ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

(IV)

BIO-TECHNOLOGY

For

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2009-2010)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

KUKATPALLY, HYDERABAD – 500 085.

Academic Regulations 2009 for B. Tech (Regular)

(Effective for the students admitted into I year from the Academic Year 2009-2010 onwards)
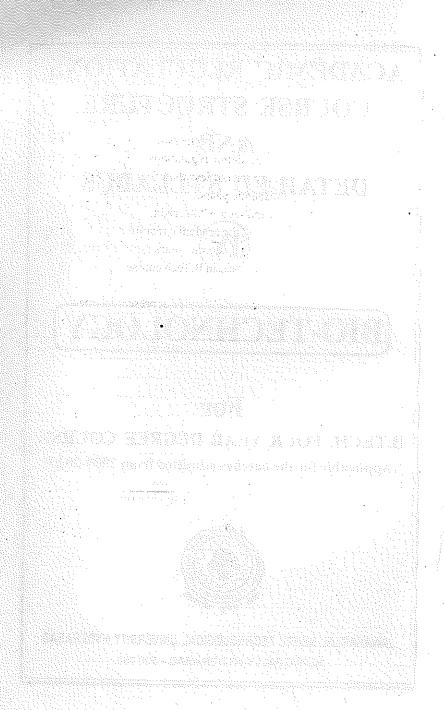
1. **Award of B.Tech. Degree**

   A student will be declared eligible for the award of the B. Tech. Degree if he fulfils the following academic regulations:

   i. Pursued a course of study for not less than four academic years and not more than eight academic years.

   ii. Register for 200 credits and secure 200 credits

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech course.

3. **Courses of study**

   The following courses of study are offered at present for specialization for the B. Tech. Course:

Branch Code	Branch
I	Aeronautical Engineering.
II	Automobile Engineering.
III	Bio-Medical Engineering.
IV	Biotechnology.
V	Chemical Engineering.
VI	Civil Engineering.
VII	Computer Science and Engineering.
VIII	Electrical and Electronics Engineering.
IX	Electronics and Communication Engineering.
X	Electronics and Computer Engineering.
XI	Electronics and Instrumentation Engineering.
XII	Electronics and Telematics Engineering.
XIII	Information Technology.
XIV	Instrumentation and Control Engineering.
XV	Mechanical Engineering (Mechatronics).
XVI	Mechanical Engineering (Production).
XVII	Mechanical Engineering.
XVIII	Metallurgy and Material Technology.

and any other course as approved by the authorities of the University from time to time.

4. Credits

	I Year		Semester	
	Periods / Weeks	Credits	Periods / Weeks	Credits
Theory	03	06	03	03
Practical	02	04	--	--
Drawing	03	04	03	02
			06	04
Mini Project	02T / 03D	04	---	02
Comprehensive Viva Voce	---	---	---	02
	---	---		
Seminar	---	---	6	02
Project	---	---	15	10

5. Distribution and Weightage of Marks

i.   The performance of a student in each semester / I year shall be evaluated subject –wise with a maximum of 100 marks for theory and 75 marks for practical subject. In addition, Industry oriented mini-project, seminar and project work shall be evaluated for 50, 50 and 200 marks respectively.

ii.   For theory subjects the distribution shall be 25 marks for Internal Evaluation and 75 marks for the End-Examination.

iii.   For theory subjects, during the semester there shall be 2 mid term examinations. Each mid term examination consists of one objective paper, one subjective paper and one assignment. The objective paper is for 10 marks and subjective paper is for 10 marks, with a duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for subjective paper). Objective paper is set for 20 bits of – multiple choice questions, fill-in the blanks, matching type questions – for the 10 marks. Subjective paper of each semester shall contain 4 full questions (one from each unit) of which, the student has to answer 2 questions, each carrying 5 marks.

First mid term examination shall be conducted for 1-4 units of syllabus and second mid term examination shall be conducted for 5-8 units. 5 marks are allocated for Assignments (as specified by the concerned subject teacher) – first Assignment should be submitted before the conduct of the first mid, and the second Assignment should be submitted before the conduct of the second mid. The total marks secured by the student in each mid term examination are evaluated for 25 marks, and the better of the two mid term examinations shall be taken as the final marks secured by each candidate.

However, for first-year, there shall be 3 mid term examinations (each for 25 marks), *along with 3 assignments* in a similar pattern as above [1st mid shall be from 1-2 units, 2nd mid from 3-5 units and 3rd mid shall be from 6-8 units], and the average marks of the best two examinations secured *(each evaluated for a total of 25 marks)* in each subject shall be considered as final marks for the internals / sessionals.

iv.   For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 50 end examination marks. Out of the 25 marks for internal, day-to-day work in the laboratory shall be evaluated for 15 marks and internal examination for practical shall be evaluated for 10 marks conducted by the concerned laboratory teacher. The end examination shall be conducted with external examiner and laboratory teacher. The external examiner shall be appointed from the cluster of colleges as decided by the University examination branch.

v.   For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day work and 10 marks for internal tests) and 75 marks for end examination. There shall be two internal tests in a Semester and the better of the two shall be considered for the award of marks for internal tests. However in the I year class, there shall be three tests and the average of best two will be taken into consideration.

vi.   There shall be an industry-oriented mini-Project, in collaboration with an industry of their specialization, to be taken up during the vacation after III year II Semester examination. However, the mini project and its report shall be evaluated with the project work in IV year II Semester. The industry oriented mini project shall be submitted in report

form and should be presented before the committee, which shall be evaluated for 50 marks. The committee consists of an external examiner, head of the department, the supervisor of mini project and a senior faculty member of the department. There shall be no internal marks for industry oriented mini project.

vii. There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.

viii. There shall be a Comprehensive Viva-Voce in IV year II semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of (i) Head of the Department (ii) two Senior Faculty members of the Department. The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects he / she studied during the B.Tech course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive viva-voce.

ix. Out of a total of 200 marks for the project work, 50 marks shall be for Internal Evaluation and 150 marks for the End Semester Examination. The End Semester Examination (viva-voce) shall be conducted by the same committee appointed for industry oriented mini project. In addition the project supervisor shall also be included in the committee. The topics for industry oriented mini project, seminar and project work shall be different from each other. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project.

x. Laboratory marks and the sessional marks awarded by the College are not final. They are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the College will be referred to a Committee. The Committee will arrive at a scaling factor and the marks will be scaled as per the

scaling factor. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same is asked for.

6. **Attendance Requirements:**

i. A student shall be eligible to appear for University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

ii. **Shortage of Attendance below 65% in aggregate shall in NO case be condoned.**

iii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee.

iv. A student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester / I year, as applicable. They may seek re-admission for that semester / I year when offered next.

v. Students whose shortage of attendance is not condoned in any semester / I year are not eligible to take their end examination of that class and their registration shall stand cancelled.

vi. A stipulated fee shall be payable towards condonation of shortage of attendance.

7. **Minimum Academic Requirements:**
The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.6

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical design or drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together.

ii. A student shall be promoted from II to III year only if he fulfils the academic requirement of 37 credits from one regular and one supplementary examinations of I year, and one regular examination of II year

I semester irrespective of whether the candidate takes the examination or not.

iii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of total 62 credits from the following examinations, whether the candidate takes the examinations or not.

a. Two regular and two supplementary examinations of I year.

b. Two regular and one supplementary examinations of II year I semester.

c. One regular and one supplementary examinations of II year II semester.

d. One regular examination of III year I semester.

iv. A student shall register and put up minimum attendance in all 200 credits and earn the 200 credits. Marks obtained in all 200 credits shall be considered for the calculation of percentage of marks.

v. Students who fail to earn 200 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

8. Course pattern :

i. The entire course of study is of four academic years. The first year shall be on yearly pattern and the second, third and fourth years on semester pattern.

ii. A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the supplementary examination.

When a student is detained due to lack of credits / shortage of attendance he may be re-admitted when the semester / year is offered after fulfilment of academic regulations, whereas the academic regulations hold good with the regulations he was first admitted.

9. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	Class Awarded
First Class with Distinction	70% and above	From the aggregate marks secured for the best 200 Credits.
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

10. Minimum Instruction Days :

The minimum instruction days for each semester / I year shall be 90/180 clear instruction days.

11. There shall be no branch transfers after the completion of admission process.

12. There shall be no place transfer within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.

13. General:

i. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

ii. The academic regulation should be read as a whole for the purpose of any interpretation.

iii. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

iv. The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

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Academic Regulations for B. Tech. (Lateral Entry Scheme)
(Effective for the students getting admitted into
II year from the Academic Year 2009-2010 and onwards)

1. The Students have to acquire 150 credits from II to IV year of B.Tech. Program (Regular) for the award of the degree.
Register for **150** credits and secure **150** credits.

2. Students, who fail to fulfil the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.

3. The same attendance regulations are to be adopted as that of B. Tech. (Regular).

4. **Promotion Rule :**
A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of 37 credits from the examinations.

   a. Two regular and one supplementary examinations of II year I semester.
   b. One regular and one supplementary examinations of II year II semester.
   c. One regular examination of III year I semester.

5. **Award of Class:**
After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes :

Class Awarded	% of marks to be secured	Class Awarded
First Class with Distinction	70% and above	From the aggregate marks secured for 150 Credits. (i.e. II year to IV year)
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

6. All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/ Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in tha subject only
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subj-ect only of all the candidates inv-olved. Incase of an out-sider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programm-able calculators, palm computers or any other form of material rele-vant to the subject of the exami-nation	Expulsion from the examination hall and cancellation of the performance in that subj-ect and all other subjects the candidate has already appe-ared including practical exam-inations and project work and

	(theory or practical) in which the candidate is appearing.	shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester / year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of

	the any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The
		continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and a police case will be registered against them.

10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
(i) A show cause notice shall be issued to the college.
(ii) Impose a suitable fine on the college.
(iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.TECH. BIO-TECHNOLOGY

I YEAR   **COURSE STRUCTURE**

Code	Subject	L	T/P/D	C
51001	English	2	-	4
51002	Mathematics - I	3	1	6
51009	Fundamental of Biology *	3	1	6
51004	Engineering Physics	2	1	4
51005	Engineering Chemistry	2	-	4
51006	Computer Programming & Data Structures	3	-	6
51007	Engineering Drawing	2	3	4
51664	Computer Programming Lab.	-	3	4
51665	Engineering Physics & Engineering Chemistry Lab	-	3	4
51666	English Language Communication Skills Lab.	-	3	4
51667	Engineering Workshop / IT Workshop	-	3	4
	Total	17	18	50

* Note: For B.Tech Biotechnology programme "Fundamentals of Biology" (FOB) can be introduced in place of Engineering Mechanics.

II YEAR I SEMESTER   **COURSE STRUCTURE**

Code	Subject	L	T/P/D	C
53045	Biochemistry	4	1	4
53002	Basic electrical & electronic engineering	4	0	4
53046	Cell Biology	3	1	3
53001	Mathematics II	4	1	4
53047	Process engineering principles	3	1	3
53048	Microbiology	3	1	3
53632	Biochemistry Lab	-	3	2
53633	Cell Biology and Microbiology Lab	-	3	2
	Total	21	11	25

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.TECH. BIO-TECHNOLOGY

II YEAR II SEMESTER   COURSE STRUCTURE

Code	Subject	L	T/P/D	C
54047	Mass Transfer Operations	4	1	4
54004	Environmental Studies	3	-	3
54048	Analytical Methods in biotechnology	3	1	3
54049	Molecular Biology & Genetics	4	1	4
54050	Thermodynamics for Biotechnologists	3	1	3
54051	Bioprocess Engineering	4	1	4
54632	Bioprocess Engineering Lab	-	3	2
54633	Analytical Methods in biotechnology Lab	-	3	2
	Total	21	11	25

III YEAR I SEMESTER   COURSE STRUCTURE

Code	Subject	L	T/P/D	C
55073	Transport Phenomena in Bio Processes	3	1	3
55074	Biochemical Reaction Engineering	4	1	4
55075	Basic Industrial and Environmental Biotechnology	3	1	3
55076	Genetic Engineering	4	1	4
55077	Fundamentals of Enzyme Mechanisms & Technology	3	1	3
55015	Managerial Economics and Financial Analysis	4	-	4
55634	Molecular Biology & Genetic Engineering Lab	-	3	2
55635	Advanced English Communication skills lab	-	3	2
	Total	21	11	25

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.TECH. BIO-TECHNOLOGY

III YEAR II SEMESTER   COURSE STRUCTURE

Code	Subject	L	T/P/D	C
	Open Elective	4	-	4
56076	Artificial Neural Networks			
56077	Bioinformatics			
56042	Computer Organization			
56078	Plant Biotechnology	4	1	4
56079	Heat Transfer in Bioprocesses	3	1	3
56080	Instrumentation and Process Control	3	1	3
56081	Immunology	4	1	4
56066	Probability and Statistics	3	1	3
56639	Plant Tissue Culture Lab	-	3	2
56640	Immunology Lab	-	3	2
	Total	21	11	25

IV YEAR I SEMESTER   COURSE STRUCTURE

Code	Subject	L	T/P/D	C
57129	Computational Molecular Biology	4	-	4
57130	Bio Ethics, Bio Safety and Intellectual Property Rights	3	1	3
57131	Downstream Processing	3	1	3
57132	Bioprocess optimization and plant design	3	1	3
	ELECTIVE –I	4	1	4
57133	Crop improvement			
57134	Structural Biology			
57135	Cancer Biology			
	ELECTIVE –II	4	1	4
57136	Molecular pathogenesis			
57137	Biopharmaceuticals			
57138	Introduction to Bio materials			
57633	Bioinformatics Lab	-	3	2
57634	Downstream Processing Lab	-	3	2
	Total	21	11	25

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.TECH. BIO-TECHNOLOGY

IV YEAR II SEMESTER   COURSE STRUCTURE

Code	Subject	L	T/P/D	C
58101	Animal Cell Science & Technology	3	1	3
	ELECTIVE –III	3	1	3
58102	Fundamentals of Food Science & Technology			
58103	Nanobiotechnology			
58104	Clinical Trials & Regulatory Affairs	3	-	3
58665	Industry Oriented Mini Project	-	-	2
58666	Seminar	-	6	2
58667	Project	-	15	10
58668	Comprehensive viva	-	-	2
	Total	9	23	25

Note : All End Examinations (Theory and Practical) are of three hours duration.

T-Tutorial   L – Theory

P – Practical/Drawing   C – Credits

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B.Tech. Biotech.	L	T/P/D	C
	2	-/-/-	4

(51001) ENGLISH

1. INTRODUCTION:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

The text for non-detailed study is for extensive reading/reading for pleasure by the students. Hence, it is suggested that they read it on their own with topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section , as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc.. *However, the stress in this syllabus is on skill development and practice of language skills.*

2. OBJECTIVES:

a. To improve the language proficiency of the students in English with emphasis on LSRW skills.

b. To equip the students to study academic subjects with greater facility through the theoretical and practical components of the English syllabus.

c. To develop the study skills and communication skills in formal and informal situations.

3. SYLLABUS:

Listening Skills:

Objectives

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation

2. To equip students with necessary training in listening so that can comprehend the speech of people of different backgrounds and regions

   Students should be given practice in listening to the sounds of the language to be able to recognise them, to distinguish between them to mark stress and recognise and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills:

Objectives

1. To make students aware of the role of speaking in English and its contribution to their success.

2. To enable students to express themselves fluently and appropriately in social and professional contexts.

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities (Using exercises from all the nine units of the prescribed text: *Learning English : A Communicative Approach.*)
- Just A Minute(JAM) Sessions.

Reading Skills:

Objectives

1. To develop an awareness in the students about the significance of silent reading and comprehension.

2. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.

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

NOTE: *The students will be trained in reading skills using the prescribed text for detailed study. They will be examined in reading and answering questions using 'unseen' passages which may be taken from the non-detailed text or other authentic texts, such as magazines/newspaper articles.*

Writing Skills :

Objectives

1. To develop an awareness in the students about writing as an exact and formal skill

2. To equip them with the components of different forms of writing, beginning with the lower order ones.

- Writing sentences
- Use of appropriate vocabulary
- Paragraph writing
- Coherence and cohesiveness
- Narration / description
- Note Making
- Formal and informal letter writing
- Editing a passage

4. TEXTBOOKS PRESCRIBED:

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

For Detailed study

1. First Text book entitled "Enjoying Everyday English", Published by Sangam Books, Hyderabad

For Non-detailed study

1. Second text book "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

A. STUDY MATERIAL:

Unit –I

1. Chapter entitled *Heaven's Gate* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad

2. Chapter entitled *Haragovind Khorana* from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

Unit –II

1. Chapter entitled *Sir CV Raman: A Pathbreaker in the Saga of Indian Science* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad

2. Chapter entitled *Sam Petroda* from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

Unit –III

1. Chapter entitled *The Connoisseur* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad

2. Chapter entitled *Mother Teresa* from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

Unit –IV

1. Chapter entitled *The Cuddalore Experience* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad

2. Chapter entitled *Dr Amartya Kumar Sen* from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

Unit –V

1. Chapter entitled *Bubbling Well Road* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad

2. Chapter entitled *I Have a Dream* by Martin Luther King from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

Unit –VI

1. Chapter entitled *Odds Against Us* from "Enjoying Everyday English", Published by Sangam Books, Hyderabad

2. Chapter entitled *Ask Not What Your Country can do for you* by John F Kennedy from "Inspiring Speeches and Lives", Published by Maruthi Publications, Guntur

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

Unit – VII

Exercises on

Reading and Writing Skills

Reading Comprehension

Situational dialogues

Letter writing

Essay writing

Unit – VIII

Practice Exercises on Remedial Grammar covering

Common errors in English, Subject-Verb agreement, Use of Articles and Prepositions, Tense and aspect

Vocabulary development covering

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

REFERENCES :

1. **Innovate with English: A Course in English for Engineering Students,** edited by T Samson, Foundation Books

2. English Grammar Practice, **Raj N Bakshi, Orient Longman.**

3. **Effective English, edited** by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson

4. Handbook of English Grammar& Usage, **Mark Lester and Larry Beason,** Tata Mc Graw –Hill.

5. Spoken English, **R.K. Bansal & JB Harrison, Orient Longman.**

6. Technical Communication, **Meenakshi Raman, Oxford University Press**

7. Objective English **Edgar Thorpe & Showick Thorpe, Pearson Education**

8. Grammar Games, **Renuvolcuri Mario, Cambridge University Press.**

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

10. Everyday Dialogues in English, **Robert J. Dixson, Prentice Hall India Pvt Ltd.,**

11. ABC of Common Errors **Nigel D Turton, Mac Millan Publishers.**

12. Basic Vocabulary **Edgar Thorpe & Showick Thorpe, Pearson Education**

13. Effective Technical Communication, **M Ashraf Rizvi, Tata Mc Graw –Hill.**

14. An Interactive Grammar of Modern English, **Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO**

15. A Communicative Grammar of English, **Geoffrey Leech, Jan Svartvik, Pearson Education**

16. Enrich your English, **Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,**

17. A Grammar Book for You And I, **C. Edward Good, MacMillan Publishers.**

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(51002) MATHEMATICS – I

UNIT – I Sequences – Series

Basic definitions of Sequences and series – Convergences and divergence – Ratio test – Comparison test – Integral test – Cauchy's root test – Raabe's test – Absolute and conditional convergence

UNIT – II Functions of Single Variable

Rolle's Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – Generalized Mean Value theorem (all theorems without proof) Functions of several variables – Functional dependence-Jacobian- Maxima and Minima of functions of two variables with constraints and without constraints

UNIT – III Application of Single variables

Radius, Centre and Circle of Curvature – Evolutes and Envelopes Curve tracing – Cartesian , polar and Parametric curves.

UNIT – IV Integration & its applications

Riemann Sums , Integral Representation for lengths, Areas, Volumes and Surface areas in Cartesian and polar coordinates multiple integrals – double and triple integrals – change of   order of integration-change of variable

UNIT – V Differential equations of first order and their applications

Overview of differential equations- exact, linear and Bernoulli. Applications to Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories and geometrical applications.

UNIT – VI Higher Order Linear differential equations and their applications

Linear differential equations of second and higher order with constant coefficients,   RHS term of the type $f(X) = e^{ax}$; Sin ax, Cos ax, and x^n, $e^{ax} V(x)$, $x^n V(x)$, method of variation of parameters. Applications bending of beams, Electrical circuits, simple harmonic motion.

UNIT – VII   Laplace transform and its applications to Ordinary differential equations

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

UNIT – VIII   Vector Calculus

Vector Calculus: Gradient- Divergence- Curl and their related properties Potential function - Laplacian and second order operators. Line integral – work done ---- Surface integrals - Flux of a vector valued function.

Vector integrals theorems: Green's -Stoke's and Gauss's Divergence Theorems (Statement & their Verification) .

TEXT BOOKS:

1. Engineering Mathematics – I by P.B. Bhaskara Rao, S.K.V.S. Rama Chary, M. Bhujanga Rao.

2. Engineering Mathematics – I by C. Shankaraiah, VGS Booklinks.

REFERENCES:

1. Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.

2. Engineering Mathematics – I by D. S. Chandrasekhar, Prison Books Pvt. Ltd.

3. Engineering Mathematics – I by G. Shanker Rao & Others I.K. International Publications.

4. Higher Engineering Mathematics – B.S. Grewal, Khanna Publications.

5. Advance Engineering Mathematics by Jain and S.R.K. Iyengar, Narosa Publications.

6. A text Book of KREYSZIG'S Engineering Mathematics, Vol-1 Dr .A. Ramakrishna Prasad. WILEY publications

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(51009) FUNDAMENTALS OF BIOLOGY

UNIT I: INTRODUCTION TO MICROORGANISMS

Diversity in biological systems, Cell biology and cell structure, Difference between Prokaryotes & Eukaryotes. Kingdom systems. Five-kingdom classification General characters, Brief account on Ecology, Morphology, Nutrition, Locomotion and Reproduction, useful and harmful effects of Bacteria, Viruses, Algae, Fungi and Protozoans.

UNIT II: PLANT BIOLOGY

Classification of Plant Kingdom. Concepts of Growth, Meristems. Development of different plant organs; Plant growth regulators; Economic Importance of Plants, Biology of Pests in relation to Rice, Cotton, Sugarcane and Groundnut.

UNIT III: ANIMAL BIOLOGY

Classification of Animal Kingdom, Functions, morphology, growth and Reproduction, economic importance. Phylogeny of Invertebrate & Vertebrate Phyla, Concepts of Species & Ecosystem. Protozoan Parasites – two important forms in man (*Plasmodium, Entamoeba histolytica*), Helminthes (*Fasciotopsis buski, Taenia solium, Ascaris, Wucheria bancrofti*)

UNIT IV: BASIC MOLECULAR BIOLOGY

Genetics: DNA as genetic material, Structure of DNA, DNA replication, Transcription, Translation, Genes to proteins to protein function, Gene expression and regulation. Recombinant DNA technology.

UNIT V: HUMAN BIOLOGY I

Introduction of body as a whole, Cells and Tissue Organization, Electrolytes and Body fluids. Physiology of Blood. Digestive system, Respiratory system and Endocrine system.

UNIT VI: HUMAN BIOLOGY II

Human Physiology: Biological axons and neurons, Neuromuscular and synaptic junctions, Sensory systems - hearing, taste, smell and visual receptors.

UNIT VII: PHOTOSYNTHESIS

Bacterial & Plant photosynthesis; oxygenic and anoxygenic photosynthesis; chlorophyll as trapper of solar energy, photosynthetic reaction centres, Hill reaction, PS I & PS II, Photophosphorylation - cyclic & non-cyclic; Dark reaction & CO2 fixation.

UNIT VIII : APPLICATIONS OF BIOTECHNOLOGY: BASIC CONCEPTS

Drugs and Chemicals from Plants & Animals, Definition and importance (in general) of Biofuels, Biofertilizers, Biopesticides, Bioindicators and Biosensors, Microbial Enzymes, Single Cell Protein (SCP), Monoclonal Antibodies, Introduction to Transgenic Plants & Animals.

TEXT BOOKS:

1. H.G. Rehen and G.Reed, biotechnology Volume I & 2
2. Basic Biotechnology, Second Edition, by Colin Ratledge and Bjorm Kristiansen, Cambridge University Press.
3. Anatomy and Physiology In Health and Disease,K. J.W. Wilison and A. Waugh, Churchill & Livingston.

REFERENCES

1) Plant Physiology F.B Salisbury & C.W. Ross 4th edition Thomson Wadsworth
2) Dr. C.C. Chatterjee, *Human Physiology (11th Edition) Vol I and II*, Medical Allied Agency, Kolkata, 1987.
3) Introduction to biology and biotechnology, second edition, K.Vaitaidyanath, K. Pratap Reddy, and K.Satya Prasad, BS Publication.

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(51004) ENGINEERING PHYSICS

UNIT-I

1. **Bonding in Solids:** Ionic Bond, Covalent Bond, Metallic Bond, Hydrogen Bond, Vander-Waal's Bond, Calculation of Cohesive Energy.
2. **Crystallography and Crystal Structures:** Space Lattice, Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices, Miller Indices, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Diamond and hcp Structures, Structures of NaCl, ZnS, CsCl.

UNIT-II

3. **X-ray Diffraction:** Basic Principles, Bragg's Law, Laue Method, Powder Method, Applications of X- ray Diffraction.
4. **Defects in Crystals:** Point Defects: Vacancies, Substitutional, Interstitial, Frenkel and Schottky Defects; Qualitative treatment of line (Edge and Screw Dislocations) Defects, Burger's Vector, Surface Defects and Volume Defects.

UNIT-III

5. **Elements of Statistical Mechanics:** Maxwell-Boltzman, Bose-Einstein and Fermi-Dirac Statistics (Qualitative Treatment), Photon gas , Wein's Law, Rayleigh-Jeans law,, Planck's Law of Black Body Radiation, Concept of Electron Gas, Fermi Energy, Density of States.
6. **Principles of Quantum Mechanics:** Waves and Particles, de Broglie Hypothesis , Matter Waves, Davisson and Germer's Experiment, G. P. Thomson Experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time Independent Wave Equation - Physical Significance of the Wave Function - Particle in One Dimensional Potential Box.

UNIT-IV

7. **Band Theory of Solids:** Electron in a periodic Potential, Bloch Theorem, Kronig-Penny Model (Qualitative Treatment), Origin of

Energy Band Formation in Solids, Classification of Materials into Conductors, Semi Conductors & Insulators, Concept of Effective Mass of an Electron and Hole.

UNIT-V

8. **Semiconductor Physics:** Fermi Level in Intrinsic and Extrinsic Semiconductors, Intrinsic Semiconductors and Carrier Concentration, Extrinsic Semiconductors and Carrier Concentration, Equation of Continuity, Direct & Indirect Band Gap Semiconductors, Hall Effect.

9. **Physics of Semiconductor Devices:** Formation of PN Junction, Open Circuit PN Junction, Energy Diagram of PN Diode, I-V Characteristics of PN Junction, PN Diode as a Rectifier (Forward and Reverse Bias), Diode Equation, LED, LCD and Photo Diodes.

UNIT-VI

10. **Dielectric Properties:** Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities - Internal Fields in Solids, Clausius - Mossotti Equation, Piezo-electricity, Pyro-electricity and Ferro-electricity.

11. **Magnetic Properties:** Permeability, Field Intensity, Magnetic Field Induction, Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magneton, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Domain Theory of Ferro Magnetism on the basis of Hysteresis Curve, Soft and Hard Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials, Ferrites and their Applications, Concept of Perfect Diamagnetism, Meissner Effect, Magnetic Levitation, Applications of Superconductors.

UNIT-VII

12. **Lasers:** Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Lasing Action, Einstein's Coefficients and Relation between them, Ruby Laser, Helium-Neon Laser, Carbon Dioxide Laser, Semiconductor Diode Laser, Applications of Lasers.

13. **Fiber Optics:** Principle of Optical Fiber, Acceptance Angle and

Acceptance Cone, Numerical Aperture, Types of Optical Fibers and Refractive Index Profiles, Attenuation in Optical Fibers, Application of Optical Fibers.

UNIT-VIII

14. **Acoustics of Buildings & Acoustic Quieting:** Basic Requirement of Acoustically Good Hall, Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time(Qualitative Treatment), Measurement of Absorption Coefficient of a Material, Factors Affecting The Architectural Acoustics and their Remedies. Acoustic Quieting: Aspects of Acoustic Quieting, Methods of Quieting, Quieting for Specific Observers, Mufflers, Sound-proofing.

15. **Nanotechnology:** Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-gel, Precipitation, Combustion Methods; Top-down Fabrication: Chemical Vapour Deposition, Physical Vapour Deposition, Pulsed Laser Vapour Deposition Methods, Characterization(XRD&TEM) and Applications.

TEXT BOOKS:

1. Applied Physics – P.K.Palanisamy (SciTech Publications (India) Pvt. Ltd., Fifth Print 2008).
2. Applied Physics – S.O. Pillai & Sivakami (New Age International (P) Ltd., Second Edition 2008).
3. Applied Physics – T. Bhima Shankaram & G. Prasad (B.S. Publications, Third Edition 2008).

REFERENCES:

1. Solid State Physics – M. Armugam (Anuradha Publications).
2. Modern Physics – R. Murugeshan & K. Siva Prasath – S. Chand & Co. (for Statistical Mechanics).
3. A Text Book of Engg Physics – M. N. Avadhanulu & P. G. Khsirsagar– S. Chand & Co. (for acoustics).
4. Modern Physics by K. Vijaya Kumar, S. Chandralingam: S. Chand & Co.Ltd
5. Nanotechnology – M.Ratner & D. Ratner (Pearson Ed.).
6. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).
7. Solid State Physics – A.J. Dekker (Macmillan).
8. Applied Physics – Mani Naidu Pearson Education

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(51005) ENGINEERING CHEMISTRY

UNIT I:

Electrochemistry and Batteries: Concept of Electro Chemistry, Conductance-Electrolyte in solution, Conductance-Specific, Equivalent and molar conductance, Ionic mobilities, Kolrausch's Law. Application of conductance. EMF: Galvanic Cells, types of Electrodes, Reference Electrode (SCE, Quinhydrone electrode), Ion Selective Electrodes (Glass Electrode) Nernest equation, Concentration Cells, Galvanic series, Potentiometric titrations, Numerical problems.

Batteries: Primary and secondary cells, (lead-Acid cell, Ni-Cd cell, Lithium cells). Applications of batteries, fuel cells – Hydrogen – Oxygen fuel cells, Advantages of fuel cells.

UNIT II:

Corrosion and its corrosion control: Introduction, causes and different types of corrosion and effects of corrosion, theories of corrosion – Chemical, Electrochemical corrosion, corrosion reactions, factors affecting corrosion – Nature of metal – galvanic series, over voltage, purity of metal, nature of oxide film, nature of corrosion product. Nature of environment-effect of temperature, effect of pH, Humidity, effect of oxidant. Corrosion control methods – Cathodic protection, sacrificial anode, impressed current cathode. Surface coatings – methods of application on metals- hot dipping, galvanizing, tinning, cladding, electroplating - Organic surface coatings – paints constituents and functions.

UNIT III:

Polymers: Types of Polymerization, Mechanism (Chain growth & Step growth).Plastics: Thermoplastic resins & Thermo set resins. Compounding & fabrication of plastics, preparation, properties, engineering applications of: polyethylene, PVC, PS, Teflon, Bakelite, Nylon. Conducting Polymers: Poly acetylene, polyaniline, conduction, doping, applications. Liquid Crystal polymers: Characteristics and

uses Rubber – Natural rubber, vulcanization. Elastomers – Buna-s, Butyl rubber, Thiokol rubbers, Fibers – polyester, fiber reinforced plastics (FRP), applications

UNIT IV:

Water: Introduction, Hardness: Causes, expression of hardness – units – types of hardness, estimation of temporary & permanent hardness of water, numerical problems. Boiler troubles – Scale & sludge formation, caustic enbsittlement corrosion, priming & foaming Softening of water (Internal & external treatment-Lime soda, Zeolite, Ion exchange process and Numerical problems) Reverse osmosis, electro dialysis.

UNIT V:

Surface Chemistry: Solid surfaces, types of adsorption, Longmuir adsorption isotherm, BET adsorption equip. Calculation of surface area of solid & application adsorption, classification of colloids, Electrical & optical properties micelles, applications of colloids in industry. Nano materials: Introduction, preparation and applications of nano meterials

UNIT VI:

Energy sources: fuels, classification – conventional fuels (solid, liquid, gaseous) Solid fuels – coal – analysis – proximate and ultimate analysis and their significance Liquid fuels – primary – petroleum – refining of petroleum-cracking knocking synthetic petrol – Bergius and Fischer Tropsech's process; Gaseous fuels – natural gas, analysis of flue gas by Orsat's method Combustion – problems, Calorific value of fuel – HCV, LCV, determination of calorific value by Junker's gas calorie meter.

UNIT VII:

Phase rule: Definitions – phase, component, degree of freedom, phase rule equitation. Phase diagrams – one component system: water system. Two component system lead- silver system, heat treatment based on iron-carbon phase diagram, hardening, annealing.

UNIT VIII:

Materials Chemistry: Cement: composition of Portland cement, manufacture of port land Cement, setting & hardening of cement

(reactions). Lubricants: Criteria of a good lubricant, mechanism, properties of lubricants: Cloud point, pour point,flash & fire point,Viscocity. Refractoriess: Classification, Characteristics of a good refractory. Insulators & conductors: Classification of insulators characteristics of thermal & electrical insulators and applications of Superconductors ($Nb-Sn$ alloy, $YBa_2 Cu_3 O_{7-x}$), applications.

TEXT BOOKS:

1. Text Books of Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).

2. Text of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co,New Delhi(2006)

REFERENCE BOOKS

1. Engineering Chemistry by B. Siva Shankar Mc.Graw Hill Publishing Company Limited , New Delhi(2006)

2. Enginering Chemistry J.C. Kuriacase & J. Rajaram, Tata McGraw Hills co., New Delhi (2004).

3. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008).

4. Chemistry of Engineering Materials by CV Agarwal,C.P Murthy, A.Naidu, BS Publications.

5. Chemistry of Engineering Meterials by R.P Mani and K.N.Mishra, CENGAGE learning.

6. Applied Chemistry – A text for Engineering & Technology – Springar (2005).

7. Text Book of Engineering Chemistry – Shasi Chawla, Dhantpat Rai publishing Company, NewDelhi (2008).

8. Engineering Chemistry – R. Gopalan, D. Venkatappayya, D.V. Sulochana Nagarajan – Vikas Publishers (2008).

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(51006) COMPUTER PROGRAMMING AND DATA STRUCTURES

UNIT - I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programmes, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

UNIT - II

Introduction to C Language – Background, Simple C Programme, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

Selection Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Programming examples.

UNIT - III

Designing Structured Programmes, Functions, basics, user defined functions, inter function communication,

Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programmes

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C programme examples.

UNIT - IV

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments.

Strings – Concepts, C Strings, String Input / Output functions, arrays of

strings, string manipulation functions, string / data conversion, C programme examples.

UNIT - V

Derived types – Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

UNIT - VI

Input and Output – Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C programme examples.

UNIT – VII

Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort, Searching-linear and binary search methods.

UNIT - VIII

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack application-infix to postfix conversion, postfix expression evaluation, recursion implementation, Queues-operations, array and linked representations.

TEXT BOOKS :

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson education.

REFERENCES:

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

3. C Programming with problem solving, J.A. Jones & K. Harrow, dreamtech Press
4. Programming in C – Stephen G. Kochan, III Edition, Pearson Eductaion.
5. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
6. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education / PHI
7. C Programming & Data Structures, E. Balagurusamy, TMH.
8. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
9. C& Data structures – E V Prasad and N B Venkateswarlu, S. Chand&Co.

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(51007) ENGINEERING DRAWING

UNIT – I

INTRODUCTION TO ENGINEERING DRAWING : Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions. Curves used in Engineering Practice & their Constructions :

a) Conic Sections including the Rectangular Hyperbola – General method only.

b) Cycloid, Epicycloid and Hypocycloid

c) Involute.

d) Scales: Different types of Scales, Plain scales comparative scales, scales of chords.

UNIT – II

DRAWING OF PROJECTIONS OR VIEWS ORTHOGRAPHIC PROJECTION IN FIRST ANGLE

PROJECTION: Principles of Orthographic Projections – Conventions – First and Third Angle, Projections of Points and Lines inclined to both planes, True lengths, traces.

UNIT – III

PROJECTIONS OF PLANES & SOLIDS: Projections of regular Planes, auxiliary planes and Auxiliary projection inclined to both planes. Projections of Regular Solids inclined to both planes – Auxiliary Views.

UNIT – IV

SECTIONS AND SECTIONAL VIEWS:- Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

DEVELOPMENT AND INTERPENETRATION OF SOLIDS: Development of Surfaces of Right, Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts. Interpenetration of Right Regular Solids

UNIT – V

INTERSECTION OF SOLIDS:- Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

UNIT - VI

ISOMETRIC PROJECTIONS : Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.

UNIT –VII

TRANSFORMATION OF PROJECTIONS : Conversion of Isometric Views to Orthographic Views – Conventions.

UNIT – VIII

PERSPECTIVE PROJECTIONS : Perspective View : Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods (General Method only).

TEXT BOOK :

1. Engineering Drawing, N.D. Bhat / Charotar
2. Engineering Drawing and Graphics, Venugopal / New age.
3. Engineering Drawing – Basant Agrawal, TMH

REFERENCES :

1. Engineering drawing – P.J. Shah.S.Chand.
2. Engineering Drawing, Narayana and Kannaiah / Scitech publishers.
3. Engineering Drawing- Johle/Tata Macgraw Hill.
4. Computer Aided Engineering Drawing- Trymbaka Murthy- I.K. International.
5. Engineering Drawing – Grower.
6. Engineering Graphics for Degree – K.C. John.

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(51664) COMPUTER PROGRAMMING LAB

Objectives:

- To make the student learn a programming language.
- To teach the student to write programs in C to solve the problems.
- To Introduce the student to simple linear data structures such as lists, stacks, queues.

Recommended Systems/Software Requirements:

- Intel based desktop PC
- ANSI C Compiler with Supporting Editors

Week I.

a) Write a C program to find the sum of individual digits of a positive integer.

b) A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Week 2.

a) Write a C program to calculate the following Sum:
Sum=$1-x^2/2! +x^4/4!-x^6/6!+x^8/8!-x^{10}/10!$

b) Write a C program toe find the roots of a quadratic equation.

Week 3

a) Write C programs that use both recursive and non-recursive functions

i) To find the factorial of a given integer.

ii) To find the GCD (greatest common divisor) of two given integers.

iii) To solve Towers of Hanoi problem.

Week 4

a) The total distance travelled by vehicle in 't' seconds is given by distance = $ut+1/2at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec²). Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

b) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Week 5

a) Write a C program to find both the largest and smallest number in a list of integers.

b) Write a C program that uses functions to perform the following:

i) Addition of Two Matrices ;ii) Multiplication of Two Matrices

Week 6

a) Write a C program that uses functions to perform the following operations:

i) To insert a sub-string in to a given main string from a given position.

ii) To delete n Characters from a given position in a given string.

b) Write a C program to determine if the given string is a palindrome or not

Week 7

a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.

b) Write a C program to count the lines, words and characters in a given text.

Week 8

a) Write a C program to generate Pascal's triangle.

b) Write a C program to construct a pyramid of numbers.

Week 9

Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:

$1+x+x^2+x^3+\ldots\ldots\ldots+x^n$

For example: if n is 3 and x is 5, then the program computes
$1+5+25+125$.

Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal ? If so, test for them too.

Week 10

a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

b) Write a C program to convert a Roman numeral to its decimal equivalent.

Week 11

Write a C program that uses functions to perform the following operations:

i) Reading a complex number

ii) Writing a complex number

iii) Addition of two complex numbers

iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

Week 12

a) Write a C program which copies one file to another.

b) Write a C program to reverse the first n characters in a file.

(Note: The file name and n are specified on the command line.)

Week 13

a) Write a C programme to display the contents of a file.

b) Write a C programme to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Week 14

Write a C program that uses functions to perform the following operations on singly linked list.:

i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 15

Write C programs that implement stack (its operations) using

i) Arrays ii) Pointers

Week 16

Write C programs that implement Queue (its operations) using

i) Arrays ii) Pointers

Week 17

Write a C program that uses Stack operations to perform the following:

i) Converting infix expression into postfix expression

ii) Evaluating the postfix expression

Week 18

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

i) Bubble sort

ii) Selection sort

Week 19

Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers :

i) Linear search   ii) Binary search

Week 20

Write C program that implements the following sorting method to sort a given list of integers in ascending order: i) Quick sort

Week 21

Write C program that implement the following sorting method to sort a given list of integers in ascending order: i) Merge sort

Week 22

Write C programs to implement the Lagrange interpolation and

Newton- Gregory forward interpolation.

Week 23

Write C programs to implement the linear regression and polynomial regression algorithms.

Week 24

Write C programs to implement Trapezoidal and Simpson methods.

Text Books

1. C programming and Data Structures, P. Padmanabham, Third Edition, BS Publications

2. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.

3. The Spirit of C, an introduction to modern programming, M.Cooper, Jaico Publishing House.

4 Practical C Programming,Steve Oualline,O'Reilly,SPD. TMH publications.

5. Computer Basics and C Programming, V. Rajaraman, PHI Publications.

6. Data structures and Program Design in C,R.Kruse, C.L.Tondo,B.P.Leung,M.Shashi,Pearson Education.

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I Year B.Tech. Biotech.	L	T/P/D	C
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(51665) ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB

ENGINEERING PHYSICS LAB

(Any twelve experiments compulsory)

1. Dispersive power of the material of a prism – Spectrometer
2. Determination of wavelength of a source – Diffraction Grating.
3. Newton's Rings - Radius of curvature of plano convex lens.
4. Melde's experiment – Transverse and longitudinal modes.
5. Time constant of an R-C circuit.
6. L-C-R circuit.
7. Magnetic field along the axis of current carrying coil – Stewart and Gees method.
8. Study the characteristics of LED and LASER sources.
9. Study the characteristics of p-i-n and avalanche photodiode detectors.
10. Bending losses of fibres.
11. Evaluation of numerical aperture of given fibre.
12. Energy gap of a material of p-n junction.
13. Thermo electric effect – Seebeck effect and Peltier effect.
14. Torsional pendulum.
15. Single slit diffraction using laser.

ENGINEERING CHEMISTRY LAB

List of Experiments (Any 12 of the following):

Titrimetry:

a. Estimation of hardness of water by EDTA method. (or) Estimation of calcium in limestone by Permanganometry.

Mineral Analysis:

2. Determination of percentage of copper in brass
3. Estimation of manganese dioxide in pyrolusite.

Instrumental Methods:

4. **Colorimetry:** Determination of ferrous iron in cement by colorimetric method. (Or) Estimation of Copper by Colorimetric method.

5. **Conductometry:** Conductometric titration of strong acid Vs strong base. (or) Conductometric titration of mixture of acids Vs strong base.

6. **Potentiometry:** Titration of strong acid Vs strong base by potentiometry. (or) Titration of weak acid Vs strong base by potentiometry.

Physical Properties:

7. Determination of viscosity of sample oil by redwood/oswald's viscometer

8. Determination Surface Tension of lubricants.

Identification and Preparations:

9. Identification of functional groups present in organic compounds.

10. Preparation of organic compounds Asprin (or) Benzimidazole

Kinetics:

11. To determine the rate constant of hydrolysis of methyl acetate catalysed by an acid and also the energy of activation. (or) To study the kinetics of reaction between $K_2S_2O_8$ and KI.

12. Demonstration Experiments (Any One of the following) :

    a. Determination of dissociation constant of weak acid-by PH metry, b. Preparation of Thiokol rubber, c. Adsorption on Charcoal, d. Heat of reaction

TEXT BOOKS:

1. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.

2. Inorganic quantitative analysis, Vogel.

REFERENCE BOOKS:

1. Text Book of engineering chemistry by R. N. Goyal and Harrmendra Goel.

2. A text book on experiments and calculation Engg. S.S. Dara.

3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

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(51666) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

The **Language Lab** focuses on the production and practice of sounds of language and familiarises the students with the use of English in everyday situations and contexts.

Objectives:

1. To expose the students to a variety of self-instructional, learner-friendly modes of language learning.

2. To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams such GRE, TOEFL, GMAT etc.

3. To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.

4. To train them to use language effectively to face interviews, group discussions, public speaking.

5. To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.

SYLLABUS :

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

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.

2. Introduction to Stress and Intonation.

3. Situational Dialogues / Role Play.

4. Oral Presentations- Prepared and Extempore.

5. 'Just A Minute' Sessions (JAM).

6. Describing Objects / Situations / People.

7. Information Transfer

8. Debate

9. Telephoning Skills.

10. Giving Directions.

Minimum Requirement:

The English Language Lab shall have two parts:

i) **The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

ii) **The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

System Requirement (Hardware component):

Computer network with Lan with minimum 60 multimedia systems with the following specifications:

i) P – IV Processor

a) Speed – 2.8 GHZ

b) RAM – 512 MB Minimum

c) Hard Disk – 80 GB

ii) Headphones of High quality

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- The Rosetta Stone English Library.
- Clarity Pronunciation Power – Part I.
- Mastering English in Vocabulary, Grammar, Spellings, Composition
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- Language in Use, Foundation Books Pvt Ltd with CD.
- Oxford Advanced Learner's Compass, 7th Edition.
- Learning to Speak English - 4 CDs.
- Vocabulary in Use, Michael McCarthy, Felicity O'Den, Cambridge.
- Murphy's English Grammar, Cambridge with CD.
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. A Handbook for English Language Laboratories – Prof. E. Suresh Kumar, P. Sreehari, Foundation Books.

2. Effective Communication & Public Speaking by S. K. Mandal, Jaico Publishing House.

3. **English Conversation Practice** by Grant Taylor, Tata McGraw Hill.

4. **Speaking English effectively** by Krishna Mohan, N. P. Singh, Mac Millan Publishers.

5. **Communicate or Collapse: A Handbook of Efffective Public Speaking, Group Discussions and Interviews,** by Pushpa Lata & Kumar, Prentice-Hall of India.

6. **Learn Correct English, Grammar, Usage and Composition** by Shiv. K. Kumar & Hemalatha Nagarajan, Pearson Longman

7. **Spoken English** by R. K. Bansal & J. B. Harrison, Orient Longman.

8. **English Language Communication: A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr. G. Natanam & Prof. S. A. Sankaranarayanan, Anuradha Publications, Chennai.

9. **Effective Technical Communication,** M. Ashraf Rizvi, Tata McGraw-Hill.

10. **A Practical Course in English Pronunciation,** (with two Audio cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.

11. **A text book of English Phonetics for Indian Students** by T. Balasubramanian, Mac Millan

12. **Spoken English: A foundation Course, Parts 1 & 2, Kamalesh Sadanand and Susheela punitha,** Orient Longman

DISTRIBUTION AND WEIGHTAGE OF MARKS

English Language Laboratory Practical Paper:

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.

2. For the Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 year-end Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year-end Examination shall be conducted by an external examiner/ or the teacher concerned with the help of another member of the staff of the same department of the same institution.

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(51667) ENGINEERING WORKSHOP / IT WORKSHOP

1. **TRADES FOR EXERCISES:**

   At least two exercises from each trade:

   1. Carpentry
   2. Fitting
   3. Tin-Smithy and Development of jobs carried out and soldering.
   4. Black Smithy
   5. House-wiring
   6. Foundry
   7. Welding
   8. Power tools in construction, wood working, electrical engineering and mechanical Engineering.
   9. IT Workshop-I : Computer hard ware , identification of parts , Disassembly, Assembly of computer to working condition, Simple diagnostic exercises.
   10. IT workshop-II : Installation of Operating system windows and Linux , simple diagnostic exercises.

2. **TRADES FOR DEMONSTRATION & EXPOSURE:**

   1. Plumbing
   2. Machine Shop
   3. Metal Cutting (Water Plasma)

TEXT BOOK:

1. Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech Publishers.
2. Workshop Manual by Venkat Reddy

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II Year B. Tech. Biotech I-Sem	L	T/P/D	C
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(53045) BIOCHEMISTRY

UNIT-I

Chemical foundations of Biology: Properties of water, pH & Buffers, The Handerson Hasselbalch equation, determination of pKa values, Physiological buffers. Covalent bond and non covalent interactions.

UNIT II

Classes of organic compounds and functional groups – Basics of Stereochemistry of Biomoleculess

UNIT III

Carbohydrates; Classification of carbohydrates,Properties and chemical reactions of carbohydrates,Industrially Significant carbohydrates, Lectins,Glucose tolerance test,Glycolysis,Aerobic and anaerobic Fate of Pyruvate, Gluconeogenesis,Pentose phosphate pathway

UNIT IV

Bioenergetics; Redox potential, components in electron transport systems in mitochondria, respiratory chain. Oxidative phosphorylation - Energetics ,High energy compounds.

UNIT V

Amino acids and peptides - classification, chemical reactions and physical properties, non- natural aminoacids and their significance.

UNIT VI

Protein and Aminoacid metabolisms; Proteins - classification and hierarchy in structure, Ramachandran map,Nitrogen cycle, Nitrogen balance, Reductive animation and transamination, Urea cycle;Production of aminoacids-Glutamate pathway,Shikimate pathway for the production of aminoacids.

Unit VII

Lipids; Classification of lipids, Characterisation of Fats, Brief outlines of Fatty acid synthesis and breakdown, Significance of cholesterol and lipoproteins in Lipid profile analysis,Lipids as surfactants in industry.

UNIT VIII

Nucleic acids and their metabolism, Structure of purines and Pyrimidines,Brief outlines of Biosynthesis and Degradation.

TEXT BOOKS:

1. Lehninger A L,Nelson O.L,M.M.Cox,Principles of Biochemistry 3rc edition,2000CBS PublicTIONS,1993.

2. Fundamentals of Biochemistry JL.Jain S.chand Publishers.

REFERENCE BOOKS

1. Voet D,Voet J .G.Biochemistry,second Edition,John C wiley and Sons,1994

2. L.Stryer ,JM.Berg ,JL Tymockzo Biochemistry 5th edition,WH Freeman & Co, 2002

3. Campbell and Farell ,Biochemistry ,Brooks/cole CENGAGE learning, 2008

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II Year B. Tech. Biotech I-Sem	L	T/P/D	C
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(53002) BASIC ELECTRICAL AND ELECTRONIC ENGINEERING

UNIT I: D.C CIRCUITS

RLC concepts, Kirchoff's laws, steady state solution of D.C circuits.

UNIT II: A.C CIRCUITS

Introduction to A.C circuits, RMA & Average values of wave forms, complex impedance and complex power, power factor, analysis of single phase A.C circuits.

UNIT III: 3-PHASE CIRCUITS

Introduction of 3-phase circuits, power in 3- phase circuits, analysis of simple 3-phase balance circuits.

UNIT IV: ELECTRICAL MACHINES

Principles of operation and characteristics of D C machines, Transformers (single phase and three phase) - Synchronous Machines - three Phase and single phase induction motors -(Principles of operation and constructional details).

UNIT V: MEASUREMENTS

Moving coil and moving iron instruments (Ammeter and voltmeter). Dynamometer type watt meters and energy meters (Principles of operation and constructional details).

UNIT VI: SEMICONDUCTOR DEVICES & RECTIFIERS

Classification of solids based on energy hand theory - Intrinsic semiconductors - Extrinsic semiconductors - P type and N type - P-N junction - V I characteristic of PN junction diode - Zener diode - Zener diode characteristics - Half wave and full wave rectifiers - Voltage regulation, SCR, Diac, Triac, Characteristics and simple applications.

UNIT VII: TRANSISTORS

Bipolar junction transistor - CB, CE, CC - Configurations and characteristics – Biasing circuits - Field Effect Transistor - Configurations and characteristics - FET amplifier - UJT - characteristics and simple applications - switching transistors -

concept of feed back - negative feed back - application in temperature and motor speed control.

UNIT VIII: DIGITAL ELECTRONICS

Binary number system - AND, OR, NOT, NAND, NOR circuits - Boolean algebra - Exclusive OR gate - Half and Full adders - flip flops - registers and counters - A/D, D/A conversion - Digital computer principle.

TEXT BOOKS:

1. Basic Electrical Engineering by Sukhija and Nagasarkar, Oxford publications.

2. Basic Electrical Engineering by Mittle V.N, TMH Edition, New Delhi.

REFERENCES

1. Electrical Engineering Fundamentals by Del Taro, Prentice Hall of India Pvt. Ltd., New Delhi, Second edition.

2. Hughes Electrical and Electronic Technology by Edword Hughes, Pearson edition, 9th Edition.

3. Electronic Devices and Circuits by S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Tata McGraw Hill Companies 2008.

4. Principles of electrical engineering and Electrons by V.K. Mehta, Rohit, S. Chand & Company Ltd.

5. Millman & Halkias, Integrated Electronics, McGraw Hill,

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II Year B.Tech. Biotech. I-Sem

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(53046) CELL BIOLOGY

UNIT I: CELL STRUCTURE AND FUNCTION

Discovery of cells; Basic properties of cells; Cell theory; Cell complexity; Different classes of cells; Prokaryotic & Eukaryotic system; Dimensions of cells; Size & shape of Prokaryotic & Eukaryotic cells; Chemistry of the cell; Importance of carbon and water; Plasma membrane- structure and function; Cytoplasm & Cytoskeleton; Microtubules, microfilaments, intermediate filaments.

UNIT II: INTRACELLULAR COMPARTMENTS

Structure and functions of Nucleus, Endoplasmic Reticulum, Ribosomes, Golgi Complex, Lysosomes, Peroxisomes, Chloroplast & Mitochondria.

UNIT III: TRANSPORT ACROSS CELL MEMBRANES

Passive and Active Transport, Permeases, Na^+/K^+ Pump, ATPase pumps, Lysosomal & Vacuolar membrane, ATP dependent Proton Pumps, Co-Transport Symport, Antiport, Transport into Prokaryotic Cells, Endocytosis and Exocytosis.

UNIT IV: POST-TRANSLATIONAL MODIFICATIONS AND TRANSPORT OF MACROMOLECULES

Protein glycosylation, and other modifications. Sorting & macromolecular traffic within cells. Polarization of cells & trafficking in polarized cells.

UNIT V: CELL DIVISION

Overview of the Cell Cycle, Interphase, Mitosis, Meiosis and Cytokinesis. Animal Cell & Yeast Cell Division, Cell Cycle Control & Checkpoints.

UNIT VI: CELL DIFFERENTIATION

General Characteristics of Cell Differentiation, Historical events in Cell differentiation, Cytoplasmic determinants, Nucleoplasmic Interactions; Stem Cell differentiation and its Biological Importance.

UNIT VII RECEPTORS & SIGNAL TRANSDUCTION

Cytosolic, Nuclear & Membrane bound receptors, Examples and types of receptors; Chemo receptors of Bacteria (Attractants & Repellents), Concept of Secondary messengers; cAMP, cGMP, Protein Kinases, G Proteins, Steroid / Peptide hormone regulation, Tissue specific regulation.

UNIT VIII: DISRUPTION OF CELLULAR PATHWAYS AND INTRODUCTION TO CANCER

Characteristics of cancer cells; Disruption in cell cycle; Disruption in cell signaling. Micro organisms and cancer. Telomere/telomerase and cancer.

TEXT BOOKS:

1) Cell & Molecular Biology by Gerald Karp (2nd Ed.) Wiley publishers.
2) The Cell by Cooper.

REFERENCE BOOKS:

1) The World of the cell by Becker, Reece, Poenie (3rd edition) Benjamin Publishers.
2) Molecular Biology of the cell by Bruce Alberts.
3) Cell and Molecular biology – De Robertis and De Robertis (1998) Waverly Pvt. Ltd.
4) Molecular biology- Mohan P. Arora

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II Year B. Tech. Biotech I-Sem

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(53001) MATHEMATICS – II

UNIT – I: Linear Systems

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

UNIT – II : Eigen values & Eigen vectors

Eigen Values, Eigen vectors - properties – Cayley-Hamilton Theorem - Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonolization of matrix. Calculation of powers of matrix – Modal and spectral matrices.

UNIT-III: Linear Transformations

Real matrices -Symmetric, skew - symmetric, orthogonal, Linear Transformation - Orthogonal Transformation. Complex matrices: Hermitian, Skew-Hermitian and Unitary – Eigen values and Eigen vectors of complex matrices and their properties.

UNIT –IV: Quadratic forms

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

UNIT-V : Fourier Series

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

UNIT –VI : Introduction to partial differential equations

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations.

UNIT –VII: Solution of partial differential equations

Classification of second order linear Partial Differential Equations, separation of variables methods for the solutions of one dimensional

heat equation, wave equation and two-dimensional Laplace's equation under initial and boundary conditions.

UNIT-VIII: Fourier transforms

Fourier integral theorem - Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

TEXT BOOKS:

1. Engineering Mathematics – II by P.B. Bhaskara Rao, S.K.V.S.Rama Chary, M.Bhujanga Rao, B.S. Publications.
2. Engineering Mathematics – II by G.Shankar Rao & Others, I.K. International Publications.

REFERENCES:

1. Engineering Mathematics – II by T.K.V. Iyengar, B.Krishna Gandhi & Others, S.Chand.
2. Higher Engineering Mathematics by B.S.Grewal, Khanna Publications.
3. Engineering Mathematics – II by Engineering Mathematics – II by C. Shankaraiah, Vijaya Publications.
4. Advanced Engineering Mathematics by Jain and S.R.K. Iyengar, Narasa Publications.
5. Engineering Mathematics – II by Dr. A. Anjaneyulu & others, Deepti Publications.

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II Year B. Tech. Biotech I-Sem

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(57047) PROCESS ENGINEERING PRINCIPLES

UNIT-I

Application of Engineering principles in biotech Industries-Introduction to unit operations and unit processes–application of transport phenomenon principles (momentum, mass and heat transfer) in bioprocessing.

UNIT-II

Units and dimensions, basic quantities and derived units. Conversion of units. Concept of mass and force, definition of gc and its utility. Various equations of state including ideal gas law to evaluate P.V.T data, their application in process calculations by solving basic numerical problems.

UNIT-III

Fluid mechanics- Properties of fluids, fluid statics, energy balance in fluid flow through pipes and condunits, Bernoulli's equation and its application, calculation of power required for pumping fluids. Examples from bioprocessing systems .

UNIT-IV

Rheology of fluids - Newton's law of viscosity. Concept of Newtonian and non - Newtonian fluids- Different types of non-Newtonian fluids with examples in bioprocessing. Measurement of viscosity using extrusion rheometer, plate and cone viscometer, coaxial cylinder viscometer.

UNIT-V

Flow through pipes, average velocity, flow regimes, boundary layer concept. Laminar and turbulent flow – characterization by Reynold's number, pressure drop due to skin friction and form friction, friction factor chart, Hagen -Poiseuille equation. Brief introduction to flow of compressible fluids.

UNIT-VI

Flow past immersed bodies: Definition of drag and drag coefficient.

Friction in flow through beds of solids, derivation of friction factor equations and pressure drop expressions. Introduction of the concept of packed beds. Motion of particles through fluids, terminal velocity.

UNIT-VII

Flow measuring and monitoring systems- valves, bends, elbows, prevention of leaks, mechanical seals, stuffing box. Flow measuring devices-manometers, orifice meter, venture meter and rotameter.

UNIT-VIII

Fluid transportation machinery: Different types of pumps, positive displacement pumps, reciprocating pumps, diaphragm pumps, peristaltic pumps. Calculation of pump horse power.

TEXT BOOKS:

1. Introduction to Biochemical Engineering, D.G.Rao, Tata Mc Hill (2005)

2. Bio-process Engineering Principles, Pauline M.Doran. Academic press (1995)

3. Unit operations of chemical engineering,Mc Cabe, W.L, Smith J.C., and Harriot P., Mc-Graw Hill, 3rd Ed. (1993).

REFERENCES:

1. "Technical aspects of the rheological properties of microbial cultures", - Charles, M (1978) in Advanmces in Biochemical Engineering, Ghose, T.K., Fiechter, A and Blakebrough, N.(Eds), Spinger-Verlag, Berlin, pp. 1-62

2. Unit operation in Food processing, Earle, R.L. (1996) Pergamon Press, Oxford, PP. 212-282.

   All relevant units will have basic numerical problems.

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II Year B. Tech. Biotech I-Sem

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(53048) MICROBIOLOGY

UNIT I: INTRODUCTION TO MICROBIOLOGY

1. Discovery of microorganisms; Theory of spontaneous generation, Germ theory of diseases; Major contribution and events in the field of Microbiology. Scope and relevance of microbiology.

2. Identification of Microorganisms - A general account. Microdiversity

UNIT II: MAJOR GROUPS OF MICROORGANISMS.

1. General characteristics of Bacteria, Archaea and Eubacteria. Diversity classification of Woese et al. Three domains of life. Five - kingdom system of Whittaker.

2. Classification systems - Phylogenetic, Phenetic, Taxonomic ranks, Major characteristics used in Taxonomy - Morphological, Physiological, ecological, Biochemical, Immunological, Genetical and Molecular.

UNIT III: NUTRITION AND CULTIVATION

1. Nutrition of microorganisms; nutritional classes of microbes, Macro and micronutrients, their sources and physiological functions of nutrients. Growth factors and their functions in metabolism. Aerobic and anaerobic metabolism.

2. Cultivation of microorganisms; Culture media, synthetic, complex media, solidifying agents, types of media -selective, differential and enrichment and enriched media, pure culture methods - spread plate, pour plate and streak plate, special techniques for cultivation of anaerobes.

UNIT IV : IDENTIFICATION AND PRESERVATION OF MICROBES

1. Preservation of Microganisms: working and primary stock cultures – agar slants, agar stabs, spore preparation, use of sterile soil, cryopreservation, lyophilisation, Application and limitations of various methods.

2. Influence of environmental factors on growth – solutes, water activity, pH, temperature, oxyzen, osomotic pressure, radiation.

3. Colony characteristics, staining techniques; Fixation, Principle dyes, simple standing, differential staining spore staning, flageller straining.

4. Biochemical tests – Sugar fermentations, IMVIC tests, Catalase production etc.

UNIT V: PATHOGENESITY

Definition of infection, diseases and pathogens, virulence and virulence factors. Examples: Influenza, Toxin, Tuberculosis

UNIT VI: INTRODUCTION TO VIRUSES

Virus properties, Structure of Viruses; Animal Virology; Plant Virology; Viruses of Arthropods, bacteria and other lower organisms; and classification of viruses (Bacterial, plant and animal replication with 1 example each) and Applications of Virology in Biotech Industry,

UNIT VII: REPLICATION OF VIRUSES

Viral Replication; Bacterial, plant and animal replication with 1 example each (in case of animal viruses the teaching should include the examples of DNA and RNA viral replication and also of those that replicate in the cytoplasm and nucleus).

UNIT VIII: IDENTIFICATION, CULTURING AND ASSAY OF VIRUSES

Identification and in vitro cultivation of viruses. Assay of viruses (Both Bacterial and animal viruses)

TEXT BOOKS:

1. Microbiology, Pelczar M.J. Chan ECE and Krieg NR. Tata McGraw Hill.

2. Introduction to Micro Biology a case History approach 3rd edition john. L. Ingraham, Catherine A lingraham, Thomson Publications.

REFERENCES:

1. Biology of Micro organisma. BROCK, Prentice Hall, International Inc.

2. General Microbiology. Hons. G.Schlege. Combridge university press.

3. General Microbiology. Roger Y stanier, Macmilian.

4. General Microbiology. Prescott and Dunn Mc Graw Hill Publishers.

5. Introduction to microbiology – A case history approach 3rd edition – john L. ingram, Catherine A. Ingram Thomson Publishers.

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II Year B. Tech. Biotech I-Sem

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	0	-/3/-	2

(53632) BIOCHEMISTRY LAB

1. Units, Volume & Weight measurements. Concentration units, pH Measurement. Preparation of buffers,

2. Qualitative tests for carbohydrates. Estimation of Reducing sugars by the Benedict's method.

3. Qualitative tests for Amino Acids. Quantitative method for Amino Acids,Ninhydrin method

4. Protein estimation by Biuret / Folin's / Bradford method.

5. Extraction of lipids. Saponification of Fats.

6. Estimation of cholesterol.

8. Estimation of Nucleic Acids, Precipitation by sodium sulphate, Test for ribose and deoxyribose sugar.

9. Extraction of Caffeine from tea leaves.

10. Hydrolysis of ester using Papain.

11. Preparation of β Glucopyranose penta acetate from Glucose.

TEXT BOOK:

1. Laboratory Manaual in Biochemistry by J.Jayaraman New age International Publications.

2. Principles & Techniques of Practical Biochemistry 5th edition. K. Wilson & J.Walker, Cambridge University Press, 2000.

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II Year B. Tech. Biotech I-Sem	L	T/P/D	C
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(53633)CELL BIOLOGY AND MICROBIOLOGY LAB

1. Identification of Animal, Plant & Bacterial cells.
2. Micrometry.
3. Differential centrifugation and isolation of Chloroplast & Mitochondria.
4. Sterilization techniques (lecture/demonstrations)
5. Preparation of culture media (a) Broth type of media (b) Solid media
6. Culturing of microorganisms: (a) Broth (b) Pure culture techniques: Streak 1plate, pour plate.
7. Isolation and preservation of bacterial culture.
8. Identification of microorganisms (a) Staining technique (b) Biochemical testing.
9. Antibiotic test - Disc diffusion method, minimum inhibitory concentration.
10. Microbiological examination of water.
11. Biochemical tests : IMVIC test   Catalase test
    Coagulase test   Gelatinase test   Oxidase test.
12. Determination of Bacterial growth by turbidometry/colorimetry.
13. Factors effecting the bacterial growth – effects of temperature of pH.

TEXT BOOKS:

1. Microbiological and applications, Laboratory, Manual in General Microbiology by Benson, Mc Graw Publications.
2. Laboratory manual in microbiology by P. Gunasekharan, Newage international Publishers.

REFERENCES :

J.G. Cappucin and N.Sherman, A Laboratory manual, 4ᵗʰ edition, Addison & weslay, 1999.

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II Year B. Tech. Biotech II-Sem	L	T/P/D	C
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(54047) MASS TRANSFER OPERATIONS

UNIT I: INTRODUCTION TO MASS TRANSFER AND DIFFUSION

Introduction to Mass Transfer Operations; Fick's Law of Diffusion, Gas diffusion and Liquid diffusion (one component transferring to non-transferring component and equimolar counter diffusion.) Diffusivity estimation (Stefan's experiment); permeability, distribution of gas and liquid components through solid, diffusion of biological solutes in liquids, diffusion in biological gels.

UNIT II: INTERFACE MASS TRANSFER AND MASS TRANSFER CO-EFFICIENT

Interface mass transfer with special reference to gas absorption, oxygen mass transfer and parameter effecting oxygen mass transfer, convective mass transfer (k_c), Evoluation of K_c using various Dimensionless numbers, Sherwood number, Stanton number, Schmidt number.

UNIT III: GAS LIQUID OPERATIONS

Absorption: Definition, Solubilities of gases in liquids, single stage (one component transferring) operation. Distillation: VLE, single stage equilibrium distillation, simple distillation and steam distillation operation; continuous distillation (McCabe Thiele method only).

UNIT IV: LIQUID – LIQUID OPERATIONS

Liquid-Liquid extraction: LLE, types of equilibrium system, Singe stage extraction, Multi stage cross and counter current operations.

UNIT V: SOLID –LIQUID OPERATIONS

Solid liquid operation: Leaching, SLE, Single stage leaching. Adsorption: Physical adsorption, Chemisorption, Adsorption hysterisis, Adsorption isotherm, Single stage operation, Fixed bed adsorption. Crystallization, theory and principles various crystallization equipment,

UNIT VI: GAS-SOLID OPERATIONS

Drying, Theory and principles of drying, definition of various terms, Drying kinetics, Drying rate terms, Mechanism of batch drying - contest

rate and falling rate periods evaluation and diffusivity coefficient; various drying operations, drying equipment, criteria for selection of dryers.

UNIT VII: MEMBRANE SEPARATION PROCESSES

Dialysis; Hemodialysis; Gas permeation process, introduction to types of flow in gas permeation; hollow – fiber separation assembly, reverse osmosis, application of reverse osmosis, introduction of ultra filtration processes and micro filtration processes.

UNIT VIII: CASE STUDIES

Application of various mass transfer operations in bioprocessing namely; Oxygen mass transfer in production of penciline, Drying of baker's yeast, Extraction of penciline using butyl acetate, Crystallization of citric acid, Distillation of alcohol from fermentation broth, Absorption of ammonia in water, etc,.

TEXT BOOKS:

1. Robert E. Treybal, Mass Transfer Operations III Edition, Mc. Graw Hill International.

2. Christi J. Geankoplis, Transport process & Unit operations, III ed., Prentice Hall India Pvt. Ltd.

3. Unit operations of chemical engineering,Mc Cabe, W.L, Smith J.C., and Harriot P., Mc-Graw Hill, 3rd Ed. (1993).

REFERENCES:

1. Judson Kind: Separation Processes, II Edition, Mc Graw Hill Chemical Engineering series.

2. Philip A. Schweitzer, Handbook of separation Techniques for chemical Engineering, III Edition, Mc. Graw Hill.

3. Philip C. Wankat Rate, Controlled separations, Chapman and Hall, 1985.

4. P.M.Doran Bioprocess Engineering Principles, Academic Press 1995

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B. Tech. Biotech II-Sem	L	T/P/D	C
	3	-/-/-	3

(54004) ENVIRONMENTAL STUDIES

UNIT-I : ECOSYSTEMS: Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structure and Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Homeostasis / Cybernetics, Food chain concentration, Biomagnification, ecosystems value, services and carrying capacity.

UNIT-II: NATURAL RESOURCES: Classification of Resources: Living and Non-Living resources, Renewable and non-renewable resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources – 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 and land use / land cover mapping.

UNIT-III: BIODIVERSITY AND BIOTIC RESOURCES: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, conservation of biodiversity: In-Situ and Ex-situ conservation. Food and fodder resources, Timber and non-timber forest products.

UNIT-IV: ENVIRONMENTAL POLLUTION AND CONTROL: Classification of pollution and pollutants, causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards, Waste water treatment methods: effluent treatment plants (ETP), Sewage treatment plants

(STP), common and combined effluent treatment plants (CETP).Soil Pollution: Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of hazardous waste, coastal pollution due to sewage and marine disposal of industrial effluents. Noise Pollution: Sources, Industrial Noise- Occupational Health hazards, standards, Methods of control of Noise. Thermal Pollution: Thermal Comforts, Heat Island effect, Radiation effects. Nuclear Pollution: Nuclear power plants, nuclear radiation, disasters and impacts, genetical disorders. Solid waste: types, Collection processing and disposal of industrial and municipal solid wastes composition and characteristics of e-Waste and its management.

UNIT-V: GLOBAL ENVIRONMENTAL PROBLEMS AND GLOBAL EFFORTS

: Green house effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their impacts on human environment. Ozone depletion and Ozone depleting substances (ODS).Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol,

UNIT-VI: ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PLAN: Definition of Impact:

classification of impacts, Positive and Negative, Reversible and irreversible, light, moderate and severe, methods of baseline data acquisition. Impacts on different components: such as human health resources, air, water, flora, fauna and society. Prediction of impacts and impact assessment methodologies. Environmental Impact Statement (EIS). Environmental Management Plan (EMP): Technological Solutions, preventive methods, Control technologies, treatment technologies: green-belt-development, rain water harvesting, Remote sensing and GIS methods.

UNIT-VII: ENVIRONMENTAL POLICY, LEGISLATION, RULES AND REGULATIONS

National Environmental Policy, Environmental Protection act, Legal aspects Air (Prevention and Control of pollution) Act- 1981, Water(Prevention and Control of pollution) Act-1974, Water pollution Cess Act-1977, Forest Conservation Act, Municipal solid waste management

and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules .

UNIT: VIII — TOWARDS SUSTAINABLE FUTURE

Concept of Sustainable Development, Threats to Sustainability, Population and its explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development, Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable Cities and Sustainable Communities, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism (CDM).

SUGGESTED TEXT BOOKS:

1. Environmental studies , From crisis to cure by R.Rajagopalan, 2005
2. Text book of Environmental Science and Technology by M.Anji Reddy 2007
3. Environmental studies by Erach Bharucha 2005, University Grants Commission, University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning Private Ltd. New Delhi
2. Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.

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II Year B. Tech. Biotech II-Sem

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(54048) ANALYTICAL METHODS IN BIOTECHNOLOGY

UNIT I: INTRODUCTION

Electromagnetic Spectrum, Interaction of Electromagnetic radiation with matter and transition between molecular energy levels, Jablonski diagram, Types of molecular energies, classification of Instrumental methods.

UNIT II: MICROSCOPY

Bright field, Dark field, Fluorescent, Phase contrast, confocal microscopy, SEM & TEM Microscopy, Flow Cytometry.

UNIT III: SPECTROSCOPY

Beer – Lambert's Law and apparent deviations, UV - VIS Spectrophotometer, Spectrofluorimeter, Principle and applications of Atomic absorption & Atomic emission spectroscopy.

UNIT IV - METHODS OF STRUCTURAL DETERMINATION

X-ray Diffraction, optical Rotatory dispersion, Circular dichromism, NMR

UNIT V: SEPARATION TECHNIQUES

Hydrodynamic methods, Sedimentation, Centrifugation and Filtration, Electrophoresis of proteins and nucleic acids, 1D and 2D Gels, Types of Electrophoretic techniques (Capillary and Pulse field).

UNIT VI: CHROMATOGRAPHY

Paper, Column, TLC, GC, HPLC and GPC – Principles and applications, Capillary columns, the stationary liquid phase – Bonded phase – Sample injection – Solids samples – detectors first family detectors – second family detectors – detector scavenging – dual detection – temperature programming – commercial gas chromatographs – qualitative analysis – simulated distillation, qualitative analysis. Solvent extraction and ion – exchange techniques.

UNIT VII:

Potentiometry , Polarography, voltametry and Amperometry

UNIT VIII : RADIOACTIVITY:

Types of Radioactivity, Units of Radioactivty, Types of Radioactive rays

and their properties, Types of Radioactive decay, Detection and measurement of Radioactivity –GM counters, Scintillation counters, Applications of Radioisotopes

TEXT BOOKS:

1. Instrumental methods of chemical analysis-Gurudeep R.ChatwAL 7 Sham K.Anand, Himalaya Publishing house, ISBN.
2. Skoog & West, Fundamentals of Analytical Chemistry, 1982

REFERENCE BOOKS:

1. Hobert H Willard D. L. Merritt & J. R. J. A. Dean, Instrumental Methods of Analysis, CBS Publishers & Distributors, 1992
2. Vogal, Text Book of Quantitative Inorganic Analysis, 1990
3. Ewing, Instrumental Methods of Analysis, 1992
4. Pranb kumar Banerjee, Introduction to Biophysics, S.chand Publications, 2008.

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II Year B. Tech. Biotech II-Sem	L	T/P/D	C
	4	1/-/-	4

(54049) MOLECULAR BIOLOGY AND GENITICS

UNIT I: STRUCTURE OF DNA AND ITS BIOSYNTHESIS

Structure of DNA, variation from Watson & Crick model, Denaturation & melting curves. Enzymes involved in replication, step by step process. Models of DNA replication: semi conservative Mechanism of DNA replication in *E.coli* (bi- directional). Mitochondrial (D-loop), Viral DNA (Rolling circle), Single stranded- DNA phages (M13, 174), Eukaryotic telomeres and its replication.

UNIT II: RNA STRUCTURE AND BIOSYNTHESIS

m-RNA, r-RNA, t-RNA structures, Transcription apparatus and proteins involved in transcription. Prokaryotic & Eukaryotic transcription, processing of t-RNA, r-RNA, m- RNA splicing.

UNIT III: PROTEIN BIOSYNTHESIS

The genetic code and Wobble Hypothesis, Codon usage, Protein synthesis in Prokaryotes and Eukaryotes.

UNIT IV: PHYSICAL BASIS OF HEREDITY

Basic laws of inheritance mono-hybrid, dihybrid and tri-hybrid ratios, Modification of Mendel's ratios due to gene interaction. Multiple factors of inheritance. Genes and environment, identification of the genetic materials - classical experiments. Hershey Chase, Avery McLeod etc, Packing of DNA, organization of genetic material in prokaryotes, Eukaryotes. Euchromatin and Heterochromatin organization of Nucleosomes.

UNIT V: LINKAGE, RECOMBINATION AND MAPPING

Chromosomal inheritance, the concept of linkage & recombinations, cytological basis of crossing over. Two point and three point test crosses and gene mapping. Mapping of genes by tetrad analysis by mitotic crossing over

UNIT –VI GENETIC RECOMBINATION IN BACTERIA

Discovery, Detection, Molecular mechanisms of transformation, transformation methods. Bacterial conjugation Sex factors in bacteria,

F and HFr transfer, mechanism of transfer, Mechanism of recombination, Bacterial transduction: Transduction phenomena, Methods of transduction, cotransduction, Generalized, Specialized & Abortive transduction, Bacteriophages - lytic & lysogenic life cycle.

UNIT VII: CHROMOSOME STRUCTURE, ORGANISATION, ABERRATIONS & MUTAGENESIS

Chromosome morphology, classification, karyotying. Special chromosome, chromosome aberrations, origins, types and cytogenetic effects. Mutations, spontaneous, induced, lethal, mutagens their types and actions, classifications of mutations, characters of mutations and applications. Site-directed mutagenesis and reverse genetics. DNA damage and repairs. Mutagenisity testing (Ames test)

UNIT VIII: EXTRA CHROMOSOMAL INHERITANCE

Introduction to extra chromosomal inheritance, examples of extra chromosomal inheritance. Petite phenotypes in yeast. Uniparental inheritance in algae.

TEXT BOOKS:

1. Benjamin Lewin - Gene - VII.
2. Lodish, H., Berk A., Zipursky, S.L. Matsudaria, P. Baltimore, D. and Darnell, J.2000. Molecular Cell f Biology, Media connected, W.H. Freeman and Company.

REFERENCE BOOKS:

1. Molecular Biology, David Friefeldur, Norasa Publishing Home
2. Genetics by Strickberger.
3. Genetics by Griffith.
4. Molecular biotechnology principles and practices by Channarayappa, Universities Press.
5. Genetics, PS Verma and V K Agarwal. S. Chand & Company

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	L	T/P/D	C
II Year B. Tech. Biotech II-Sem	3	1/-/-	3

(54050) THERMODYNAMICS FOR BIOTECHNOLOGISTS

UNIT I: INTRODUCTION AND FIRST LAW THERMODYNAMICS

The Scope of Thermodynamics, joule's experiments, Internal energy, Formulation of the first law thermodynamics, Thermodynamic state and state functions, Enthalpy, The study state flow process, Equilibrium, The phase rule.

UNIT II: SECOND LAW THERMODYNAMICS

The statement of second law, the heat engine, Carnot cycle for an ideal gas, Entropy, Entropy changes, Mathematical statement of second law.

UNIT III: SYSTEMS OF VARIABLE COMPOSATION. IDEAL BEHAVIOR

Fundamental Property Relation, The potential as a critical of phase equilibrium, The ideal gas law Mixtures and ideal solutions, Raoult's law.

UNIT IV: SYSTEMS OF VARIABLE COMPOSATION. NON IDEAL BEHAVIOR

Partial properties, Fugacily and fugacity coefficient, Generalized correlations for the fugacity coefficient, excess Gibbs Energy, Activity coefficient from VLE Data.

Unit V:THERMODYNAMIC PROPERTIES OF FLUIDS

Estimation of thermodynamic properties using equations of state; Maxwell relationships and their applications; Calculation of flow processes based on actual property changes.

UNIT VI: PHASE EQUILIBRIA

Criteria for phase equilibrium; Vapour-liquid equilibrium calculations for binary mixtures, liquid -Liquid equilibrium and Solid-liquid equilibrium

UNIT VII: SOLUTION THERMODYNAMICS

Partial molar properties; concepts of chemical potential and fugacity Ideal non ideal solutions; Gibbs Duhem equation; Excess properties of mixtures; Activity Coefficient - corm position models

UNIT VIII: CHEMICAL REACTION EQUILIBRIA

Equilibrium criteria for homogeneous chemical reactions; Evaluation of equilibrium constant and effect of pressure and temperature on equilibrium constant; Calculation of equilibrium conversions and yields for single and multiple chemical reactions

TEXT BOOKS :

1. J M.Smith,H.C.Van Ness and M.M.Abbott. Introduction to Chemical Engineering Thermodynamics McGraw Hill
2. Chemical process principles by Hougen and Watson

REFERENCES:

1. Chemical Engineering Thermodynamics by Pradeep Ahuja, PHI Learning Private Limited, 2009.
2. M.D.Koretsky, Engineering and Chemical Thermodynamics, John Wiley and sons,2004

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II Year B. Tech. Biotech II-Sem

	L	T/P/D	C
	4	1/-/-	4

(54051) BIOPROCESS ENGINEERING

UNIT I: INTRODUCTION TO BIOPROCESSES

An overview of traditional and modern applications of biotechnology industry, outline of an integrated bioprocess and the various (upstream and down stream) unit operations involved in bioprocesses, generalized process flow sheets.

UNIT II : MATERIAL BALANCES

Law of conservation of mass, generalized mass balance equation, Simplified form, Procedure for material balance calculations, material balance with recycle, bypass and purge streams, Electron balances, biomass yield, Product stoichiometry, maximum possible yield.

Material balance equations for un steady state.

UNIT III: ENERGY BALANCES

Basic energy concepts, intensive and extensive properties, enthalpy and it's calculation procedure, general energy balance equation, energy changes, non reactive process, procedure for energy balance with out reactions, energy changes due to reaction, Heat of reaction for system with biomass production.

Energy balance equations for un steady state.

UNIT IV: FERMENTATION PROCESSES

General requirements of fermentation processes, An overview of aerobic and anaerobic fermentation processes and their application n the biotechnology industry, solid-substrate, slurry fermentation and its applications, whole cell immobilization.

UNIT V: MEDIA DESIGN

Medium requirements for fermentation processes, carbon, nitrogen, minerals, vitamins and other complex nutrients, oxygen requirements, medium formulation for optimal growth and product formation, examples of simple and complex media, design and usage of various commercial media for industrial fermentations

UNIT VI: METABOLIC STOICHIOMETRY

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.

UNIT VII: ENERGETICS

Energetic analysis of microbial growth and product formation, oxygen consumption and heat evolution in aerobic cultures, thermodynamic efficiency of growth.

UNIT VIII: KINETICS OF MICROBIAL GROWTH AND PRODUCT FORMATION

Phases of cell growth in batch cultures, Simple unstructured kinetic models for microbial growth, Monod model, Growth of filamentous organisms. Growth associated (primary) and non - growth associated (secondary) product formation Kinetics. Leudeking-Piret models, substrate and product inhibition on cell growth and product formation. Introduction to Structured Models for growth and product formation.

TEXT BOOKS

1. M.L.Shuler and F. kargi Bioprocess engineering, Prentice Hall of India 1992.

2. P.M. Doran, Biochemical process principles, Academic Press, 1995.

3. D.G. Rao, Introduction to Biochemical Engineering, Tata McGraw-Hill, 2005.

REFERENCES:

1. Biochemical Engineering by Mukesh Doble and Sathyanarayana N. Gummadi, PHI Learning private limited, 2009.

2. Biochemical Engineering, second edition by Syed Traveer Ahmed Inamdar, PHI Learning, 2009.

All relevant units will have basic numerical problems.

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II Year B. Tech. Biotech II-Sem	L	T/P/D	C
	0	-/3/-	2

(54632) BIOPROCESS ENGINEERING LAB

1. **ENZYME ISOLATION AND ASSAY OF ENZYMATIC ACTIVITY**

   Extraction of commercially important enzymes from natural source Development of enzyme assays; quantification of enzyme activity and specific activity.

2. **ENZYME KINETICS**

   Estimation of Michaelis-Menten parameters, Effect of pH and temperature on enzyme activity, kinetics of inhibition.

3. **IMMOBILIZED ENZYME REACTIONS**

   Techniques of enzyme immobilization - matrix entrapment, ionic and cross linking; column packing; analysis of mass transfer effects on kinetics of immobilized enzyme reactions; bioconversion studies with immobilized - enzyme packed – bed reactors.

4. **MICROBIAL CULTURE STUDIES:**

   Growth of microorganisms, estimation of monod's parameters.

5. **SCREENING OF PROCESS VARIABLES**

   Plackett-Burman design practice

6. **DEMONSTRATION OF REACTOR STUDIES**

   Batch, fed-batch, and continuous flow reactor analysis and residence time distribution.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B. Tech. Biotech II-Sem	L	T/P/D	C
	0	-/3/-	2

(54633) ANALYTICAL METHODS IN BIOTECHNOLOGY LAB

1. Demonstration of viable cells using phase contrast microscopy.

2. Verification of Lambert – Beers Law by UV – VIS spectrophotometer, scanning.

3. Estimation of different macromolecules by visible spectrophotometer.

4. Estimation of turbidity using UV-VIS spectrophotometer.

5. Emission spectra of Anthracene using Spectrofluorimeter.

6. Estimation of proteins & nucleic acids by U.V. method.

7. Separation of different macromolecules by Paper, Thin layer ,Coulmn chromatography & HPLC(Theory)

8. Membrane separation-dialysis.

REFERENCES:

1. I.D.Campbell and R.T.Dwek, Biological Spectroscopy, Benjameer Cunmeib & Co., 1986.

2. F. Settle. Handbook of Instrumental Techniques for Analytical Chemistry, Prence Hall, 1997.

3. W.Botton, Instrumentation and Process Measurements, University Press, 1993.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	3	1/-/-	3

(55073) TRANSPORT PHENOMENA IN BIOPROCESSES

Unit I: Momentum Transport-I

Mechanism of Momentum Transport: Newton's Law of Viscosity, Non-Newtonian fluids, theory of viscosity of liquids, time dependant viscosity, viscosity measurement (cone-and-plate viscometer, coaxial cylinder rotary viscometer, impeller viscometer), use of viscometers with biological reaction fluids, rheological properties of fermentation broth, factors affecting broth viscosity (cell concentration, cell morphology, osmotic pressure, product and substrate concentration), Velocity distribution in laminar flow and turbulent flow

Unit II: Momentum Transport-II

Equation of change for isothermal system (equation of continuity, equation of motion, equation of mechanical energy), interphase transport in isothermal systems (friction factors for flow in tubes and in packed columns) mixing, mixing mechanism, power requirements in ungassed Newtonian and Non Newtonian fluids, gassed fluids, interaction between cell and turbulent Eddies, operating conditions for turbulent shear damage. Macroscopic Balances- mass, momentum and mechanical energy balances.

Unit III: Energy Transport-I

Thermal conductivity and the mechanisms of energy transport-measurement of thermal conductivity, Fourier's law, steady state conduction, analogy between heat and momentum transfer

Unit IV: Energy Transport-II

Temperature distribution with more than one independent variables-heating in a semi infinite and finite slab,temperature distribution in turbulent flow- reference to stirred tank reactor, relationship between heat transfer, cell concentrations and stirring conditions

Unit V: Mass Transport I

Diffusivity, theory of diffusion, analogy between mass heat and momentum transfer, role of diffusion in bioprocessing, film theory,

concentration distribution with more than one independent variable-unsteady diffusion, boundary layer theory, concentration distribution in turbulent flow- Corrsin equation

Unit VI: Mass Transport II

Definition of binary mass transfer coefficients, transfer coefficients at high mass transfer rates- boundary layer theory, penetration theory

Unit VII: Mass Transport III

Convective mass transfer, Liquid-solid mass transfer, liquid-liquid mass transfer, gas-liquid mass transfer

Unit VIII: Oxygen Transport

Oxygen uptake in cell cultures, Factors affecting cellular oxygen demand, oxygen transfer from gas bubbles to aerobic culture, oxygen transfer in fermentors- bubbles, factors affecting oxygen transport-sparging, stirring, medium properties, antifoam agents, temperature, mass transfer correlations, measurements of k_La - oxygen balance method, dynamic method.

Note: In all units relevant basic numerical problems should be practiced

TEXT BOOKS

1. R.B.Bird, W.E.Stewart, E.N.Lightfoot, Transport Phenomena, John wiley and sons, Singapore , 1994

2. P.M.Doran, Bioprocess Principles, Academic Press, 1995

3. Harvey W. Blanch, Douglas S. Clark Biochemical Engineering, Marcecel, Dekker, 2007.

REFERENCE BOOK

1. M.L.Shuler and F. Kargi, Bioprocess Engineering: Basic concepts, 2nd edition, Prentice Hall of India, 2003

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III Year B.Tech. Biotech. I-Sem	L	T/P/D	C
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(55074) BIOCHEMICAL REACTION ENGINEERING

Unit- I: Difference and similarities between chemical and bioreactors; classification of bioreactors; Reactor configuration; Description of a conventional bioreactor with all aspects.

Unit- II: Sterilization: Basic principles of sterilization, media sterilization, kinetics of thermal death of cells & spores, design of batch and continuous sterilization, sterilization of air and filter design. Other methods of sterilization viz., radiation and chemical sterilization.

Unit- III: Growth Kinetics: Batch growth quantifying cell concentration, growth profile and kinetics in batch culture, fed batch growth, continuous growth and their growth kinetic quantification, Chemostate growth, Semi- continuous/ Exponential feeding strategy.

Unit- IV: Design equation for enzyme reactors, Batch growth of microorganisms, Design equation of plug flow reactor, Design of CSTR with washout concept; Stirred tank reactor with recycle of biomass; Continuous tank fermenters in series without and with recycle of biomass; Estimation of kinetic parameters.

Unit- V: Multiphase Bioreactors: Different types reactors: Air lift reactors, Multipurpose tower reactors, liquid impelled loop reactor, Pumped tower loop reactor, Fluidized-bed reactor, Packed-bed reactor, Bubble-column reactors, Airlift reactors.

Unit- VI: Role of diffusion in bioprocessing, Convective mass transfer, Liquid-solid mass transfer, Liquid – liquid mass transfer, gas-liquid mass transfer. Factors affecting cellular oxygen demand, Oxygen transfer in fermenters.

Unit- VII: Methodology of oxygen transfer from gas bubble to cell. Measuring dissolved oxygen concentrations, Mass transfer correlations, Measurement of $K_{L}a$ by various methods viz., sulphite oxidation method. dynamic gassing out and oxygen balance methods, Scale-up and scale-down of bioreactors.

Unit- VIII: Non-ideal flow conditions: The residence time distribution

(RTD). State of aggregation of the flowing stream. Earliness of mixing, Role of RTD, State of aggregation and earliness of mixing in determining reactor behavior. Exit age distribution of fluid, Experimental methods for finding E – pulse, step experiments, Relationship between F and E curves. The convolution integral, Conversion in non-ideal flow reactors, Axial dispersion – fitting the dispersion model for small extents of dispersion and for large deviation from plug flow, Appropriate numerical problems may be dealt with.

Text Books:

1. Biochemical Egnineering. H.W. Blanch and D.S. Clank. Marcel-Dekker, New York. (2007)
2. Biochemical engineering Fundaments. Bailey and Ollis. Second Edition, McGraw-Hill International Edition.
3. Pauline M. Doran. Bioprocess Engineering Principles. Academic Press. (1995)

Reference Books:

1. Bioprocess Engineering. Shuler and Kargi. Prentice Hall India.
2. **Octave Levenspiel,** Chemical Reaction Engineering, Second Edition (1995), John Wiley & Sons publication.
3. **D.G. Rao.** Introduction to Biochemical engineering (2005), TMH, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	3	1/-/-	3

(55075) BASIC INDUSTRIAL AND ENVIRONMENTAL BIOTECHNOLOGY

Unit- I: Primary metabolites

Brief outline of production process: Organic acids (Citric & Lactic acid); Amino acids (Glutamic acids & Pheaylalala); Alcohols (Ethanol & Butanol).

Unit- II: Secondary metabolites

Brief outline of production process: Antibiotics (Beta lactams, Cephalosporins, Streptomycin & Erythromycin); Vitamin B_{12}; Overview of steroids (no description of process).

Unit- III: Recombinant Proteins

Insulin; Interleukin (IL-2); Interferon (IFN-Gamma); Recombinant vaccines (Hepatitis).

Unit- IV: Enzymes

Proteases; Lipases; Cellulases; Other commercially important enzymes for food & pharma.

Unit- V: Water pollution and biological treatment of wastewater

Domestic and Industrial wastewater characteristics; Biological process for wastewater treatment; Aerobic system and anaerobic system; Domestic wastewater treatment schemes.

Unit- VI: Bioremediation

Overview & definition of Bioremediation; Strategies of Bioremediation; Types of Bioremediation: *Insitu* & *Exsitu*; Applications of Bioremediation; A case study for bioremediation of Heavy metals like Mercury; Constrains and priorities of Bioremediation.

Unit- VII: Hazardous Waste Management

Hazardous Waste Characteristics; Sources and types; Bio-technological applications for hazardous waste management.

Unit- VIII: Novel Biotechnological Applications for environmental management

Biofuels; Biopolymers; Biofertilizers; Biopesticides; Biofilms; Bioleaching.

TEXT BOOKS:

1. Biotechnology, 3rd edition by John E. Smith. Cambridge low price editions. Industrial Microbiology: - J. E. Casida;
2. Environmental Biotechnology by S. K. Agarwal.
3. Biodegradation & Bioremediation (1999), Martin Alexander, Academic press.

REFERENCES:

1. Microbiology: - Prescott and Dunn.
2. Microbial biotechnology: Glazer, A.N. and Nikaido, H. 1995 W.H. Freeman &Company, New York.
3. Industrial Microbiology:- A. H. Patel.. Stanier R. Y., Ingram J.L., Wheelis M.L., Painter R.R., General
4. Microbiology McMillan Publications, 1989.
5. Foster C.F., John Ware D.A., Environmental Biotechnology, Ellis Horwood Ltd.,1987.
6. Karrely D., Chakrabarty K., Omen G.S., Biotechnology and Biodegradation,
7. Advances in Applied Biotechnology Series, Vol.4, Gulf Publications Co. London, 1989.
8. Bioremediation engineering; design and application 1995 John. T. cookson,Jr. Mc Graw Hill, Inc.
9. Environmental Biotechnology by A.K. Chatterjee
10. Environmental Biotechnology by S.N.Jogdand Himalaya Publishing.

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III Year B.Tech. Biotech. I-Sem	L	T/P/D	C
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(55076) GENETIC ENGINEERING

Unit I: Gene Regulation and Expression

Prokaryotes: *Lac, ara* and *trp* operons, sigma switch; **Eukaryotes:** Repetitive DNA, gene arrangement, gene amplification, switch, non-switch; Regulatory elements- repressors, activators, promoters, enhancers.

Unit II: Vectors for gene transfer: plasmids & transposons

Plasmids: Definition, and types/classification, Host restriction in transfer; Transposons: Definition and types including retrotransposons, mechanism of transposition & excision, applications; Others: phagemids and cosmids.

Unit III: DNA Technology I: Manipulation of DNA

Construction of prototype vector PBR^{322}; Enzymes in genetic engineering; Cloning strategies: sticky and blunt end cloning, T/A cloning, addition of linkers and adapters.

UNIT IV: DNA Technology II: Verification of Manipulated DNA

Size of plasmid: gel retardation; Restriction mapping, DNA methylation; sequencing.

UNIT – V: Expression and Detection

Methods of gene transfer: chemical and electrical; Expression in *E. coli,* yeast, insect cells, mammalian cells; Detection of gene (southern), mRNA (Northern) and protein (Western); Dot & slot blot; Genomic and cDNA library construction and application.

Unit VI: PCR and its application

Principles of PCR; Primer design; PCR methodology; Reverse transcription PCR; Multiplex PCR; Identification of PCR product; Application of PCR.

Unit VII: Molecular markers

RFLP, RAPD, AFLP; 16s r-RNA typing; Micro array and Gene chip; Applications in disease profile.

Unit VIII: Applications of r-DNA Technology

Gene cloning in medicine (Insulin, Blood clotting factor VIII); Overview of transgenic and Knock-out plants and animals; Introduction to Gene therapy (*Ex vivo* & *In vivo*), case study of ADA.

TEXT BOOKS:

1) Old RW, Primrose SB, principles of Gene manipulation, An introduction to Genetic engineering, Blackwell Scientific Publications, 1993

2) T.A. Brown, Gene Cloning.

REFERENCES:

1) Ansubel FM., Brent A, Kingston AE, Moore DO, Current protocols in Molecular Biology, Greene Publishing Associates, NY, 1988.

2) Berger SL, Kimmer AR, Methods in Enzymology, Vol 152, Academic Press, 1987.

3) Molecular Cell Biology – Gerald Carp.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	3	1/-/-	3

(55077) FUNDAMENTALS OF ENZYME MECHANISM AND TECHNOLOGY

Unit I: Enzymes-I

Brief History: Definition; Classification with examples from each class; Functions of Enzymes; Sources of Enzymes; Whole cells vs isolated enzymes. Application of enzymes in industrial, medical, pharmaceutical and food sectors.

Unit II: Enzymes-II

Enzyme isolation, purification, immobilization and assay methods.

Unit III: Enzyme Catalysis

Specific and general acid-base catalysis; covalent catalysis; Factors affecting the mechanism of enzyme catalysis, and factors affecting enzyme activity viz., pH, Temperature, Fluid forces, chemical agents and radiation.

Unit IV: Enzyme Structure

Basic Unit; Amino acids; Natural and non-natural amino acids; physico-chemical properties of amino acids e.g. P^{ka}- chemical properties of amino acids, Methods of identification of amino acids.

Unit V: Enzyme Kinetics

Kinetics of single substrate reaction – Michelis-Menton equation; Brigg's-Halder eqation, Kinetics for reversible reaction. The turnover number, Evalution of kinetic parameters. Kinetics of multiple – substrate kinetics.

Unit VI: Enzyme Inhibition and Mechanisms

Various types of enzyme inhibition, Substrate and product inhibition, Mechanism of action of chymotrypsin, Glyceraldehyde 3-phosphate dehydrogenase, Isoenzyme, Carboxy peptidase etc.

Unit VII: Presteady–state Kinetics

Rapid mixing methods, Determination of number of active sites – the limitial "Burst" kinetics of chymotrypsin, relaxation techniques, enzyme kinetics at limiting conditions.

Unit VIII:

Internal and external mass transfer effects in immobilized enzyme reactions, Intra-particle diffusion and reaction, Interaction between mass transfer and biochemical reaction. Concept of Thiele – modulus and effectiveness factor, operational stability and optimization; general design parameters.

Text Books:

1. Biochemical Engineering. H.W. Blanch and D.S. Clark, Marcel – Dekker New york (1997).
2. Biochemical Engineering. J.M.Lee, Prentice- Hall, new Jersey (1992).

References books:

1. Biochemical Egnineering. H.W. Blomch and D.S. Clank. Marcel-Dekker, New York. (2007)
2. Biochemical engineering Fundaments. Bailey and Ollis. Second Edition, McGraw-Hill International Edition.
3. Bioprocess Engineering. Shuler and Kargi. Prentice Hall India.
4. Octave Levenspiel, Chemical Reaction Engineering, Second Edition (1995), John Wiley & Sons publication.
5. D.G. Rao. Introduction to Biochemical engineering (2005), TMH, New Delhi.

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III Year B.Tech. Biotech. I-Sem	L	T/P/D	C
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(55015) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Unit I Introduction to Managerial Economics:
Definition, Nature and Scope of Managerial Economics–Demand Analysis: Demand Determinants, Law of Demand and its exceptions.

Unit II *Elasticity of Demand*: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

Unit III Theory of Production and Cost Analysis: Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.

Cost Analysis: Cost concepts, Opportunity cost, Fixed vs. Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)- Managerial Significance and limitations of BEA.

Unit IV Introduction to Markets & Pricing Policies:

Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.

Objectives and Policies of Pricing- Methods of Pricing: Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization.

Unit V Business & New Economic Environment: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

Unit VI Capital and Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance.

Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

Unit VII Introduction to Financial Accounting: Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

Unit VIII Financial Analysis through ratios: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Profit Ratio, P/E Ratio and EPS).

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.

2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.

REFERENCES:

1. Raghunatha Reddy & Narasimhachary: Managerial Economics & Financial Analysis, Scitech, 2009.

2. V.Rajasekarn & R.Lalitha, Financial Accounting, Pearson Education, New Delhi, 2010.

3. Suma Damodaran, Managerial Economics, Oxford University Press, 2009.

4. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Cengage, 2009.

5. Subhash Sharma & M P Vittal, Financial Accounting for Management, Text & Cases, Machmillan, 2008.

6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2008.

7. Truet and Truet: Managerial Economics:Analysis, Problems and Cases, Wiley, 2009.

8. Dwivedi:Managerial Economics, Vikas, 2009.

9. M.Kasi Reddy, S.Saraswathi: Managerial Economics and Financial Accounting, PHI, 2007.

10. Erich A. Helfert: Techniques of Financial Analysis, Jaico, 2007.

Prerequisites:

Objective: To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making.

Codes/Tables: Present Value Tables need to be permitted into the examinations Hall.

Question Paper Pattern: 5 Questions to be answered out of 8 questions .Out of eight questions 4 questions will be theory questions and 4 questions should be problems.

Each question should not have more than 3 bits.

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III Year B.Tech. Biotech. I-Sem	L	T/P/D	C
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(55634) MOLECULAR BIOLOGY AND GENETIC ENGINEERING LAB

1. Isolation of Plant and Bacterial Genomic DNA and Plasmid DNA.

2. Agarose Gel Electrophoresis.

3. Restriction Enzyme digestion.

4. Demonstration Chemical mutagenesis.

5. Isolation and visualization of plasmid on Agarose gel.

6. Restriction mapping and ligation.

7. Transformation, screening for recombinants.

8. Characterization of secondary metabolites by Polyacrylamide gel Electrophoresis. Silver staining of protein gels.

9. Blotting Techniques.

10. Expression of Beta – galactosidase and assay.

11. Cloning of DNA into plasmid vector.

REFERENCES:

Current protocols in Molecular Biology by Maniatis.

EQUIPMENTS:

Autoclave.

Laminar air flow chamber.

Water bath

Balance.

Microfuge.

Micropipettes

Submarine gel electrophoresis unit with power pack.

U.V.Transilluminator.

Vertical slab gel electrophoresis equipment.

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III Year B.Tech. Biotech. I-Sem	L	T/P/D	C
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(55635) ADVANCED ENGLISH COMMUNICATION SKILLS LAB

1. Introduction

The introduction of the English Language Lab is considered essential at 3rd year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be an integrated theory and lab course to enable students to use 'good' English and perform the following:

- Gather ideas and information, to organise ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice versa.
- To take part in social and professional communication.

2. Objectives:

This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.

3. Syllabus:

The following course content is prescribed for the Advanced Communication Skills Lab:

- **Functional English** - starting a conversation – responding appropriately and relevantly – using the right body language – role play in different situations.
- **Vocabulary Building** – synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases.
- **Reading Comprehension** – reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, Critical reading.
- **Writing Skills** – structure and presentation of different types of writing – *Resume writing /*
  e-correspondence/Technical report writing/Portfolio writing – planning for writing – *research abilities/data collection/organizing data/tools/analysis* – improving one's writing.
- **Group Discussion** – dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.
- **Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars and written presentations through posters/projects/reports/PPTs/e-mails/assignments etc.
- **Interview Skills** – concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing.

4. Minimum Requirement:

The English Language Lab shall have two parts:

i) **The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

ii) **The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

System Requirement (Hardware component):

Computer network with Lan with minimum 60 multimedia systems with the following specifications:

iii) P – IV Processor

a) Speed – 2.8 GHZ

b) RAM – 512 MB Minimum

c) Hard Disk – 80 GB

iv) Headphones of High quality

5. **Suggested Software:**

The software consisting of the prescribed topics elaborated above should be procured and used.

Suggested Software:

- **Clarity Pronunciation Power** – part II
- **Oxford Advanced Learner's Compass,** 7th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider,** by Dreamtech
- **TOEFL & GRE**(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
  - ➢ **Preparing for being Interviewed,**
  - ➢ **Positive Thinking,**
  - ➢ **Interviewing Skills,**
  - ➢ **Telephone Skills,**
  - ➢ **Time Management**
  - ➢ **Team Building,**
  - ➢ **Decision making**
- **English in Mind,** Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

6. **Books Recommended:**

1. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.

2. **Advanced Communication Skills Laboratory Manual** by Sudha

Rani, D, Pearson Education 2011.

3. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.

4. **English Vocabulary in Use** series, Cambridge University Press 2008.

5. **Management Shapers Series** by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.

6. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.

7. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.

8. **Job Hunting** by Colm Downes, Cambridge University Press 2008.

9. **Master Public Speaking** by Anne Nicholls, JAICO Publishing House, 2006.

10. **English for Technical Communication for Engineering Students,** Aysha Vishwamohan, Tata Mc Graw-Hil 2009.

11. Books on **TOEFL/GRE/GMAT/CAT/ IELTS** by Barron's/DELTA/ Cambridge University Press.

12. **International English for Call Centres** by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

DISTRIBUTION AND WEIGHTAGE OF MARKS:

Advanced Communication Skills Lab Practicals.

1. The practical examinations for the English Language Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.

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

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III Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	4	-/-/-	4

(56076) ARTIFICIAL NEURAL NETWORKS
(OPEN ELECTIVE)

UNIT I

Introduction - what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

UNIT II

Learning Process – Error Correction learning, Memory based learning, Hebbian learing, Competitive, Boltzmann learning, Credit Asssignment Problem, Memory, Adaption, Statistical nature of the learning process

UNIT III

Single layer perceptrons – Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perceptron –convergence theorem, Relation between perceptron and Bayes classifier for a Gaussian Environment

UNIT IV

Multilayer Perceptron – Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, Comuter experiment, feature detection

UNIT V

Back Propagation - back propagation and differentiation, Hessian matrix, Generalization, Cross validation, Network pruning Techniques, Virtues and limitations of back propagation learning, Accelerated convergence, supervised learning.

UNIT VI

Self Organization Maps – Two basic feature mapping models, Self organization map, SOM algorithm, properties of feature map, computer simulations, learning vector quantization, Adaptive patter classification

UNIT VII

Neuro Dynamics – Dynamical systems, stability of equilibrium states, attractors, neurodynamical models, manipulation of attractors as a recurrent network paradigm

UNIT VIII

Hopfield Models – Hopfield models, computer experiment

TEXT BOOK:

1. Neural networks A comprehensive foundations, Simon Hhaykin, PHI edition.

REFERENCES:

1. Artifical neural networks - B.Vegnanarayana Prentice Halll of India P Ltd 2005

2. Neural networks in Computer intelligence, Li Min Fu TMH 2003

3. Neural networks James A Freeman David M S kapura pearson education 2004

4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

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III Year B.Tech. Biotech. II-Sem	L	T/P/D	C
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(56077) BIOINFORMATICS
(OPEN ELECTIVE)

Unit I: Introduction to Bioinformatics:

Scope of Bioinformatics, Elementary commands and protocols, ftp, telnet, http. Primer on information theory.

Unit-II: Special Topics in Bioinformatics

DNA mapping and sequencing, Map alignment, Large scale sequencing methods Shotgun and Sanger method. cDNA sequencing; Genome Mapping, Map assembly, Comparative Sequence analysis.

Unit III Sequencing Alignment and Dynamic Programming

Aligment-Local, Gloval alignment, pair wise and multiple sequence algorithms. Concept of gap penalty and e-value, Alignment algorithms, Dynamic programming in sequence alignment: Neddleman-Wunsch Aligrithm and Smith-Waterman Algorithm, Amino acid substitution Matrics (PAM, BLOSUM). Sequence similarity search with database: BLAST and FASTA.

Unit IV: Primary Data Base Information

Introduction to Biological databases, Organization and management of databases. Searching and retrieval of information from the World Wide Web. Structure databases - PDB (Protein Data Bank), Molecular Modeling Databases (MMDB). Primary Databases NCBL, EMBL, DDBJ.

Unit V: Secondary Data Base

Introduction to Secondary Databases Organization and management of databases Swissprot, PIR, KEGG.

Unit VI: Phylogenetic analysis and tree building

Introduction to phylogenetics, Methods of Phylogenetic analysis, Role of multiple sequence alignment algorithms in Phylogenetic analysis, Automated Tools for Phylogenetic Analysis, Construction of phylogenetic tree.

Unit VII: Biochemical Data Bases

Introduction to BioChemical databases-organization and Management

of databases. KEGG, EXGESCY, BRENDA, ERGO.

Unit VIII: Introduction to Homology

Introduction to Homology, Levels of protein structures, Homology modeling of proteins (sequence to structure), Cn3D, RasMul and SPDbV in homology modeling-case studies.

TEXT BOOKS:

1. Bioinformatics Basics. Applications in Biological Science and Medicine by Hooman H. Rashidi and Lukas K.Buehler CAC Press 2000.

2. Bioinformatics – A Practical guide to the Analysis of Genes and Proteins – Andreas D.Baxevanis, B.F. Francis Ouellette. 3rd Edition, 2005, John Wiley & Sons, Inc.

3. Algorithms on Strings Trees and Sequences Dan Gusfiled. Cambridge University Press 1997.

REFERENCES:

1. Bioinformatics: A Machine Learning Approach P. Baldi. S. Brunak, MIT Press 1988.

2. Bioinformatics by Kenneth Baclawasi & Tianhua Niu. Jaico Publishing house.

3. Bioinformatics. David Mount, 2000. CSH Publications

4. Genomics and Proteomics-Functional and Computational aspects. Springer Publications. Editior-Sandor Suhai.

5. Bioinformatics- Methods and Protocols-Human Press. Stephen Misener, Stephen A. Krawetz.

6. Computational Biochemistry – C.Stan ,TSAI WILEY Publications.

7. Bioinformatics – Principles and Applications – Harshawardhan P.Bal TATA MEGRAW HILL.

8. BLAST: An Essential guide Ian Korf, O'Reilly publishers.

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III Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	4	-/-/-	4

(56042) COMPUTER ORGANIZATION
(OPEN ELECTIVE)

UNIT I :

BASIC STRUCTURE OF COMPUTERS : Computer Types, Functional unit, Basic OPERATIONAL concepts, Bus structures, Software, Performance, multiprocessors and multi computers. Data Representation. Fixed Point Representation. Floating – Point Representation. Error Detection codes.

UNIT II :

REGISTER TRANSFER LANGUAGE AND MICRO OPERATIONS : Register Transfer language. Register Transfer Bus and memory transfers, Arithmetic Mircrooperatiaons, logic micro operations, shift micro operations, Arithmetic logic shift unit. Instruction codes. Computer Registers Computer instructions – Instruction cycle.

Memory – Reference Instructions. Input – Output and Interrupt. STACK organization. Instruction formats. Addressing modes. DATA Transfer and manipulation. Program control. Reduced Instruction set computer.

UNIT III :

MICRO PROGRAMMED CONTROL : Control memory, Address sequencing, microprogram example, design of control unit Hard wired control. Microprogrammed control

UNIT IV :

COMPUTER ARITHMETIC : Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit Decimal Arithmetic operations.

UNIT V :

THE MEMORY SYSTEM : Basic concepts semiconductor RAM memories. Read-only memories Cache memories performance considerations, Virtual memories secondary storage. Introduction to RAID.

UNIT-VI

INPUT-OUTPUT ORGANIZATION : Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt Direct memory Access, Input –Output Processor (IOP) Serial communication; Introduction to peripheral component, Interconnect (PCI) bus. Introduction to standard serial communication protocols like RS232, USB, IEEE1394.

UNIT VII :

PIPELINE AND VECTOR PROCESSING : Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.

UNIT VIII :

MULTI PROCESSORS : Characteristics or Multiprocessors, Interconnection Structures, Interprocessor Arbitration. InterProcessor Communication and Synchronization Cache Coherance. Shared Memory Multiprocessors.

TEXT BOOKS :

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson

REFERENCES :

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI
3. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.
4. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition Elsevier
5. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.

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(56078) PLANT BIOTECHNOLOGY

UNIT I TISSUE CULTURE

Introduction to cells and tissue culture, concept of totipotency, laboratory requirements and general techniques. Tissue culture media, constituents and preparation. Initiation of aseptic culture.

UNIT II TISSUE CULTURE APPLICATION I

Suspension culture, somatic embryogenesis, organogenesis, Micro propagation (clonal propagation)

Haploid production ands its application & limitations.

UNIT III TISSUE CULTURE APPLICATION II

Protoplast isolation, culture & regeneration, short term & long term germplasm conservation, somaclonal variations.

UNIT IV PRODUCTION OF SECONDARY METABOLITES

Production of chemicals and other important compounds from plants. Strategies for enhancing the product yield. Bioreactor models for commercialization of product.

UNIT V TRANSFORMATION TECHNOLOGY

Agrobacterium mediated transformation, direct gene transfer methods, chemical methods, electroporation, microinjection and particle bombardment. Basic concept and essential steps of the genetic transformation process.

UNIT VI TRANSGENSIS

Production of transgenic plants for biotic and Abiotic stress tolerance (Drought, temperature, salt).

(Herbicide resistance, insect resistance, disease resistance, Virus resistance).

UNIT VII MOLECULAR MARKERS

Concept of molecular DNA markers – RFLP, RAPD, AFLP, SNPs, SSRs, SSCPs and their role in crop improvement.

UNIT VIII MOLECULAR FARMING AND APPLICATIONS

Plant biotechnology applications for production of industrial enzymes and therapeutic proteins, antigens, antibodies etc,.

TEXT BOOKS:

1. Roberta Smith, Plant Tissue Culture: Techniques and Experiments. 2nd ed., Academic Press, 2000.

2. Bhojwani, S.S. and Rajdan, Plant Tissue Culture: Theory and Practice. 2004

REFEPENCES:

1. Crispeels, M.J. and Sadava, D.E., Plants, Genes and Crop Biotechnology, Jones and Bartlett Publishers (2nd Edition), 2003.

2. Bhowjwani, S.S., Plant Tissue Culture: Application and Limitations. Amsterdam, Elsevier,1990.

3. Charles Cunningham and Andrew J.R. Porter, Recombinant Proteins from Plants: Production and isolation of Clinically Useful Compounds (Methods in Biotechnology), Humana Press, 1997.

4. Bernard R. Glick and John E. Thompson, Methods in Plant Molecular Biology and Biotechnology, CRC Press, 1993.

5. I. Potrykus and G. Spangenberg, Gene Transfer to Plants (Springer Lab Manual), Springer Verlag, 1997.

6. Peter M. Gresshoff, Plant Genome Analysis: Current Topics in Plant Molecular Biology. CRC Press, 1994.

7. John Hammond, Peter McGarvey, Vidadi Yusibov, Plant Biotechnology: New Products and Applications, Springer Verlag, 1999.

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III Year B.Tech. Biotech. II-Sem	L	T/P/D	C
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(56079) HEAT TRANSFER IN BIOPROCESSES

UNIT I: Introduction to Heat Transfer

Basics of Heat Transfer, Various modes of Heat Transfer viz., conduction, convection and radiation.

UNIT II: Conductive Heat Transfer

Mechanism of Heat Transfer by conduction; Study state Heat Transfer through slabs and through series of resistances, Heat Transfer through hollow cylinders, concept of log-mean radius, un steady-state Heat Transfer, through uniformity long slabs, cylinders and spheres. Extended surface Heat Transfer through fins etc.

UNIT III: Convection

Introduction to Convective Heat Transfer, Natural convection & forced convection, application of dimensional analysis to convective Heat Transfer Various correlations for evaluating Heat Transfer coefficient in agitated vessels, Packed beds, Jacketed vessels.

UNIT IV: Boiling & condensation

Heat transfer to fluids with phase chage- heat transfer from condensing vapors- Drop wise and Film wise condensation – Derivations and practical use of Nusselt equation. Boiling of saturated liquid- maximum heat flux and critical temperature drop, minimum flux and film boiling. Design concept of condensers.

UNIT V: Radiation

Introduction to radioactive Heat Transfer; Absorptivity, reflectivity, transmissivity; Concept of black body, emissive power & emissivity. Various laws of black body radiation viz., Kirchoff's, Stefan- Boltzman law, Planck's law and Wien's displacement law.

UNIT VI: Heat transfer equipment

Typical heat exchange, equipment & various types of heat exchangers- counter and parallel flows, energy balances, long-mean temperature difference and correction for mixed and cross flow – Rating of single

and multiple heat exchangers – Description of extended surface heat exchangers.

UNIT VII:

Single and Multiple effect evaporations and numerical problems on evaporators. Steam economy, Steam capacity, evaporators performance with various feeding viz, forward, backward and parallel.

UNIT VIII:

Analogy between heat, mass and momentum transfer. Applications of heat transfer in bioprocessing-batch sterilization and design of continuous sterilization.

TEXT BOOKS:

1. W.L. Mc Cabe and JC Smith, Unit Operations of Chemical Engineering, Mc Graw Hill, 5" edition, 1993.

2. Heat Transfer, k.a. Gavhane and Nirali Prakashan.

3. P.M. Doran, Bioprocess Engineering Principles, Academic Press, 1995.

REFERENCE BOOKS:

1. BIOTOL Series: Transport phenomena in bioprocesses, Verlag

2. D.G.Rao, Introduction to Biochemical Engineering, Tata Mc Graw Hill, 2005.

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III Year B.Tech. Biotech. II-Sem	L	T/P/D	C
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(56080) INSTRUMENTATION AND PROCESS CONTROL

Unit –I:

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

Unit-II:

Thermo electricity: Industrial thermocouples, thermocouple wires, thermo couple wells. Composition analysis, spectroscopic analysis by absorption, emission, mass and color measurement spectrometers, gas analysis by thermal conductivity, analysis of moisture, gas chromatography, refractometer.

Unit-III:

Head, density and specific gravity, direct measurement of liquid level, pressure measurement in open vessels, level measurements in pressure vessels. Pressure vacuum and head: liquid column manometers, measuring elements for gauge pressure and vacuum, indicating elements for pressure gauges, measurement of absolute pressure, measuring pressure in corrosive liquids.

Unit –VI:

Head flow meters, area flow meters, open channel meters, viscosity meters, quantity meters, viscosity measurements. Recording instruments, indicating and signaling instruments.

UNIT-V:

Biosensors: Types, Transducers in biosensors- calorimetric, optical, potentiometric / amplometric, conductometric/ resistometric, piezoelectric, semi conductor, mechanical and molecular electromics based, molecular wires and switches, development of molecular arrays as memory stores, design for a biomolecular photomic computers- information processing.

Unit- VI:

Introduction. Response of First order system, Transfer Function, Transient response to step, mpulse, sinusoidal forcing function, physical examples of first order systems, liquid level, mixing process, concept of time constant, Response of Second order system to step, impulse and sinnoidnl forcing function. Transportation lag control systems, Servo and Regulatory control problems.

Unit- VII:

Development of Block diagram, Controllers and final control elements, Ideal transfer functions of operational, PI, PD and PID Controllers. Reduction of physical control system to block diagram. Closed loop transfer functions for servo regulator problems. Overall Transfer function for multi loop control system. Stability and control system by Routh's Criterion.

Unit-VIII:

Frequency response: Bode diagram, First order, first order system in series, second order system and for controllers and transportation log. Bode stability criterion. Gain margin and phase margin.

Text Book:

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

2. KR Rogers, M. Mascion, Biosensors for analytical monitoring EP & biosensors year

3. Donald R. Coughanowr, Process Systems Analysis and Control, McGraw-Hill 1991

REFERENCE:

1. Principles of industrial instrumentation by Patra Nabis, TMH. Chemical Process Control Stephanoupoulis, G., Prentice Hall, New Delhi. 1990.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	4	1/-/-	4

(56081) IMMUNOLOGY

UNIT I: The Immune System

Phylogeny; Innate and acquired immunity; Antigens and immunogens, their chemical nature; Antigenicity and immunogenicity, properties influencing them; Haptens and adjuvants.

UNIT II: Cells Of The Immune System, Phagocytosis And Inflammation

Cells of innate immunity; Cells of adaptive immunity; Haematopoiesis and major cell lineages; Phagocytosis and inflammation.

UNIT III: Organs Of The Immune System

Primary lymphoid organs (Thymus and Bone marrow); Secondary lymphoid organs (Spleen and Lymph node); Mucosal immune system.

UNIT IV: Humoral Immunity-I: Antibodies And Their Applications

Immunoglobulins, structure, classes, sub classes; Isotypes, allotypes and idiotypes; Immunoglobulin functions; Applications: hybridomas and monoclonals, immunotoxicins, chimeric antibodies, abzymes; Antigen- antibody interaction.

UNIT V: Humoral Immunity –Ii: B Cells And Ontogeny

Diffrentiation and maturation; Activation and effectors function; Generation of antibody diversity and class switching.

UNIT VI: Cell Mediated Immunity

T-cells subclasses and their functions; MHC and polymorphism + T cell diversity; Ag processing and presentation; Ontogeny of T cells: differentiation, maturation, activation, effector function, regulation.

UNIT VII: Complements and Hypersensititvity

Copmplements: Classical and atternate pathways; Function-opsonization, inflammation.

Hypersensitivity: Types and mechanisms; relevance and significance.

UNIT VIII: Transplantation, Autoimmunity and Tumors

Graft rejection types and mechanisms; prevention of graft rejection: immunosuppression by chemicals and biologicals; Autoimmunity:

experimental models and treatment; Tumor immunology: evasion of immunity, cancer immunotherapy.

Text Books:

1) E. Roitt Essential Immunology, Vaccines conventional, subunit and recombinant, antidiotypic vaccine, Blackwell Scientific publications, Oxford,1991.

2) Kuby Immunology, 5th Edition . Richard A Goldsby, Thomas J Kindt Barbara A Osborne. W H Freeman and Company.

3) Esssential Immunology by Abhas & Liechmann.

4) Khan FH. The elements of Immunology. Pearson education. 2009.

References:

1) Benjamin E and Leskowitz S, immunology A short Course. Wiley LISS NY, 991. ELISA Immunological Techniques. DNA vaccines Immunotechnology.

2) Cellular Molecular Immunology. Abul Abbas and Litchman. 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	3	1/-/-	3

(55066) PROBABILITY AND STATISTICS

UNIT-I

Probability: Sample space and events – Probability – The axioms of probability – Some

Elementary theorems - Conditional probability – Baye's theorem.

UNIT-II

Random variables – Discrete and continuous – Distribution – Distribution function. Distribution

UNIT-III

Binomial and poison distributions Normal distribution – related properties.

UNIT-IV

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

UNIT-V

Estimation: Point estimation – interval estimation - Bayesian estimation.

UNIT-VI

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

UNIT-VII

Tests of significance – Student's t-test, F-test, χ^2 test. Estimation of proportions.

UNIT-VIII

Queuing Theory: Pure Birth and Death Process M/M/1 Model and Simple Problems.

Text Books:

1. Probability & Statistics, T. K. V. Iyengar, B. Krishna Gandhi and Others, S. Chand & Company.

2. A text book of Probability & Statistics, Shahnaz Bathul, V. G. S. Book Links.

References:

1. Probability & Statistics, Arnold O. Allen, Academic Press.

2. Probability & Statistics for Engineers, Miller and John E. Freund, Prentice Hall of India.

3. Probability & Statistics, Mendan Hall, Beaver Thomson Publishers.

4. Probability & Statistics, D. K. Murugeson & P. Guru Swamy, Anuradha Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	0	-/3/-	2

(56639) PLANT TISSUE CULTURE LAB

1. Preparation of Media
2. Surface sterilization
3. Callus induction
4. Organ culture
5. Protoplast isolation, culture and Cytological examination
6. *Agrobacterium* mediated gene transfer, selection of transformants, reporter gene (GUS) assays.

REFERENCE:

Plant Biotechnology: Practical Manual, C.C.Giri & Archana Giri, IK International, 2007.

EQUIPMENTS:

1. Autoclave.
2. pH Meter.
3. Laminar air flow chamber.
4. B.O.D. Incubator.

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III Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	0	-/3/-	2

(56640) IMMUNOLOGY LAB

1. Immunoprecipitation
   a) Ouchterlony's immuno diffusion technique.
   b) Counter current immuno electrophoresis.
2. Agglutination: Haemagglutination & Blood typing / grouping.
3. Enzyme linked immunosorbant assay(ELISA)
4. Immunoglobulins purification.
5. Differential (Identification of cell types) & Total leukocyte counts of blood
6. Isolation & Viability determination of Lymphocytes from peripheral blood.
7. Lymphocyte proliferation with mitogen and migration with capillary tubes.
8. Identification of cell types by receptors – Immunofluorsence.
9. Raising of antibodies in animals – Polyclonal antibodies.

Equipments:

1. Haemocytometer
2. ELISA reader
3. Centrifuge
4. Electrophoresis unit
5. Microscope

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	4	-/-/-	4

(57129) COMPUTATIONAL MOLECULAR BIOLOGY

UNIT I: INTRODUCTION TO COMPUTATIONAL MOLECULAR BIOLOGY

Introduction to active areas of research in Computational Molecular Biology, Functional Genomics, Comparative Genomics, Dynamic Programming, Graphical representation of biochemical systems, S-systems equations, steady state analysis, Model refinements

UNIT II: GENOMICS

DNA Sequence assembly and gene identification. Homology based gene prediction. Gene expression profiling, Identification of SNPs, SNP arrays, Role of SNP in Pharmacogenomics, other applications. Methods of studying gene expression, EST approach, Human Genome Project.

UNIT III: MICRO ARRAYS

Understanding microarray data, normalizing microarray data, detecting differential gene expression correlation of gene expression data to biological processes and computational analysis tools.

UNIT IV: PROTEOMICS I

Introduction to proteins. Protein identification, structure and function determination. Structure comparison methods. Prediction of secondary structure from sequence.

UNIT V: PROTEOMICS II

Protein homology modeling, Protein threading. Protein ab initio structure prediction. Protein design emphasis on structural Bioinformatics.

UNIT VI: TAXONOMY AND PHYLOGENY

Basic concepts in systematics, taxonomy and phylogeny; Nature of data used in taxonomy and phylogeny; Molecular evolution, Definition and description of Phylogenetic trees and types of trees

UNIT VII: DENDROGRAMS

Dendograms and its interpretation

UNIT-VIII: DRUG DESIGN

Drug discovery process, Role of Bioinformatics in drug design, Target identification and validation, lead optimization and validation.

TEXT BOOKS:

1. David W Mount. Bioinformatics- Sequence and genome analysis. CSHL Press.

2. Jonathan Pevsner. Bioinformatics and Functional Genomics. A Jhon Wiely & Sons, Inc., Publication

3. E.O.Voit Computational Analysis of Biochemical systems, Cambridge University Press 2000.

REFERENCES:

1. Introduction to computational biology, An Evalutionary Approach by Bernhard Haubold and Thomas Wiehe. Spinger India publications. India (2006).

2. Moody P C E and A J Wilkinson. Protein Engineering. IRL Press.

3. Creighton T E, Proteins. Freeman W H. Second edition 1993.

4. Journal BIOINFORMATICS (Oxford University).

5. BRANDOND TOOZE – Proteomics

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	3	1/-/-	3

(57130) BIO ETHICS, BIO SAFETY AND INTELLECTUAL PROPERTY RIGHTS

UNIT I: BIOETHICS

Introduction to Bioethics. Social and ethical issues in Biotechnology, The principles of bioethics, autonomy, human rights, privacy justice. Ethics related to use of experimental animals. ICMR guide lines.

UNIT II: BIOSAFETY CONCEPTS AND ISSUES

Definition of Biosafety. Biosafety for human health and environment. Biosafety in laboratory institutions, laboratory associated infections, Assessment of biological hazards and level of biosafety. Prudent biosafety practical in laboratory.

UNIT III: BIOSAFETY REGULATIONS

Use of genetically modified organisms and their release in to the environment. Special procedures for r-DNA based products. International dimensions in Biosafety, catagena protocol on biosafety, bioterrorism. Biotechnology and Food safety. Case study- BT Cotton, BT Brinjal.

UNIT IV: REGULATORY AFFAIRS

Regulatory requirements and guide lines for regulatory affairs- Indian context for drugs and Biologics. GLP. GMP, understanding of drugs and cosmetics act.

UNIT V: INTELLECTUAL PROPERTY RIGHTS I

Intellectual property rights, and Intellectual Property protection, patents and methods of application of patents, case study on patents (Basmati rice, turmeric, neem).

UNIT VI: INTELLECTUAL PROPERTY RIGHTS II

Trade Secrets copyrights, Trade Marks, legal implications, farmers rights, plant breeder's rights, TRIPS, International and regional agreements.

UNIT VII: INTELLECTUAL PROPERTY RIGHTS III

Patent search, Patent drafting & patent cooperation treaty for filling patents.

UNIT VIII

International and National conventions on biotechnology and related areas. Establishment of WIPO. Mission activities ,General Agreement on trade and tariff (GATT) – Fundamental principles in impact on developed countries.

TEXT BOOKS:

1. Sasson A, Biotechnologies and Development, UNESCO Publications, 1988.
2. Sasson A. Biotechnologies in developing countries present and future, UNESCO publishers, 1993.

REFERENCE:

1. Singh K. Intellectual Property Rights on Biotechnology, BCII, New Delhi.
2. Protection of industrial property rights - P Das and Gokul Das
3. V. Sree Krishna. Bioethics and Biosafety in Biotechnology. New Age International Publications. (2007).
4. Original laws published by Govt of India.
5. Intellectual property Today : vol Nos May 2001 (www.iptoday.com).
6. Thomas JA; Fuch RL (2002) Biotechnology and safety Assessment (3rd) Academic press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	3	1/-/-	3

(57131) DOWNSTREAM PROCESSING

UNIT I: ROLE OF DOWNSTREAM PROCESSING IN BIOTECHNOLOGY

Role and importance of downstream processing in biotechnological processes. Problems and requirements of bioproduct purification. Economics of downstream processing in Biotechnology, cost-cutting strategies, characteristics of biological mixtures, process design criteria for various classes of bioproducts (high volume, low value products and low volume, high Value products)

UNIT-II:

Physico-chemical basis of bio-separation processes. Recent development in product

Isolation (for ex. one step purification, reverse Micro cellular extraction on line membrane separation).

UNIT III: PRIMARY SEPARATION AND RECOVER PROCESS

Cell disruption methods for intracellular products, removal of insoluble, biomass (and particulate debris) separation techniques, flocculation and sedimentation, centrifugation and filtration methods.

UNIT IV: MEMBRANE SEPARATIONS

Membrane-based separations (micro and ultrafiltration), theory, design and configuration of membrane separation equipment applications,

UNIT V: ENRICHMENT OPERATIONS

Precipitation methods (with salts, organic solvents, and polymers, extractive separations, aqueous two-phase extraction, supercritical extraction), in situ product removal, integrated bioprocessing.

UNIT VI: ELECTROPHORESIS

Electrophoresis of proteins and nucleic acids, 1D-2D Gels, Types of Electrophoretic techniques (Capillary and Pulse field).

UNIT VII: PRODUCT RESOLUTION / FRACTIONATION

Chromatographic techniques- Paper, TLC, Adsorption, Ion exchange, Gel filtration, affinity chromatographic separation processes, GC,

HPLC, FPLC, Chromatofocusing electrophoretic separations.

UNIT VIII: NEW AND EMERGING TECHNOLOGIES

Dialysis, Crystallization Pervaporation, super liquid extraction foam based separation case study with examples for processing of Two Industrial Products (Citric acid / Penicillin and Low volume high value product like recombinant proteins).

TEXT BOOKS:

1. Wankat PC. Rate controlled separations, Elsevier, 1990.
2. Belter PA and Cussler E. Bioseparations, Wiley 1985.

REFERENCES:

1. Product Recovery in Bioprocess Technology, BIOTOL. Series, VCH, 1990.
2. Asenjo J.M. Separation processes in Biotechnology, 1993, Marcel Dekkere Inc
3. M.R.Ladisch, Bioseparation engineering: Principles, Practice and Economics, Wiley Interscience 2001

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IV Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	3	1/-/-	3

(57132) BIOPROCESS OPTIMIZATION AND PLANT DESIGN

Unit I: Basic concepts

Overview of experimental design in biological process, understanding of variables in biological processes. Introduction to optimization of bioprocesses.

Unit II: Optimization approaches

Non-statistical, statistical and numerical optimization fundamental theory. First order and second order designs, differences in approaches, general response surface analysis.

Unit III: Determination of optimal condition

Statistical experimental procedures for placktt – Burman designs; Method of Ridge analysis, Nelder – Mead simplex method; Optimization of multi – response biological systems.

Unit IV: General Design Consideration

Technical feasibility survey, process development, principles of equipment design and specification. Project consideration: Marketability of product, availability of technology, raw materials, equipment, human resources, land and utilizations. Other consideration: Site characteristics, waste disposal, government regulation and other legal restriction, community factors and other factors affecting investment.

Unit V: Design of fermenter

Application of mass and energy balances in the design, evalution of size and related features of the fermenter. Application of optimization techniques in the design fermenter in terms of size, cost and project economics.

Unit VI: Design of Heat exchanger

Evalution of heat load for any fermentation process, design of heat exchanger using energy balance equation. Application of optimization techniques in the design of a heat exchanger in terms- heat transfer area, temperature differences, cost and project economics.

Unit VII: Non statistical Optimization and examples

Self directing optimization, case-studies with simple response and multi-response analysis.

Unit VIII: Patents & IPR issues

Patent concept and its composition and protection of right and their limitations and intellectual property protection. Application of patents and IPR issues with special reference to biological systems.

Text Books:

1. B. Volesky and J. Votrubla. Modeling optimization of fermentation process. Elsevier, Amsterdam. 1992.

2. Peters and Timmerhaus. Plant design and economics and for chemical engineers. Mc Graw-Hill. 4th Edition. 1989.

Reference Books:

1. Rudd and Watson. Strategy of process engineering. Wiley. 1987.

2. Ganguli. Gearing up for patents. The Indian scenario. University press.

3. D.C. Montgomery. Design and Analysis of Experiments. 5th edition. Wiley India (P) Ltd., New Delhi. 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. I-Sem

L	T/P/D	C
4	1/-/-	4

(57133) CROP IMPROVEMENT
(Elective-I)

Unit I: Conventional methods for crop improvement

Introduction to Conventional methods for crop improvement, Pedigree breeding, Heterosis breeding, Mutation breeding.

Unit II: Tissue culture in crop improvement

Micropropagation for virus-free plants, Somaclonal variation, Somatic Hybridization, Haploids in plant breeding.

Unit III: Genetic engineering for increasing crop productivity

Genetic engineering for increasing crop productivity by manipulation of Photosynthesis, Nitrogen fixation, Nutrient uptake efficiency, Male sterility, Increasing shelf life.

Unit IV: Genetic engineering for increasing crop productivity: Biotic factors

Genetic engineering for biotic stress tolerance, Insects, fungi, bacteria, viruses, weeds.

Unit V: Genetic engineering for increasing crop productivity: Abiotic factors

Genetic engineering for abiotic stress, drought, flooding, salt and temperature

Unit VI: Genetic engineering for quality improvement

Genetic engineering for quality improvement, Protein, lipids, carbohydrates, vitamins & mineral nutrients.

Unit VII: Molecular Marker aided Breeding and MolecularTagging

Introduction to Molecular breeding, constructing molecular maps; Molecular markers, RFLP, RAPD, STS, SCAR, SSCP, AFLP, Molecular tagging of genes/traits.

Unit VIII: Marker Assisted selection

Molecular marker-assisted selection of qualitative and quantitative traits, Map based cloning.

TEXT BOOKS:

1. Principles of crop production: Theory, and Technology by George Acquahh. PHI Publications, 2004
2. Plant tissue culture by Bhojwani SS and Razdan MK. Elsevier, 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. I-Sem

L	T/P/D	C
4	1/-/-	4

(57134) STRUCTURAL BIOLOGY
(Elective-I)

UNIT I: INTRODUCTION

Nucleic acids, proteins, carbohydrates, lipids, cofactors, vitamins and hormones.

UNIT II: MACROMOLECULAR STRUCTURE

Levels of structure in biomolecules, size and shape, Molecular chirality and Structural transitions.

UNIT III: CONFORMATIONAL ANALYSIS

Forces that determine Protein and Nucleic acid structure, basic problems. Polypeptide chains; geometric, potential energy calculations, observed values for rotation angles, hydrogen bonding, hydrophobic interactions and structure of water molecule; ionic interactions, disulphide bonds.

UNIT IV: PROTEIN FOLDING

Types of proteins and interactions that govern protein folding, protein structure, The protein globule and hydrophic interactions, organized folds, folding mechanisms, membrane proteins, helix-coil transitions.

UNIT V: BIOMOLECULAR INTERACTIONS

Molecular recognition, supramolecular interactions, Functional importance of Protein-protein and protein-nucleic acid interactions. Specific and non-specific DNA-protein complexes.

UNIT VI: STRUCTURAL ANALYSIS OF BIOMOLECULES

Prediction of protein structure; Sequence-structure relationships (fundamentals of bioinformatics: sequence homology), Nucleic acids; general characteristics of nucleic acid structure, geometric, glycosidic bond rotational isomers, backbone rotational isomers and ribose puckering forces stabilizing ordered forms, base pairing, base stacking; tertiary structure of nucleic acids.

UNIT VII: KINETICS OF LIGAND INTERACTIONS

Biochemical Kinetics studies, uni-molecular reactions, simple

bimolecular multiple intermediates, steady state kinetics, catalytic efficiency relaxation spectrometry, ribonuclease as an example.

UNIT VIII: EXPERIMENTAL METHODS

Size and shape of micro molecules: photons, chromophores, transition dipole moments, absorbance, and concentration. Methods of direct visualization of macromolecules as hydrodynamic particles - macromolecular diffusion, ultra centrifugation, viscometry.

TEXT BOOK:

1) Tinoco, I., Jr., Sauer, K., Wang, J. C., & Puglisi, J. D. (2001) Physical Chemistry: Principles and Applications in Biological Sciences, 4th ed. Prentice Hall.

2) Introduction to Protein Architecture: The Structural Biology of Protein by A.M. Lesk, Oxford University press.(2001).

3) Vijayan. M. Yathindra. N. and Kolaskar A.S. (1999) Perspectives in structural Biology. Indian Academy of Sciences.

REFERENCES:

1. Introduction to Protein Structure, by Branden and Tooze

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IV Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	4	1/-/-	4

(57135) CANCER BIOLOGY
(Elective-I)

UNIT I: FUNDAMENTALS OF CANCER BIOLOGY

Regulation of Cell cycle, mutations that cause changes in signal molecules, effects on receptor, signal switches, Different forms of cancer – Classification: Epidemiology of cancer.

UNIT II: PRINCIPLES OF CARCINOGENESIS I

Chemical Carcinogenesis, Metabolism of Carcinogenesis, Natural History of Carcinogenesis, Targets of Chemical Carcinogenesis, Diet & Cancer

UNIT III: PRINCIPLES OF CARCINOGENESIS II

Principles of Physical Carcinogenesis, X - Ray radiation, UV - mechanism of radiation Carcinogenesis.

UNIT IV: MOLECULAR CELL BIOLOGY OF CANCER

Oncogenes, Identification of Oncogenes, Viruses and Cancer, Detection of Oncogenes, Growth Factor and Growth Factor receptors that are Oncogenes. Oncogenes / Proto Oncogene activity. Growth factors related to transformations. Signal transduction and aberrant cell growth.

UNIT V: PRINCIPLES OF CANCER METASTASIS

Clinical significances of invasion, heterogeneity of metastatic phenotype, Metastatic cascade, Basement Membrane disruption, Three-step theory of Invasion, Proteinases and tumour cell invasion.

UNIT VI: DETECTION OF CANCER

Detection of Cancers, Prediction of aggressiveness of Cancer, Advances in Cancer detection.

UNIT VII: TUMOR SUPPRESSION

Tumor suppressor genes, modulation of cell cycle in cancer.

UNIT VIII: CANCER THERAPY

Different forms of therapy, Chemotherapy new molecules, radiation Therapy, and Immunotherapy: advantages and limitations.

TEXT BOOKS

1. Maly B.W.J. Virology a practical approach, IRL Press, Oxford, 1987.
2. L.M. Franks, N.M. Teich. An Introduction to Cellular and Molecular Biology of Cancer, Oxford Medical publications, 1991.
3. Raymond. W. Ruddon, 4th Edition, Oxford University press.

REFERENCE:

1. Dunmock N.J and Primrose.S.B., Introduction to modern Virology, Blackwel.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	4	1/-/-	4

(57136) MOLECULAR PATHOGENESIS
(Elective-II)

UNIT I: INTRODUCTION

Introduction to pathogenesis, components of microbial pathogenicity. Population genetics of Microbial pathogenesis, methods to detect genetic diversity and structure in nature population, epidemiology, cryptic diseases.

UNIT II: HOST DEFENCES I

Host defense against pathogens, clinical importance of understanding host defense, components of the host surface defences systems like skin, mucosa, eye, mouth, respiratory tract.

UNIT III: HOST DEFENCES II

Components of the systemic defense like the tissues and blood.

UNIT IV HOST- PATHOGEN INTERACTION

Virulence and virulence factors, colonising virulence factors, virulence factors damaging the host tissues, virulence genes and regulation of the virulence genes.

UNIT V: EXPERIMENTAL METHODS

Experimental methods to study host-pathogen interaction, selecting the pathogen model, measurement of virulence, identification of potential virulence factors.

UNIT VI MODULATION OF IMMUNE RESPONSE

Modulation of immune response by vaccines, properties of vaccines, other immuno modulators.

UNIT VII: PARADIGMS OF PATHOGENESIS:

Diphtheria disease by colonisation; Disease without colonisation *Clostridium botulinum* and *Staphylococcus aureus*; Intestinal infections, *Shigella* and *E.coli* infections; *Vibrio cholera Salmonella* infections; fungal infections.

UNIT VIII: FUTURE CHALLENGES

Gastric and duodenal ulcers - are they due to infections? Lyme disease

and Syphilis - unsolved mystery. Legionnaires disease-aftermath of comforts.Tuberculosis and other mycobacterial infections reemerging with vengeance. Rheumatic fever and glomerulo nephritis - still a question to be solved.

TEXT BOOKS:

1) Iglewski B.H. and Clark V.L. Molecular basis of Bacterial pathogenesis, Academic press, 1990.

2) Janeway C.A. Jr, and Travers P. T. Immunobiology. Blackwell J Scientific.Publishers, 1994.

REFERENCES:

1) Talaro K. and Talaro A. Foundations in Microbiology, W.C. Brown Publishers, 1993.

2) Roitt I. Essentials of Immunology, 8th edition, Blackwell Scientific Publishers, 1994.

Austyn J.M. and Wood K.J. Principles Cellular and Molecular Immunology, OxfordUniversityPress,1993.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	4	1/-/-	4

(57137) BIOPHARMACEUTICALS
(Elective-II)

UNIT I: INTRODUCTION TO PHARMACEUTICALS

History & Definition of Drugs. Sources of Drugs - Plant, Animals, Microbes and Minerals. Different dosage forms. Routes of drug administration.

UNIT II: PHARMACODYNAMICS

Physico-Chemical Principles, Pharmacodynamics- Mechanism of drug action, drug receptors, and Physiological receptors: structural and functional families.

UNIT III: PHARMACOKINETICS

Pharmacokinetics- Drug absorption, factors that affect the absorption of drugs, Distribution of drugs, Biotransformation of drugs, Bioavailability of drugs and drug metabolism.

UNIT IV: DRUG MANUFACTURING PROCESSES I

Bulk drug manufacturing, Application, preservation, packing technologies and Quality management, manufacturing facilities, Good manufacturing practices.

UNIT V: DRUG MANUFACTURING PROCESSES II

Production and analytical Methods and test for various biopharmaceuticals.

UNIT VI: PRODUCTION OF BIOPHARMACEUTICALS

Production of Therapeutic Proteins, Hormones, Cytokines - Interferons, Interleukins I & II, Tumor Necrosis Factor (TNF); Nucleic acids.

UNIT VII: APPLICATIONS OF BIOPHARMACEUTICALS

Role of Biopharmaceuticals in treatment of various health disorders.

UNIT VIII: DRUG DELIVERY SYSTEMS, BIOMATERIALS AND THEIR APPLICATIONS

Controlled and sustained delivery of drugs. Biomaterial for the sustained drug delivery. Liposome mediated drug delivery. Drug delivery methods for therapeutic proteins.

Reference:

1. Biopharmaceuticals: Biochemistry & Biotechnology, Gary Walsh (1998), John Wiley & Sons Ltd.

2. Remington's Pharmaceutical sciences, (Mark Publications & Company eston PA) year 1980.

3. Theory & Practice of Industrial Pharmacy (3rd ed.) Leon Lachman, Lea & Febiger (1986)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	4	1/-/-	4

(57138) INTRODUCTION TO BIOMATERIALS
(Elective-II)

UNIT I: INTRODUCTION

Definition of polymers and biomaterials, functionality, polymer isomerism

UNIT II: SELECTION OF BIOMATERIALS

Selection criteria, fiber folding, membrane lamination, in situ polymerization

UNIT III: BIOLOGICALLY DERIVED BIOMATERIALS

Polyhydroxialkanoates, polylactides- characterization, synthesis in organism and extraction

UNIT IV: MATERIALS FOR TISSUE ENGINEERING

Case studies with regenerated polymers

UNIT V: TRENDS IN BIOCOMPOSITE

Biodiode , polymer coated blood, polymer precursor synthesis and characterization

UNIT VI: IMPROVED FUNCTIONS OF BIOPOLYMERS

Genetic and molecular Biology aspects of synthesis

UNIT VII: FERMENTATIVE PRODUCTION

Biopolyester, microbial polysaccharides, microbial cellulose, bioadhesive, polyglutamic acid

UNIT VIII: OPTIMIZATION OF PRODUCTION KINETICS, SEPARATION

Statistical optimization of probable variables for production of biomaterials, use of reactors, kinetic analysis for production, separation of Biomaterials by cell digestion and extraction

TEXT BOOKS:

1. D. Byrom, Biomaterials –novel materials from biological sources, Stockton press, New York, 1991.
2. J.B.Park, Biomaterials science and engineering, Plenum Pulo, 1984.

REFERENCE BOOK:

1. A. Steinbuechel – Biopolymers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	0	-/3/-	2

(57633) BIOINFORMATICS LAB

1) Demonstration of BLAST, FASTA and other search engines
2) Clustering and contig assembly tool
3) Multiple sequence alignment and phylogenetic analysis.
4) Gene finder (Prediction)
5) Restriction site analysis tools
6) Protein visualization tools (RASMOL)

EQUIPMENTS:

1. Computers
2. Internet facility
3. Bioinformatics software

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. I-Sem	L	T/P/D	C
	0	-/3/-	2

(57634) DOWNSTREAM PROCESSING LAB

Cell disruption techniques.

Solid separation methods-filtration, sedimentation, centrifugation, product enrichment operations, precipitation, ultra filtration, two-phase aqueous extraction, high-resolution purification, preparative liquid chromatographic techniques, product crystallization and drying.

Equipments

1. Tangential flow filtration unit
2. Ultra filtration membrane
3. Centrifuge
4. Chromatographic matrix
5. Chromatographic columns
6. UV-Vis spectrophotometer
7. separating funnels
8. Lyophilizer
9. Magnetic stirrer

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	3	1/-/-	3

(58101) ANIMAL CELL SCIENCE AND TECHNOLOGY

Unit I: Introduction

Structure and Organization of animal cell; Equipments and materials; Primary and established cells.

Unit II: Media & Supplements

Balanced salt solutions and simple growth medium; Physical, chemical and metabolic functions of media constituents; Role of CO_2; Role of serum & supplements.

Unit III: Characterization of cultured cells

Cell duplication time – examples of slow & rapid growers; Parameters of growth and their measurement; Measurement of viability and toxicity; Introduction to apoptosis and necrosis.

Unit IV: Basic mammalian cell culture techniques

Disaggregation of tissue and primary cells – enzymatic and non-enzymatic; Maintenance of cell culture- suspension and adherent; Cell separation – based on cell density and phenotypic markers.

Unit V: Stem cells

Definition; Types – pleuripotent v/s totipotent; Embryonic, adult and fetal; Role of stem cells in tissue engineering; Application of stem cells.

Unit VI: Higher order cultures

Organ and histotypic cultures; Three dimensional cultures; Mixed cell cultures – eg., study of immune response; Skin rafts.

Unit VII: Application of Animal cell cultures

Study of biological process- eg., polarized and non-polarized cells; Production of vaccines; Biologicals and therapeutics (monoclonal antibody and recombinant protein).

Unit VIII: Introduction to cell selection and manipulation

Cloning; Micromanipulation; Synchronization; Transformation.

TEXT BOOKS:

1. Culture of Animal Cells, (3rd Edition), F1. Ian Froshney. Wiley-Liss.
2. Animal Cell Culture – Practical Approach, Ed. John R.W. Masters, OXFORD.

REFERENCES

1. Cell Culture Lab Fax. Eds. M. Butler & M. Dawson, Bios Scientific Publications Ltd., Oxford.
2. Animal Cell Culture Techniques. Ed. Martin Clynes, Springer.
3. Methods in Cell Biology, Vol. 57, Animal Cell Culture Methods. Ed. Jenni P. Mather and David Barnes. Academic Press.
4. Cell Growth and Division: A Practical Approach. Ed. R. Basega, IRL Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B. Tech. Biotech. II-Sem	L	T/P/D	C
	3	1/-/-	3

(58102) FUNDAMENTALS OF FOOD SCIENCE & TECHNOLOGY
(Elective-III)

Unit I: Introduction To Food Processing

Biotechnology in relation to the food industry, nutritive value of food, and types of microorganisms associated with food, its sources, types and behavior in foods.

Unit II: Food Preservation I

Bioprocessing of meat, fisheries, vegetables, dairy products, enzymes and chemicals used in food processing,

Unit III: Food Preservation II

biochemical engineering for flavor and food production, cryopreservation, irradiated foods.

Unit IV: Fermented Food Products

Dairy products, non-beverage plant products, beverages and related products of baking.

Unit V: Quality Control

Quality control, case studies on Biotechnology in the evolution of food quality.

Unit VI: Food Spoilage & Food Borne Diseases

Food -borne infections & intoxications.

Unit VII: Food Microbiology I

Utilization of microorganisms in food Industry, Single cell protein, Neutraceuticals etc.,

Unit VIII: Food Microbiology II

Natural and artificial sweeteners and their role in controlling diseases and deficiencies.

TEXT BOOKS

1. Roger A., Gordan B., and John T., Food Biotechnology, 1989.

2. Frazier, Food Microbiology,

3. Essentials of Food process Engineering. Chandra Gopala Rao. BS Publications. (2006).

REFERENCES

1. George J.B., Basic Food Microbiology, CBS Publishers Distributors, 1987.

2. James M .J. Modern Food Microbiology, CBS Publishers & Distributors, 1987.

3. Lindsay, Willis Biotechnology, Challenges for the flavor and food Industries, Elsevier Applied Science, 1988.

4. Fundamentals of Food Engineering. D.G Rao. Prentice-Hall of India 2010.

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IV Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	3	1/-/-	3

(58103) NANO BIOTECHNOLOGY
(Elective-III)

Unit I: Basic Nano Biotechnology
Nanoscale effects in biosystems, scope and future prospects.

Unit II: Characterization tools for nanostructures
AFm, STM, SEM, TEM, electron microscopy.

Unit III: Fabrication methods for nanostructures
Self assembly of nanostructures, lithography, e-beam lithography, sol-gel process.

Unit IV: Nanostructures in drug delivery
Core/shell nanoparticles- clasification- organic, organic/inorganic, polymeric nanoparticles. Targeting cancer cells using PLGA nanoparticles, nanoengineered capsules for sustained drug delivery.

Unit V: Nano biomedical engineering
Core/shell nanoparticles in tissue engineering (organic, inorganic, polymeric)

Unit VI: Nanobiocompunds
DNA polynode, RNA topoisomerase, biopolymers, procollagen, protein-magnetic materials.

Unit VII: Smart materials
Nanoscale biostructures, heterogenous nanostructures.

Unit VIII: Applications of nano biotechnology
Bioimaging, cell labeling, drugs-photodynamic therapy, molecular motors.

TEXT BOOKS;

1. M.ratner and D.Ratner, nanotechnology- agentle introduction to the next big idea, pearson education, 2007.

2. T. Pradeep, NANO: The Essentials, understanding Nanoscience & Nanotechnology, Mc Graw – Hill Education. (2010).

REFERENCES:

1. Harising nalwa, encyclopedia of Nanoscience and technology , scientic America

2. L.E.Foster, nanotechnology-science, innovation and opportunity, pearson education inc, 2007

3. R.R.Birge, protein based computers, scientific American, 1995.

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IV Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	3	1/-/-	3

(58104) CLINICAL TRIALS AND REGULATORY AFFAIRS
(Elective-III)

UNIT-I:

Licensing authorities-roles and responsibilities,ICH GCP,FDA, EU Clinical Trial; Directive, Data Protection Act & Regulations relating to electronic; sgnatures,Declaration of Helsinki 2000 amendment and financial disclosure; ,Law, guidelines and codes of practiceRegulation of drug preparation and

packaging,EMEA,European directives and MRECs,Ethics committees – history; structure regulation impact of ICH GCP recent development with regard to the INDIA; / USA / EU Clinical Trial directive

UNIT II:

Ethics in all aspects of health care; Historical cases; Negligence , informed consent , mental competence; Up – to – date cases: cloning, human embryos and IVF; Shared responsibilities for decisions and the understanding of risk.

UNIT III:

Definitions of GCP , auditing , monitoring and inspection; GCP auditing requirements from a regulatory perspective; GCP compliance and audit certificates; GCP auditor training; GCP audit team structure and SOPs; GCP audit planning; GCP audit conduct; Reporting GCP audit findings; Follow – up to GCP audit reports.

UNIT IV:

History and purpose of GCP development of ICH GCP; Roles and responsibilities in clinical research according to ICH GCP; Sponsor; Monitor; Investigator; IRB / IEC; Essential documentation. The INDIAN / USA / EU Directives on GCP in Clinical Trials: Purpose: How will the introduction affect clinical research; Extracts from the guidance documents. Possible sanctions for non- compliance (a) Legal and regulatory (b) Commercial and (c) Professional.

UNIT V:

Regulations in clinical research; The purpose of audits; Types of audits; Preparing for audits; In company
On site; The audit process; Typical audit finding; What are they; Resolution; How can they be avoided.

UNIT VI:

History of regulatory affairs; Main concepts QSE; Sources of information; Regulatory affairs for studies in human subjects;;What data is needed; Current and future European requirements and procedures; US perspective; Recognizing why clinical research has to meet the needs of regulatory Affairs.

UNIT VII:

Regulatory submissions for new products; What data is needed?; Requirements for gaining approval; US perspective; Regulating control over marketing and sales of medical products; Regulations
Codes of practice; Promotional materials.

UNIT VIII:

Latest developments in ICH; Purpose; Implications; Guidance notes; Inspections. INDIAN / USA / EU Ethics approval system: Overview; Recent developments. Current issues in Clinical research: Confidentiality issues; Medicines for human use (clinical trials) regulations 2003: Other relevant issues

TEXT BOOKS

1. Good Clinical Practices ,Central Drugs Standard Control Organisation, Govt. of India
2. Fundamentals of clinical trials. Third Edition. Lawrence M. Friendman, Curt D. Furberg, David L. DeMets. Springer International Edition. (2009).
3. Drugs and Cosmetics Act, 1940

REFERENCES

1. International Clinical Trial, Volume 1 &2 Dominique P.Brunier and Gerhardt Nahler, Interpharm Press, Denver, Colorado.
2. Code of Federal Regulation by USFDA – Download.
3. ICH-GCP Guidelines – Download.
4. Biosafety issues related to genetically modified organism , Biotech Consortium India Limited, New Delhi.

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IV Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	0	-/-/-	2

(58665) INDUSTRY ORIENTED MINI PROJECT

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IV Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	0	-/6/-	2

(58666) SEMINAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	0	-/15/-	10

(58667) PROJECT WORK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. Biotech. II-Sem	L	T/P/D	C
	0	-/-/-	2

(58668) COMPREHENSIVE VIVA