ACADEMIC REGULATIONS PROGRAM STRUCTURE & DETAILED SYLLABUS

Bachelor of Technology (Bio Technology)

(Effective for the students admitted from the Academic Year 2011-12)

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

'A' Grade Accreditation by NAAC

(Autonomous under JNTU Hyderabad)

Bachelor of Technology (B.Tech) degree of Jawaharlal Nehru Technological University Hyderabad (JNTUH) shall be conferred on a candidate who is admitted to the programme and fulfils all the requirements for the award of the degree.

Academic Regulations GR11 for B.Tech (Regular)
(Effective for the students admitted into I year from the Academic Year 2011-12)

1. Admissions
Admission to the B.Tech programmer shall be made subject to the eligibility and qualifications prescribed by the University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the qualifying candidate at EAMCET conducted by APSCHE or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government from time to time.

2. Award of Degree
A student will be declared eligible for the award of the B. Tech. Degree if he/ She fulfils the following academic requirements:

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

(b) Registered for 200 credits and secured 200 credits. The marks obtained in all 200 credits shall be considered for the calculation of the final percentage of marks.

(c) 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

(a) Courses offered
The following courses of study are offered at present for specializations for B. Tech.

(b) There shall be no branch transfer after the completion of admission procedures.

4. Medium of Instruction
The medium of instruction (including examinations and reports) shall be English.

Branch No.	Branch (Code)
01	Civil Engineering (CE)
02	Electrical and Electronics Engineering (EEE)
03	Mechanical Engineering (ME)
04	Electronics and Communication Engineering (ECE)
05	Computer Science and Engineering (CSE)
11	Biomedical Engineering (BME)
12	Information Technology (IT)
23	Biotechnology Engineering (BT)

5. Course Pattern

(a) Each Academic year of study (I, II, III and IV Years) is divided into two semesters.

(b) Minimum number of instruction days in each semester is 90.

6.Attendance Requirements

(a) A student shall be eligible to appear for the end semester examinations if he/ she acquire a minimum of 75% of attendance in aggregate of all the subjects in the semester.

(b) Condensation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in a semester may be granted based on medical grounds with sufficient medical proof. A committee headed by Dean (Academic Affairs) shall be the deciding authority for granting the condemnation.

(c) Students who have been granted condemnation shall pay a fee as decided by the Academic Council.

(d) Shortage of Attendance below 65% in aggregate shall in NO case be condoned.

(e) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examination of that semester. They may seek re-registration for that semester when offered next with the academic regulations of the batch into which he/she gets re-admitted.

7.Paper setting, Evaluation of Answer Scripts, Marks and Assessment

(a)   The following is the maximum marks distribution for the subjects.

	End exams (External)	Internal	Total
Theory	75	25	100
Practical	50	25	75
Drawing	75	25	100
Industrial Mini Project	50	25	75
Comprehensive Viva	100	-	100
Seminar	-	50	50
Project	150	50	200

(b)   Paper setting and Evaluation of the Answer Scripts shall be done as per the procedures laid down by the Academic Council from time to time.

(c)   For internal evaluation in theory subjects, there shall be 2 mid-term examinations during the semester. Each mid-term examination consists of an objective paper for 10 marks (20 questions) and subjective paper for 15 marks (three out of four questions) with total duration of110 minutes (20 minutes for objective and 90 minutes for subjective paper). Objective paper shall be set with multiple choice questions, true/false, fill-in the blanks, matching type questions, etc. The total marks secured by the student in each mid-term examination for 25 marks is considered and the better of the two mid-term examinations shall be taken as the final marks secured by each candidate as internal marks for the subject.

(d) For internal evaluation in Practical's

(i) Laboratory (including English laboratory): Marks: 25.
Day-to-day work in the laboratory: **15 marks**.

Two internal tests: Each of **10 marks** (conducted by the concerned laboratory Faculty members). The **better of the two** internal tests shall be considered for the award of marks.

The end examination shall be conducted at the end of the semester with the laboratory Faculty as internal examiner and an external examiner as appointed by the Controller of Examinations.

(ii) **Engineering Graphics: 25 marks**
Day-to-day work: 15 marks.

Two internal tests: Each of 10 marks. The better of the two Internal tests shall be considered for the award of marks.

(e) End Semester examinations
This examination shall be set to 75 marks with time duration of 3 hours. The pattern of the examination paper shall be as per the guidelines of the Academic Council.

(f) (i) Industrial Mini Project
Industrial Mini Project is to be taken up in collaboration with Industry during III year. At the end of the semester, Mini Project shall be displayed as a road show at the department level for the benefit of all students and staff. The same is to be evaluated by an internal committee of HOD, Supervisor and senior faculty member for 10 marks. The supervisor continuously assesses the student for 15 marks, ensuring that each student puts in effort equivalent of at least 80 periods. The mini project shall be submitted in a report form and should be presented before a committee consisting of an External Examiner, Head of Department, Supervisor and a senior faculty member. The report along with the presentation for 50 marks.

(ii) Comprehensive Viva
The comprehensive Viva shall be held in IV year II semester. The Viva shall be conducted by a Committee consisting of HOD and two senior faculty members of the department. The student shall be assessed for his/her understanding of various subjects studied during the course of study. The Viva shall be evaluated for 100 marks.

(iii) Seminar
The seminar presentation shall be held in IV year II semester. For the seminar, the student shall collect information on a specialized Topic and prepare a technical report and submit to the department. The student's seminar shall be evaluated by a Committee consisting of HOD, seminar supervisor and a senior faculty member of the department. The student shall be assessed for his/her understanding of the topic, its application and its relation with various subjects studied during the course of study. The seminar shall be evaluated for 50 marks.

(g) Project
Out of 200 marks for the project work, 50 marks shall be for internal evaluation and 150 marks for the End Semester Examination. A Report (in the form required by the Department) shall be submitted by the student before the date announced by the HOD. The End Semester Examination on the project submitted is a Viva voce examination

conducted by the same Committee appointed for Industrial mini project.In addition, the Project supervisor shall also be a member of the Committee. The topics for industry oriented mini project, seminar and project work shall be different from each other. The evaluation of the project work shall be done at the end of IV year. The Internal Evaluation shall be based on the two seminars given by each student on the topic of his/ her project.

8. Recounting of marks in the end examination answer books
A student can request for re-counting of his/her answer book on payment of a prescribed fee.

9. Re-evaluation of the answer books
A student can request for re-evaluation of his/her answer book on payment of a prescribed fee.

10. Supplementary examinations
A student who has failed in an End semester examination can appear in a supplementary examination, the schedule of which shall be announced by the Institute separately. The student has to clear all the backlog papers within the stipulated time of eight years.

11. Malpractices in Examinations
Disciplinary action shall be taken in case of malpractices during mid/ End examinations as per the rules framed by the Academic Council.

12. Academic Requirements
The following academic requirements have to be satisfied in addition to t h e attendance requirements mentioned in Para 6.

(a) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or laboratories, if he/ she secures **not less than 35%** (26 out of 75 or 17 out of 50) 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.

(b) A student shall be promoted from II year to III year; or from III year to IV year only if he/ she fulfils the academic requirement of minimum credits from the following examinations whether the candidate takes the examination or not.

Phase	Minimum	No. of Examinations				
	Credits	I-I	I-II	II-I	II-II	III-I
II to III	37	2 Regular	1 Regular	1 Regular	---	---
Year		1 Supply	1 Supply	—	---	—
III to IV	62	3 Regular	2 Regular	2 Regular	1 Regular	1 Regular
Year		2 Supply	2 Supply	1 Supply	1 Supply	

13. Award of Degree or Class

After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B.Tech Degree by JNTUH,he/she shall be placed in one of the following four classes (the marks awarded are from the aggregate marks secured for the 200 credits):

Class Awarded	% of Marks Secured
FIRST CLASS with DISTINCTION	Marks ≥ 70%
FIRST CLASS	60% ≤ Marks < 70%
SECOND CLASS	50% ≤ Marks < 60%
PASS CLASS	40% ≤ Marks < 50%

14. Withholding of results

The result of a student shall be withheld if (i) he/ she is involved in malpractices and is not cleared of the malpractice, (ii) disciplinary proceedings are pending against him/ her, or for any other reason approved by the Academic Council.

15. Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities

Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities shall be considered only on case-to-case basis by the Academic Council of the Institute.

16. Transitory Regulations

Students who have discontinued or have been detained for want of attendance, or who have failed after having undergone the Degree Program, may be considered eligible for readmission to the same or equivalent subjects as and when they are offered.

17. General Rules

(a) The academic regulations should be read as a whole for the purpose of any interpretation.

(b) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

(c) In case of any error in the above rules and regulations, the decision of the Academic Council is final.

(d) The College 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 College.

Academic Regulations GR11 for B.Tech (Lateral Entry)
(Effective for the students admitted into II year from the Academic Year 2011-12)

1. All regulations as applicable for B.Tech. Four year degree programme (Regular) will hold good for B.Tech. (Lateral Entry Scheme) except for the following rules:

   (a) Pursued a programme of study for not less than three academic years and not more than six academic years (para 2(a)).

   (b) Registered for 150 credits and secured 150 credits. The marks obtained in all 150 credits shall be considered for the calculation of the final percentage of marks(para 2(b)).

   (c) 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 programme (para 2(c)).

2. Academic Requirements
A student shall be promoted from III year to IV year only if he/ she fulfils the academic requirement of minimum credits from the following examinations whether the candidate takes the examination or not. (para 12(b).

Phase	Minimum Credits	No. of Examinations		
		II-I	II-II	III-I
III to IV Year	37	2 Regular 1 Supply	1 Regular 1 Supply	1 Regular —

3. Award of Degree or Class
After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B.Tech Degree by JNTUH, he/ she shall be placed in one of the following four classes (the marks awarded are from the aggregate marks secured for the 150 credits)(para 13):

Class Awarded	% of Marks Secured
FIRST CLASS WITH DISTINCTION	Marks ≥ 70%
FIRST CLASS	60% ≤ Marks < 70%
SECOND CLASS	50% ≤ Marks < 60%
PASS CLASS	40% ≤ Marks < 50%

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
B.Tech (BIO TECHNOLOGY) PROGRAMME STRUCTURE

I B.Tech (BT)   **I Semester**

Group	Sub-Code	Subject	L	T	P	Credits	Marks	Int	Ext
BAS	GR11A1016	Mathematics for BiotechnologyI	4	1		4	100	25	75
BAS	GR11A1017	Fundamentals Of Biology-I	4	1		4	100	25	75
BAS	GR11A1011	Engineering Chemistry	3	1		3	100	25	75
EAS	GR11A1012	Engineering Graphics	3		4	3	100	25	75
EAS	GR11A1009	Environmental Science	3	1		3	100	25	75
BAS	GR11A1014	Engineering Chemistry Lab			3	3	75	25	50
BAS	GR11A1013	IT Workshop			3	2	75	25	50
HSS	GR11A1015	English Lab			3	3	75	25	50
		Total	**17**	**4**	**13**	**25**	**725**	**200**	**525**

I B.Tech (BT)   **II Semester**

Group	Sub-Code	Subject	L	T	P	Credits	Marks	Int	Ext
BAS	GR11A1019	Mathematics for Biotechnology-II	4	1		4	100	25	75
BAS	GR11A1020	Fundamentals Of Biology-I	3	1		3	100	25	75
BAS	GR11A1022	Physics for Engineers	3	1		3	100	25	75
EAS	GR11A1002	English	3	1		3	100	25	75
EAS	GR11A1003	Computer Programming & Data Structures	4	1		4	100	25	75
BAS	GR11A1006	Computer Programming &Data Structures Lab			6	3	75	25	50
BAS	GR11A1007	Engineering Physics Lab			3	3	75	25	50
HSS	GR11A1008	Engineering Workshop			3	2	75	25	50
		Total	**17**	**5**	**12**	**25**	**725**	**200**	**525**

II B.Tech (BT)   I Semester

Group	Sub-Code	Subject	L	T	P	Credits	Marks	Int	Ext
DC	GR11A2087	Biochemistry	4	1		4	100	25	75
DC	GR11A2088	Cell Biology	4	1		4	100	25	75
DC	GR11A2089	Microbiology	4	1		4	100	25	75
DC	GR11A2091	Process Engineering Principles	4	1		3	100	25	75
DC	GR11A2090	Molecular Biology And Genetics	4	1		4	100	25	75
DC	GR11A2092	Biochemistry Lab			3	2	75	25	50
DC	GR11A2093	Cell Biology Lab			3	2	75	25	50
DC	GR11A2094	Microbiology Lab			3	2	75	25	50
		Total	**20**	**5**	**9**	**25**	**725**	**200**	**525**

II B.Tech (BT)   II Semester

Group	Sub-Code	Subject	L	T	P	Credits	Marks	Int	Ext
DC	GR11A2095	Analytical Methods in Biotechnology	4	1		4	100	25	75
DC	GR11A2097	Mass Transfer Operations	4	1		4	100	25	75
DC	GR11A2098	Chemical and Biochemical Thermodynamics	4	1		4	100	25	75
BS	GR11A2010	Probability and Statistics	4	1		3	100	25	75
DC	GR11A2096	Bioprocess Engineering	4	1		4	100	25	75
DC	GR11A2099	Analytical Methods in Biotechnology Lab			3	2	75	25	50
DC	GR11A2100	Bioprocess Engineering Lab			3	2	75	25	50
DC	GR11A2101	Process Engineering Lab			3	2	75	25	50
		Total	**20**	**5**	**9**	**25**	**725**	**200**	**525**

III B.Tech (BT) — I Semester

Group	Sub-Code	Subject	L	T	P	Credits	Marks	Int	Ext
DC	GR11A3092	Transport Phenomena in Bioprocess	4	1		3	100	25	75
DC	GR11A3011	Biochemical Reaction Engineering	4	1		4	100	25	75
DC	GR11A3010	Basic Industrial Biotechnology & Environmental Biotechnology	4	1		4	100	25	75
DC	GR11A3052	Enzyme Engineering and Technology	4	1		4	100	25	75
DC	GR11A3053	Genetic Engineering	4	1		4	100	25	75
DC	GR11A3054	Genetic Engineering Lab			3	2	75	25	50
HSS	GR11A2073	Advanced English Communications skills Lab			3	2	75	25	50
DC	GR11A3062	Industrial Biotech--Neology Lab			3	2	75	25	50
		Total	**20**	**5**	**9**	**25**	**725**	**200**	**525**

III B.Tech (BT) — II Semester

Group	Sub-Code	Subject	L	T	P	Credits	Marks	Int	Ext
DC	GR11A3013	Bioinformatics	4	1		4	100	25	75
DC	GR11A3079	Plant Biotechnology	4	1		3	100	25	75
DC	GR11A3058	Heat Transfer in Bioprocess	4	1		4	100	25	75
DC	GR11A3060	Immunology	4	1		4	100	25	75
HSS	GR11A2071	Managerial Economics and Financial Analysis	4	1		4	100	25	75
DC	GR11A3014	Bio-informatics Lab			3	2	75	25	50
DC	GR11A3061	Immunology Lab			3	2	75	25	50
DC		Industrial Oriented Mini Project Lab			3	2	75	25	50
		Total	**20**	**5**	**9**	**25**	**725**	**200**	**525**

IV B.Tech (BT)   I Semester

Group	Sub-Code	Subject	L	T	P	Credits	Marks	Int	Ext
DC	GR11A4029	Downstream Processing	4			3	100	25	75
DC	GR11A4006	Bioethics, Biosafety and IPR	4			4	100	25	75
DC	GR11A4009	Biopharmaceutical	4			4	100	25	75
DE		**Elective-I**	4			4	100	25	75
	GR11A4022	Crop Improvement							
	GR11A4117	Structural Biology							
	GR11A4014	Cancer Biology							
DE		**Elective-II**	4			4	100	25	75
	GR11A4071	Molecular Pathogenesis							
	GR11A4011	Biosensors and Bioelectronics							
	GR11A4074	Nano Bio Technology							
DC	GR11A4030	Downstream Processing Lab			3	2	75	25	50
DC	GR11A4085	Plant Tissue Culture Lab			3	2	75	25	50
DC	GR11A4085	Biopharmaceutical Technology Lab			3	2	75	25	50
		Total	**20**		**9**	**25**	**725**	**200**	**525**

IV B.Tech (BT)   II Semester

Group	Sub-Code	Subject	L	T	P	Credits	Marks	Int	Ext
DC	GR11A4004	Animal Cell Science and Technology	4			3	100	25	75
DE		**Elective-III**	4			3	100	25	75
	GR11A4043	Food Science and Technology							
	GR11A4070	Molecular Modelling and Drug Designing							
	GR11A4074	Bioprocess Optimization							
DE		**Elective-IV**	4			3	100	25	75
	GR11A4016	Clinical Trials and Regulatory Affairs							
	GR11A4021	Creativity Innovation and Product Development							
	GR11A4078	Neurobiology and Cognitive Science							
DC	GR11A4044	Food Technology Lab			3	2	75	25	50
DC	GR11A4110	Seminar				2	50		
PW	GR11A4097	Project Work						10	200
DC	GR11A4018	Comprehensive Viva	4			2	100		
		Total	**12**		**3**	**25**	**725**		

I-Year

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INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT)   **I Semester**

MATHEMATICS FOR BIOTECHNOLOGY – I

OBJECTIVES: Mathematics is the backbone of all Engineering disciplines. Mathematics – I (MB1) is specially designed for BT students to which both the students with and without back ground Mathematics are admitted. At the end of the programme, the students will be able to understand and apply the basic concepts of differentiation, integration, Matrices and ordinary differential equations.

L: 4, T: 1, Credits: 4   **Total Marks: 100 (Int: 25, Ext: 75)**

UNIT- I
Differential Calculus: Concepts of limit, continuity, differentiation, product rule and quotient rule. Differentiationnof trigonometric, logarithmic and exponential functions. Applications of differentiation: Tangent, normal, sub-tangent and sub-normals. Introduction to partial differential equations, Euler's theorem.

UNIT- II
Integral Calculus: Integration of different functions, methods of integration, integration by parts. Definite integrals and application to finding areas.

UNIT -III
Matrices: Real matrices – Symmetric, skew-symmetric, orthogonal matrices. Complex matrices: Hermitian, skew-Hermitian, Unitary matrices. Elementary row transformations, rank, echelon form, normal form. Solution of linear systems: Consistency and inconsistency of a system of equations.

Eigen values and eigen vectors: Eigen values and eigen vectors of a matrix and their properties. Modal and spectral matrices. Cayley-Hamilton theorem (without proof) and its application to find the inverse and powers of a matrix. Diagonalisation of a matrix. Eigen values and eigenvectors of complex matrices and their properties.

UNIT -IV
Quadratic forms: Definition, positive definite, negative definite, indefinite, semi-definite quadratic forms. Rank, index and signature of a quadratic form. Sylvester law. Reduction of a quadratic form to a canonical form.

UNIT- V

Ordinary differential equations: Formation of ODE. Solution of separable, homogeneous, exact, linear and Bernoulli linear equations.

Applications to Newton's law of cooling, Law of natural growth and decay, orthogonal trajectories and geometrical applications.

Solution of second and higher order linear homogeneous differential equations. Non- omogeneous differential equations with RHS term of the type $f(x) = e^{ax}$, sin ax, cos ax.

Text Books

1. Schaum series on Calculus. Elliot Mendelson.

2. Mathematical Methods: S.R.K. Iyengar and R.K. Jain, Narosa Publishing House.

3. Fundamentals of statistics: S.C. Gupta, Himalaya Publishing House.

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I B.Tech (BT)   **I Semester**

FUNDAMENTALS OF BIOLOGY-I

OBJECTIVES: At the end of the programme, the students would be able to have a knowledge of (i) microbes, (ii) plants, (iii) animals, and (iv) human system.

L: 4, T: 1, P: 0; Credits: 4   **Total Marks: 100 (Int: 25, Ext: 75)**

UNIT -I
Introduction to Microorganisms: Diversity in biological systems. Kingdom systems: Five-kingdom classification. Differences between Prokaryotes & Eukaryotes, General characters of Bacteria, Viruses, Algae, Fungi and Protozoans.

UNIT- II
Plant Biology- I: Classification of Plant Kingdom. General characters of Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.

UNIT -III
Plant Biology- II: Concepts of Growth, Meristem, Plant growth regulators: Auxins, Gibberellins, Cytokinins, Abscissic acid, Ethylene. Plant tissue culture technology.

UNIT -IV
Animal Biology: Classification of Animal Kingdom. General characters of invertibrates and vertibrates. Concept of species and ecosystem.

UNIT- V
Human Biology: Organ systems and functions: Digestive, Respiratory, Circulatory, Endocrine system and Nervous systems.

Text Books

1. Essentials of Biology & Biotechnology. Bir Bahadur.

2. Introduction to biology and biotechnology, second edition. K. Vaidyanath, K.Pratap Reddy, and K. Satya Prasad, BS Publication.

3. Human Physiology (IIth   Edition) Vol 1 and II, Medical Allied Agency, Kolkata.1987, Dr. C.C. Chatterjee.

Reference Books

1. H. G. Rehen and G. Red, biotechnology Volume 1 & 2

2. Basic Biotechnology, Second Edition, by Colin Ratledge and Bjorm Kirstiansen, Cambridge University Press.

3. Anatomy and Physiology In Health and Disease, K. J.W. Wilison and A. Wagh, Chrchill & Livingston.

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I B.Tech (BT)   **I Semester**

ENGINEERING CHEMISTRY

OBJECTIVES
At end of the programme, the student should be able to understand the

1. Role of polymers and nano materials in engineering applications.

2. Role of chemistry (conducting polymers) in the energy production.

3. Material behavior for application in environmental applications.

4. Basic concepts of application of materials in all fields of engineering.

L : 3, T : 1, P : 0, Credits : 3   **Total Marks : 100 (Int : 25 , Ext : 75)**

UNIT- I
Electrochemistry: Concept of   Conductance-   Specific, Equivalent and molar conductance and ionic conductance, electrolytic cells -   Galvanic Cells, Potentiometric titrations - strong acid vs strong base, electrochemical series Concentration Cells

Corrosion - causes and effects of corrosion , theories of corrosion – Chemical, Electrochemical corrosion, factors affecting Corrosion control methods – Cathodic protection, sacrificial anode, impressed current cathode. Surface coatings – methods of application on metals- hot dipping, galvanizing, tinning, cladding, electroplating, Paints – constituents and their functions.

UNIT- II
Water Technology: Introduction, Hardness: Causes, expression of hardness – units– types of hardness, estimation of temporary & permanent   hardness of water complexometric   method ,   Boiler troubles – Scale & sludge formation, caustic enbrittlement,   priming & foaming, Softening of water - Internal   and external treatment ,   Ion exchange process   and   Numerical problems, Desalination of brackish water - Reverse osmosis, electro dialysis.

UNIT -III
Polymer Technology: Types of Polymerization, Plastics: Thermoplastic resins & Thermo set resins. Compounding & fabrication of plastics, preparation,

properties, engineering applications of polyethylene, PVC, poly styrene, Teflon, Bakelite, Nylon. Conducting Polymers: Poly acetylene, polyaniline, applications. Liquid Crystal polymers: Characteristics and uses, Rubber – Natural rubber, vulcanization. Elastomers – Butyl rubber, Thiokol rubbers, Fiber reinforced plastics (FRP), Biodegradable polymers.

UNIT- IV
Energy sources: Concept and classification of fuels - solid, liquid, gaseous , Solid fuels – coal – analysis – proximate and ultimate analysis and their significance, Liquid fuels – petroleum, refining of petroleum – definition of cracking and its significance, knocking - octane number, cetane number, synthetic petrol – Bergius and Fischer Tropsech's process method, Gaseous fuels – natural gas, LPG, CNG, Calorific value of fuel – HCV, LCV, Introduction to biodiesel, problems.

UNIT- V
Engineering Materials

Cement: Composition and manufacture of port land Cement, setting & hardening of cement .

Lubricants: Definition and classification , theories of lubricants, properties - Cloud point, pour point, flash and fire point, Viscosity.

Refractories: Classification, Characteristics of a good refractory and failure mechanism of refractory materials.

Batteries: Definition and classification, Primary - dry cell, Secondary cells - lead-Acid cell, Ni-Cd cell, and Lithium cells , Fuel cells – Hydrogen – Oxygen fuel cells and uses. Nanomaterials – Introduction, general methods of preparation, applications.

Text Books:

1. Text book of Engineering Chemistry: Y. Bhathi kumara and C. Jyosna , VGS Book links, Vizayawada, A.P, Edition June 2009.

2. Text Book of Engineering Chemistry: C.P. Murthy, C.V. Agarwal, and A. Naidu, B.S. Publications,Hyd.

3. Text book of Engineering Chemistry by P.C Jain and Monika Jain , Dhanpat Rai Publishing company (p) Ltd , K.K. Group , New Delhi(2006)

Reference Books

1. Chemistry of Engineering Materials: R.P Mani and K.N.Mishra, CENGAGE learning.

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

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I B.Tech (BT)   **I Semester**

ENGINEERING GRAPHICS

OBJECTIVES: At the end of the programme the student is expected to

1. Learn the fundamental concepts of Engineering Graphics.

2. Drafting Practice for Geometrical Drawing and Projections.

3. Introduction to Auto CAD.

L: 3, T: 0, P: 4: Credits: 3   **Total Marks: 100 (Int: 25, Ext: 75)**

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, (b) Cycloid, Epicycloid and Hypocycloid, (c) Involutes.

(d) Scales: Different types of scales. Plain Scale, Diagonal Scale & Vernier Scale.

UNIT-II
Drawing of Projections or Views of Orthographic Projection in First Angle Projection only:

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

UNIT- III
Projections of Solids: Projections of Regular Solids inclined to both planes.

Development of Surfaces: Development of Surfaces of Right Regular Solids Prisms, Cylinder, Pyramid Cone and their parts.

UNIT-IV

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.

Transformation of Projections: Conversion of Isometric Views to Orthographic Views - Conventions.

UNIT-V

Introduction to Computer Aided Drafting: Generation of points, lines, curves, polygons, simple solids and their dimensioning.

Text Books

1. Engineering Drawing, N.D. Bhat, Charotar.

2. Engineering graphics with Auto CAD- R.B. Choudary, Anuradha Publishers.

Referecnce Books

1. Engineering Drawing and Graphics, Venugopal, New age.

2. Engineering Drawing- Johle, Tata Macgraw Hill.

3. Computer Aided Engineering Drawing- Trymbaka Murthy- I.K. International.

4. Engineering Drawing, Narayana and Kannaiah, Scietech publishers.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT)   **I Semester**

ENVIRONMENTAL SCIENCE

L: 3, T: 1, Credits: 3   **Total Marks: 100 (Int: 25, Ext: 75)**

UNIT- I
Introduction to Environment, Ecology and Ecosystems: Definition, Importance and Scope of Environmental Studies, Public Awareness and Participation. Ecology, Concept of Ecosystem, Classification of Ecosystem, Structure, Components and Function of Ecosystem. Typical Ecosystem, Food Chain, Food Web. Biodiversity- Types and values.

UNIT -II
Natural Resources: Definition, Occurrence, Classification of resources, Important natural resources for human society, Utilization-positive and negative effects of water resources, Mineral resources, Forest resources, Energy resources, Land resources. Role of individuals in conservation of important natural resources.

UNIT- III
Environmental Pollution: Definition, Classification of Pollution, Type of Pollution and Pollutants. Causes, effects and control of – Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution and Nuclear Pollution.

UNIT -IV
Environmental Problems and Management Policies: Natural Disasters-Types, causes and effects; Global warming, Climate change-El Nino-La Nina, Ozone layer- location, role and degradation; deforestation and desertification.

Management: Technological solutions, Preventive methods, control techniques; Green Belt development, Rainwater harvesting, Renewable and alternate resources.

UNIT- V
National Policy on Environment protection and Sustainability: Air (Pollution and prevention) act 1981; Water (Pollution and prevention) Act 1974; Pollution Act 1977; Forest Conservation Act; Wildlife Protection Act; Municipal solid waste management and handling Act; Biomedical waste management and handling

Act; Hazardous waste management and handling rules. Role of IT in environment, environmental ethics, environmental economics.

Sustainable development: Cause and Threats to sustainability; strategies for achieving sustainable development; Concept of Green building and Clean Development Mechanism (CDM).

Text Books

1. Text Book of Environmental Studies, Erach BArucha. University Press

2. Text book of Environmental Science and Technology by M.Anji Reddy 2007

Reference Books

1. Biotechnology & Environmental Chemistry. Surinder Jeswal & Anupama Deswal, Dhanpat Rai & Co Pvt. Ltd.

2. A Text Book of Environmental Science. Aravind Kumar. APH Publishing Corporation.

3. Glimpses of Environment. Dr. KVSG. Murali Krishna. Environmental Protection Society.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT)   **I Semester**

ENGINEERING CHEMISTRY LABORATORY

OBJECTIVES : At end of the programme, the student should be able to understand

1. The characteristics and preparation of rubber.

2. The characteristics and nature of lubricating oils.

3. The hard water analysis process.

4. Basic concepts of analysis and application of materials in all fields of engineering.

L : 0, T : 0, P : 3 Credits : 3   **Total Marks : 75 (Int : 25 , Ext : 50)**

LIST OF EXPERIMENTS

1. **Conductometry:** Conductometric titrations of strong acid verses strong base.

2. **Potentiometry:** Potentiometric titration of strong acid verses strong base.

3. **Lubricants:** Determination of viscosity of a sample oil by Redwood viscometer-I.

4. **Lubricants:** Determination of surface tension of lubricants by **stalagmometer.**

5. **Organic preparations:** Preparation of Aspirin and Thiokol rubber.

6. **Complexometry:** Estimation of hardness of water by using standard EDTA solution.

7. **Complexometry:** Estimation of copper by using standard EDTA solution.

8. **Permanganometry:** Estimation of ferrous iron by using standard potassium permanganate solution.

9. **Permanganometry:** Estimation of ferric iron by using standard potassium dichromate solution.

10. **Colorimetry:** Estimation of ferrous iron in cement by using colorimeter.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT) **I Semester**

IT WORKSHOP

L: 0, T: 0, P: 3 **Total Marks: 75 (Int: 25, Ext: 50)**

PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows , Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. The students should work on working PC to disassemble and assemble to working condition and install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.

Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced. Productivity tools module would enable the students in crafting professional word documents, spread sheets and slide presentations.

PC Hardware
Task-1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task-2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the programme content.

Task-3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task-4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva**.**

Task 5: Hardware Troubleshooting : Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They

should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Task 6: Software Troubleshooting : Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Internet & World Wide Web
Task-7: Orientation & Connectivity Boot Camp : Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task-8: Web Browsers, Surfing the Web : Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task-9: Search Engines & Netiquette : Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task-10: Cyber Hygiene : Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install an anti virus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Productivity Tools
Task-11: Introducing features of professional word documents like opening, closing, editing, saving, printing, and text formatting.

Task-12: Students would be exposed to create word documents with images, tables, formulas, and with additional word processing features.

Task-13: Introducing features of professional spread sheets like opening, closing, editing, saving, printing, and text formatting.

Tas -14: students would be exposed to compile spread sheets using formulas, different number formats, text formats and conditional formatting.

Task-15: introducing features of professional slide presentations like opening, closing, editing, saving, printing, and text formatting.

Task-16: students would be exposed to create slide presentations with tables, different views of slide presentations, master slides, custom animations.

Reference Books

1. Introduction to Information Technology, ITL Education Solutions Limited, Pearson Education.

2. Introduction to Computers, Peter Norton, 6/e Mc Graw Hil.I

3. Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education.

4. Comdex Information Technology Programme tool kit Vikas Gupta, WILEY Dreamtech.

5. IT Essentials PC Hardware and Software Companion Guide, Third Edition by David Anfinson and Ken Quamme- CISCO Press, Pearson Education.

6. PC Hardware and A+Handbook – Kate J. Chase PHI (Microsoft).

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT)   **I Semester**

ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

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

(i) 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.

(ii) To enable them better pronunciation through stress on word accent, intonation, and rhythm.

(Iii) To train students to use language effectively to face interviews, Group discussions, public speaking.

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

L: 0, T: 0, P: 3, C:2   **Total Marks : 75 (Int : 25 , Ext : 50)**

SYLLABUS: The following programme content is prescribed for the English Language Laboratory sessions:

(i) Introduction to the sounds of English –Vowels, Diphthongs & Consonants.
(ii) Situational Dialogues/Role-play.

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

(iv) Describing Objects/Situations/People.

(v) Information Transfer.   (vi) Debate.

(vii) Telephone Skills.   (viii) Giving Directions.

Suggested Software

(i) Cambridge Advanced Learners' English Dictionary with CD.

(ii)   The Rosetta Stone English Library.

(iii)   Clarity Pronunciation Power-Part 1.

(iv)   Mastering English in Vocabulary, Grammar, Spelling, and Composition.

(v)   Dorling Kindersley series of Grammar, Punctuation, Composition etc.

(vi)   Language in use , Foundation Books Pvt Ltd with CD.

(vii)   Oxford Advanced Learner's Compass, 7th   Edition. (viii) Learning to speak English-4 Cds.

(lx)   Vocabulary in Use, Michael McCarthy, Felicity O' Den, Cambridge.

(x)   Murphy's English Grammar, Cambridge with CD.

(Xi)   English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy,Cambridge

Books (to be located within the lab in addition to the CDS of the text book which are loaded on the systems):

1.   English Language Communication Skills – A Reader cum Lab Manual Programme content and Practice (with CD) Dr. A. Rama Krishna Rao, Dr.G.Natanam, Prof .S.A Sankaranarayanan.Publishers:Anuradha Publications, Chennai

2.   A Handbook of English for professionals-Fourth Edition Dr.P.Eliah, BS Publications.

3.   Better English Pronunciation, JD O' Connor,Cmabridge University Press.

4.   A Foundation English Programme for undergraduates (Practice exercises on skills) Paul Gunashekar Shyamala Kumar Das Sachil Mahadevan, Oxford University Press.

5.   Improve Your Writing, V.N. Arora & Lakshmi Chandra,Oxford University Press.

6.   Speaking English Effectively,Krihna Mohan & N.P. Singh, Macmillian Publishers.

7.   English Conversation for Indian Students, Y.V. Yardi,Orient Longman.

8. The Written Word, B Vandana R.Singh, Oxford University Press.

9. Strengthen Your Writing,V.R. Narayanaswami,Orient Longman Publishers.

10. A Handbook of Standard English and Indian Usage, J.Sethi Prentice Hall.

11. Essential Telephoning in English,Tony Garside and Barbara Garside,Cambridge press.

12. English Conversation Practice Spoken English, Grant Taylor, Tata McGraw Hill.

13. English Conversation Practice Spoken English, Jayashree Balan, Vijay Nicole Imprints Pvt.Ltd

14. How to Prepare for Group Discussion and Interview, V.Sasi Kumar P V Dhamija, Tata McGraw Hill

.
15. Speaking English Effectively, Hari Mohan Prasad Rajnish Mohan Krishna Mac Millan Publishers.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT) **II Semester**

MATHEMATICS FOR BIOTECHNOLOGY – II

OBJECTIVES: Mathematics is the backbone of all Engineering disciplines. Mathematics – II (MB2) is specially designed for BT students. The syllabus contains most topics that are useful for application in Biotechnology. At the end of the programme, the students will be able to understand and apply the basic concepts of (i) Laplace transforms, (ii) curve fitting, (ii) Fourier series, (iv) numerical integration and (v) numerical solution of ordinary differential equations.

L: 4, T: 1, Credits: 4 **Total Marks: 100 (Int: 25, Ext: 75)**

UNIT- I
Laplace transforms and its application to ordinary differential equations: Laplace transform of standard functions - inverse Laplace transform - First shifting theorem, Transform of derivatives and integrals - Unit step function - Second shifting theorem - Differentiation and integration of transforms.

Convolution theorem - Periodic function - Application of Laplace transforms to ordinary differential equations.

UNIT -II
Fourier series: Fourier series on the interval (-π, π): Determination of coefficients, Fourier series of even and odd functions, convergence. Fourier series on an arbitrary interval. Half range Fourier cosine and sine series using even and odd extensions.

UNIT- III
Solution of a non-linear equation & Solution of linear systems: Solution of non- linear equations: Bisection method, Method of false position and Newton-Raphson method.

Solution of linear systems: Gauss elimination, Gauss elimination with partial pivoting, Gauss-Jordan method.

UNIT- IV
Interpolation and curve fitting: Uniform data: Finite differences - Forward, backward and central differences. Relationship between difference operators. differences of a polynomial. Newton's forward and backward difference formulas. Non-uniform data: Lagrange formula.

Curve Fitting: Fitting a first degree (linear) and second degree (parabola), exponential, power curves for a data by the Method of least squares.

UNIT- V
Basic data Processing: Measures of central tendency: Mean, median, mode.

Measures of dispersion: standard deviation & variance, covariance, correlation & linear regression.

Text Books

1.   Mathematical Methods: S.R.K. Iyengar and R.K. Jain, Narosa Publishing House.

2.   Mathematics - I. S.R.K. Iyengar and R.K. Jain, Narosa Publishing House.

3.   Schaum series - Probability & Statistics.

Reference Books

1.   Introductory Methods of Numerical Analysis. S.S. Sastry, Prentice Hall.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT)   **II Semester**

FUNDAMENTALS OF BIOLOGY-II

OBJECTIVES: At the end of the programme, the students would be able to understand the basic concepts of (i) biomolecules, and (ii) applications of biotechnology.

L: 3, T: 1, P: 0; Credits: 3   **Total Marks: 100 (Int: 25, Ext: 75)**

UNIT-I
Biomolecules: Structure of DNA, Watson and crick model, RNA types in eukaryotes and prokaryotes. Structure and function of Carbohydrates, Proteins and Lipids.

UNIT-II
Photosynthesis: Chlorophyll as trapper of solar energy. Major photosynthetic pigments. Photosynthetic reaction centres, Hill reaction, PS I & PS II, Photophosphorylation- cyclic & non-cyclic; Dark reaction.

UNIT-III
RDNA Technology: Recombinant DNA technology- Restriction enzymes, plasmid Vectors and gene cloning. Introduction to Transgenic Plants & Animals.

UNIT-IV
Applications of Biotehcnology- Part-I: Importance of Biofuels, Biofertilizers, Biopesticides, Bioindicators and Biosensors.

UNIT-V
Applications of Biotechnology- Part-2: Importance of Microbial Enzymes, Single Cell Protein (SCP) and Monoclonal Antibodies.

Text Books

1. Essentials of Biology & Biotechnology. Bir Bahadur.

2. Introduction to biology and biotechnology, Second Edition. K. Vaidyanath, K.Pratap Reddy, and K. Satya Prasad, BS Publications.

3. Plant Physiology. F.B. Salisbury & C. W. Ross. 4th   Edition. Thomson Wadsworth.

Reference Books

1. Biotechnology. Volume 1 & 2. H. G. Rehen and G. Reed.

2. Basic Biotechnology, Second Edition. Colin Ratledge and Bjorm Kirstiansen, Cambridge University Press.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT) **II Semester**

PHYSICS FOR ENGINEERS

OBJECTIVES: (1)To equip the student the nature and concept of various solids and to gain the knowledge of various properties of materials.(2) To gain the knowledge on the acoustics at various usages.(3) To make the student learn the electrical and magnetic properties of various materials.(4) The student gain familiarity about the various techniques to evolve in order to identify the flaws in materials by using ultrasonics.(5) To gain knowledge about the various application of lasers and fiber optics and to gain familiarity with the latest developments and trends in nanotechnology

L: 3, T: 1, P: 0; Credits: 3 **Total Marks: 100 (Int: 25, Ext: 75)**

UNIT-I
Crystal Structure: Cohesive energy of a solid, Calculation of Cohesive Energy of Ionic crystal, Seven Crystal Systems, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC.

Defects in Crystals: Point Defects: Vacancies, Substitution, Interstitial, concentration of Frenkel and Scotty Defects; Qualitative treatment of line (Edge and Screw Dislocations) Defects, Burger's Vector, Surface Defects and Volume Defects.

UNIT-II
Acoustics & 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.

UNIT-III
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.

Magnetic Properties: Permeability, Field Intensity, Magnetic Field Induction, Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magnetron, 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.

UNIT-IV

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, Semiconductor Diode Laser, Applications of Lasers.

Fiber Optics: Principle & construction 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-V

Ultrasonics: Introduction, Production of ultrasonic waves: Piezo electric & Magnetostriction methods, Properties of ultrasonic waves, Detection of ultrasonic waves, Applications of ultrasonics, Introduction to NDT Theory and practice of ultrasonic testing, ultrasonic testing systems: pulse echo, trough transmission, Resonance systems and ultrasonic testing methods: Contact and Immersion methods.

Nanotechnology: Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Bottom-up Fabrication: Sol-gel, Precipitation, Combustion Methods; Top-down Fabrication: Chemical Vapor Deposition, Physical Vapor Deposition, Carbon Nano Tubes, Applications.

Text Books

1. **Engineering Physics:** P.K.Palaniswamy, SciTech Publishers.

2. **Applied Physics:** T.Bhima Sankaram, G Prasad, BS Publications.

Reference Books

1. **Solid State Physics:** Charles Kittel, Wiley & Sons (Asia) Pte Ltd.

2. **Engineering Physics:** R K Gaur & S L Gupta, Dhanpat Rai & Sons

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT)   **II Semester**

ENGLISH

OBJECTIVES: (1) to improve English language proficiency of the students with an emphasis on LSRW skills (2) to equip the students study the academic subjects with better perspective through the theoretical and practical components of the designed syllabus (3) To al and informal situationsdevelop the study skills and communication skills in form.

L: 3, T: 1, P: 0; Credits: 3   **Total Marks: 100 (Int: 25, Ext: 75)**

UNIT-I

1. **SirC.V.Raman:**Subhasree Desikhan, from "Enjoying Everyday English".

2. **Mother Teresa:** From, "Inspiring Speeches and Lives".

UNIT-II

1. **The Connoisseur:** Nergis Dalal, from "Enjoying Everyday English".

2. **Sam Pitroda:** From "Inspiring Speeches and Lives".

UNIT-III

1. **The Cuddlore Experience:** Anu George, from "Enjoying Everyday English".

2. **Amartya Kumar Sen:** From "Inspiring Speeches and Lives".

UNIT-IV

1. **Bubbling Well Road:** Rudyard Kipling, from "Enjoying Everyday English".

2. **I Have a Dream:** Martin Luther King Jr., from "Inspiring Speeches and Lives".

UNIT-V

Exercises on

1. Reading and writing Skills

2. Reading Comprehension

3. Situational Dialogues

4. Letter Writing

5. Essay writing

Practice exercises on remedial grammar covering

1. Common Errors in English

2. Subject-Verb Agreement

3. Use of Articles

4. Use of Prepositions

5. Tense and Aspect

Vocabulary Development

1. Synonyms & Antonyms

2. One-Word Substitutes

3. Prefixes & Suffixes

4. Idioms and Phrases

5. Pairs of Words Often Confused.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT)   **II Semester**

COMPUTER PROGRAMMING AND DATA STRUCTURES

OBJECTIVES: To express algorithms and draw flowcharts in a language independent manner, thus exemplifying the professional ethics (2) To provide the skills necessary for the effective application of computation and computer programming in engineering applications (3) To understand the concepts of C-programming language such as branching, loops, functions, input/output, arithmetic rules, arrays, pointers and files

L: 4, T: 1, Credits: 4   **Total Marks: 100 (Int: 25, Ext: 75)**

UNIT-I
Introduction to Computers: System Software, Program Developing Steps, Algorithms, Flowcharts. Introduction to C: Structure of C- Program, Variable Names, Data Types, Constants, Operators, Type Conversions, Expressions, Precedence and Order of Evaluation. Managing I/O: Input-Output Statements, formatted I/O.

UNIT-II
Control Flow: Statements and Blocks, if, switch statements, Loops: while, do-while, for, break and continue, goto and Labels.

Arrays and Strings: Introduction, One- dimensional arrays, Declaring and initializing Arrays, Multidimensional arrays, Strings, String Handling Functions.

UNIT-III
Functions: Introduction, Function Definition, Function Declaration, Return values and their Types, Function Calls, Categories of Functions, nesting of Functions, Recursion, Passing arrays to Functions, Storage Classes.

Structure: Basics of Structures, Structures to Functions, Arrays of Structures, Structures with in Structures, Arrays with in structures, Unions.

UNIT-IV
Pointers: Pointers and Addresses, Pointers and function Arguments, Pointers and arrays, Address Arithmetic, Character pointers and Functions, Pointer Arrays, Pointers to Structures, Pointers to Pointers, Command Line Arguments.

Files: Introduction, Types of Files, File Access Functions, I/O on Files, Random Access to Files, Error Handling.

UNIT-V
Sorting: Bubble sort, Merge sort, Insertion Sort, Selection Sort, Quick Sort.

Searching: Linear Search, Binary Search.

Introduction to Data Structures: Basics of Linear and Non-Linear Data structures.

Text Books

1. The C Programming Language, BRIAN W.KERNIGHAN Dennis M.Ritchie, Second Edition, PHI.

2. Computer Programming and Datastructures by E Balaguruswamy, published by Mc GrawHill.

Reference Books

1. Let Us C-Yashwanth Kanetkar, 10th Edition, BPB Publications.

2. C & Data structures - P. Padmanabham, B.S. Publications.

3. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.

4. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press.

5. Programming in C - Stephen G. Kochan, III Edition, Pearson Education.

6. Data Structures and Program Design in C, R.Kruse, C.L. Tondo, BP Leung, Shashi M, Second Edition, Pearson Education.

7. Programming in C and Data Structures J.R. Hanly, Ashok N Kamthane and A Ananda Rao, Pearson Eduction.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT)   **II Semester**

COMPUTER PROGRAMMING AND DATA STRUCTURES LAB

OBJECTIVES: (1) To introduce the fundamentals of C programming language anddevelop the skills for solving problems (2) To develop the proficiency in writing programs in a procedural programming language (3) To use the concepts of searching and sorting for solving real-time problems

L: 0, T: 0, P: 6; Credits: 3   **Total Marks: 75 (Int: 25, Ext: 50)**

Task- 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.

Task-II
   a) Write a C program to calculate the following Sum: $Sum=1-x2/2!+x4/4!-X6/6!+x8/8!-x10/10!$

   b) Write a C program to find the roots of a quadratic equation using if-else.

Task -III
   a) Write a 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.

Task - IV
   a) The total distance travelled by a vehicle in 't' seconds is given by distance $S= u*t+1/2at2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec2). Write a C program to find the distance travelled by a vehicle 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 form the user, performs the operation and then prints the result. (Consider the operators +,-,*,/,% and use Switch Statement)

Task - V

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

Task - VI

a) Write a C program that uses functions to perform the following operations:
   i) To insert a sub-string in to given main string to 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?

Task - VII

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.

Task - VIII

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

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

Task - IX

a) Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x2+x3+………….+xn 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 to print an error message if n d" 0, without computing the sum.

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

i) Addition of two complex numbers
ii) Multiplication of two complex numbers
(Note: represent complex number using a structure.)

Task - X

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

b) Write a C Program merging of two files in a single file.

c) Write a C Program to append data into a file.

Task - XI

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.)

Task - XII

a) Write a C Program to Search for a given element using Linear & Binary
     Search Techniques.

b) Write a C Program to Sort a given list of integers using Bubble Sort
     Technique.

Task - XIII

a) Write a C Program to Sort a given list of integers using Merge Sort
     Technique.

b) Write a C Program to Sort a given list of integers using Insertion Sort
     Technique.

Task - XIV

a) Write a C Program to Sort a given list of integers using Quick Sort
     Technique.

b) Write a C Program to Sort a given list of integers using Selection Sort
     Technique.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT)   **II Semester**

ENGINEERING PHYSICS LABORATORY

OBJECTIVES: (1)To enable the student to draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyze various electronic circuits and its components.(2) To analyze the behavior and characteristics of various materials for its optimum utilization.

L: 0, T: 0, P: 3; Credits: 3   **Total Marks: 75 (Int: 25, Ext: 50)**

LIST OF EXPERIMENTS

1. Measurements using Multimeter.

2. Measurement of voltage and Frequency using CRO.

3. B-H curve.

4. Determination of Dielectric constant.

5. Energy gap of a semi conductor

6. Study of magnetic field along the axis of a circular coil.

7. Study of Hall Voltage

8. Determination of carrier concentration and carrier mobility of a semiconductor.

9. Numerical Aperture of optical fiber.

10. Bending losses in optical fiber.

11. Air gap losses in optical fiber

12. Characteristics of LASER diode

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

I B.Tech (BT) **II Semester**

ENGINEERING WORKSHOP

OBJECTIVES: At the end of the programme the student is expected to

1. Know the various trades applicable to industries.

2. Hands on experience for common trades.

L: 0, T: 0, P: 3; Credits: 2 **Total Marks: 75 (Int: 25, Ext: 50)**

TRADES FOR PRACTICE

1. Carpentry

2. Fitting

3. Tin – Smithy and Development of jobs carried out and soldering.

4. House – Wiring

DEMONSTRATION

5. Black Smithy

6. Foundry

7. Welding

8. Plumbing

9. Power tools

Text Books

1. Work Shop Manual : P.Kannaiah, K.l.Narayana, Scitech Publishers.

2. Work Shop Manual: Venkat Reddy.

II-Year

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **I Semester**

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. Classes of organic compounds and functional groups. Basics of stereochemistry of biomolecules.

UNIT-II
Metabolism Of Carbohydrates: Glycolysis, Glucogenesis, Citric acid cycle, Glycogen metabolism and HMP shunt

UNIT-III
Bio Energetics: Redox potential. Components in electron transport systems in mitochondria, Respiratory chain, Oxidative phosphorylation,   Energetics, High energy compounds.

UNIT-IV
Protein Metabolism: Classifications, Physical and Chemical properties of aminoacids, Biosynthesis of amino acids (Glutamate pathway and Shikimate pathway). Degradation of amino acids.

UNIT-V
Fatty Acid Metabolism And Nucleic Acid Metabolism: Overview of Fatty Acid Metabolism, Synthesis and degradation of fatty acids, significance of cholesterol and lipoproteins in lipid profile analysis,   De novo synthesis of Nucleotides.

Text Books

1. Biochemistry by Jeremy M. Berg, John L. Tymozko, Lubert Stryer, Fifth edition, W.H.Freeman and Company, 1514 pages

Reference Books

1. Lehninger Principles of Biochemistry Edition 4, Nelson, David L. Cox, Michae M. Lehninger, Albert L. W H Freeman & Co

2. Student Companion to Accompany Biochemistry, Richard I. Gumport, Jeremy M. Berg, Nancy Counts Gerber, Frank H. Deis, Jeremy Berg, W H Freeman & Co

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   I Semester

CELL BIOLOGY

UNIT-I
Cell Structure And Function: Discovery of cells; Basic properties of cells; Cell theory; Cell complexity, Cell size & shape; Prokaryotic & Eukaryotic system; Chemistry of the cell; Plasma membrane -structure and function; Cytoplasm & cytoskeleton:- microtubules, microfilaments, intermediate filaments, Cell interactions-Adhesion junctions-Tight junctions-Gap junctions- Plasmodesmata.

UNIT-II
Intracellular Compartments And Transport Of Molecules: Structure and functions of Nucleus. Endoplasmic reticulum, Ribosome's, Golgi complex, Lysosomes, Peroxisomes, Chloroplast & Mitochondria.

1. Transport Across Cell Membranes: Passive and active transport, permeases, Types of Pumps, Lysosomal & Vacuolar membrane, Proton pumps, Co- transport, Symport, Antiport, Transport into Prokaryotic Cells, Endocytosis and Exocytosis

2. Post Translocational Modifications And Transport of Macromolecules.: Protein Glycosylation and other modifications. Sorting & macromolecular traffic within cells. Polarization of cells, trafficking in polarized cells.

UNIT-III
Cell Division, Cell Differentiation & Development: Overview of the Cell Cycle, Interphase, Mitosis, Cytokinesis & Meiosis. Animal Cell & Yeast Cell Division, Cell Cycle Control & Checkpoints.

General Characteristics of Cell Differentiation, Differentiation in Unicellular & Multicellular Organism, Cytoplasmic determinants, Nucleoplasmic Interactions; Embryonic and adult stem cells and its Biological Importance.

Cell death and cell renewal-Programmed cell death-Stem cells- Embryonic stem cells and therapeutic cloning.

UNIT-IV
Receptors And Signal Transduction: Cytosolic, nuclear & membrane bound receptors. Examples and types of receptors. Chemo- receptors of bacteria

(attractants & repellors). Concept of secondary messengers cAMP, cGMP, Protein Kinases, G proteins, Steroids & Peptide hormone regulation, Tissue specific regulation.

UNIT-V
Introduction to cancer, characteristics of cancer cells, Microorganisms and cancer. Role of Telomere and Telomerase in cancer pathogenesis. Disruption of Cellular Pathways, Disruption in cell cycle, Disruption in cell signaling.

Text Books

1. The Cell by Cooper.

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

3. Cell and Molecular Biology (1987), 8th Edn. De Robertis, E. D. P. and De Robertis, E.M.F. Jr., Lea & Febiger, USA (Indian Edn.: K. M. Varghese Company, Bombay).

4. Molecular Cell Biology 3rd edn, (1995) Lodish, Baltimore, Berk, Lawrence, et al, Scientific American Books, N.Y.

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. The Biochemistry of Cell Signaling-Ernst J.M.Helmreich. Oxford Press.

4. The World of Cell. 5th edition- Becker, Kleinsmith, Harden,-Pearson Publishers.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **I Semester**

MICROBIOLOGY

UNIT-I
Introduction to Microbiology: 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, Micro diversity.

UNIT-II
Microbial Nutrient Media and Cultivation: 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.

Cultivation of microorganisms: Culture media, synthetic, complex media, solidifying pure agents, types of media - selective, differential, enrichment and enriched media.

Culture methods - spread plate, pour plate and streak plate. Special techniques for cultivation of anaerobes.

UNIT-III
Identification and Preservation of Microbes

Preservation of microorganisms: Working and primary stock cultures, agar slants, agar stabs, spore preparation, use of sterile soil, cryo preservation, lyophilisation, application and limitation of various methods.

Influence of environmental factors on growth-solutes, water activity, pH, temperature, oxygen, osmotic pressure and radiation.

Staining techniques: Stains and dyes, fixation, principle dyes, simple staining, differential staining, spore straining, flagella staining, colony characteristics.

Biochemical tests -sugar fermentations, IMVIC tests, catalase production.

UNIT-IV
Introduction to Viruses: Virus properties, Structure of Viruses; Animal Virology; Plant Virology; Viruses of Arthropods, Bacteria and other lower organisms.

Classification of viruses (Bacterial, plant and animal replication with example), Identification and in vitro cultivation of viruses. Assay of viruses (Bacterial and animal viruses). Bacterial, plant and animal replication with example (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). Applications of Virology in Biotech Industry.

UNIT-V
Pathogenicity: Definition of infection, diseases and pathogens, virulence and virulence factors. Examples: influenza, toxin, tuberculosis, antimicrobial chemotherapy - Antibiotics mode of actions, antimicrobial resistance Tests for sensitivity to antimicrobial agents.

Text Books

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

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

Reference Books

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

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

3. General Microbiology. Roger Y stanier, Macmillan.

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.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **I Semester**

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.

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 basics numerical problems.

UNIT-II
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 .

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-III
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-IV
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-V
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.

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).

Reference Books

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.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **I Semester**

MOLECULAR BIOLOGY AND GENETICS

UNIT-I
DNA structure and replication: Central dogma of molecular biology. Structure of DNA; Deviations from Watson & Crick model; Denaturation and Melting curves; Enzymology of DNA replication, step by step process, semiconservative mechanism of DNA replication in E. coli (bi-directional). Eukaryotic telomeres and its replication.

UNIT-II
Transcription, RNA processing and Translation: Transcription apparatus and proteins involved in transcription. Prokaryotic and Eukaryotic transcription. mRNA processing: capping, polyadenylation and splicing. Processing of rRNA and tRNA. The genetic code and wobble hypothesis. Protein synthesis in prokaryotes and eukaryotes.

UNIT-III
Fundamentals of inheritance: Mendelian inheritance, monohybrid and dihybrid ratios,Gene interactions, Multiple factor inheritance, polygenic traits, inheritance of some human traits. Genes and environment.

UNIT-IV
Chromosome as the heredity carrier: Structure of eukaryotic chromosome,nucleosome model, Histone proteins, euchromatin & hetero chromatin, Karyotyping Concept of linkage, crossingover and recombination in prokaryotes Transformation, transduction, conjugation. Sex linkage and sex linked traits

UNIT-V
Mutations: Origin of mutations, classification of mutations, mutagens and their types, chromosomal aberrations-structural and numerical.

Text Books

1. Genetics by B.D.Singh; Genetics by Sarin.

2. Genetics by Miglina

3. Genetics by Sandhya Mitra.

4. Biochemistry, 5th edition Jeremy M Berg, John L Tymoczko, and Lubert Stryer. Jeremy M Berg,1   John L Tymoczko,2   and Lubert Stryer3.1 Johns Hopkins University School of Medicine2 Carleton College 3 Stanford University New York: W H Freeman; 2002.

5. Cell & Molecular Biology by Gerald Karp (2nd Ed.) Wiley publishers.

Reference Books

1. Prinicple of Genetics by A.G.Gardner,

2. Molecular Cell Biology, 4th edition Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. New York: W. H. Freeman; 2000.

3. Genes VII Lewin B (2000). Oxford University Press, New York.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   I Semester

BIOCHEMISTRY LAB LIST OF EXPERIMENTS

1. PH measurements and preparation of buffers

2. Qualitative tests for Carbohydrates

3. Estimation of sugars

4. Estimation of proteins by Lowry's method / Biuret method

5. Estimation of cholesterol by Zak's method

6. Determination of saponification number of lipids

7. Qualitative tests for Amino acids

8. Separation of amino acids - Thin layer chromatography

9. Separation of sugars - Paper chromatography

10. Biochemical estimation of DNA/RNA using Spectrophotometer

Text Books

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.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **I Semester**

CELL BIOLOGY LAB

1. Introduction to Cells, Tissues, and Microscopy

2. Observation of Algal Cells

3. Observation of Fungal Cultures

4. Study of Plant Cells and Tissues

5. Study of Specialized/ Modified Cells

6. Observation of Mitotic Events

7. Study of Meiotic Cells

8. Effect of Drugs/Chemicals on Cell Division

9. Study of Chromosomes- Karyotyping

Reference Manual

1. Laboratory manual for Microbiology by P Gaunasekharan, Newage International Publishers.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **I Semester**

MICROBIOLOGY LAB

LIST OF EXPERIMENTS

1. Study of student microscope - Construction, working principle, care to be taken while using the microscope and use of oil immersion objective lens.

2. Study of aseptic techniques-preparation of cotton plugs for test tubes and pipettes, wrapping of petri- plates and pipettes.

3. Sterilization techniques (lecture/demonstrations).

4. Preparation of culture media (a) Broth type of media (b) Solid media.

5. Culturing of microorganisms: (a) Broth (b) Pure culture techniques: Streak plate, pour plate and spread plate.

6. Isolation and preservation of bacterial culture.

7. Staining of bacteria - simple staining, gram staining   spore staining and capsule staining.

8. Antibiotic test - Disc diffusion method, minimum inhibitory concentration.

9. Microbiological examination of water.

10. Biochemical tests IMVIC test Catalase test Coagulase test Gelatinase test Oxidase test.

11. Determination of Bacterial growth by turbidometry/ colorimetry.

12. Factors effecting the bacterial growth -effects of temperature, pH.

Text Books

1. Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom cultivation, Aneja K.R , New Age International, New Delhi.

2. Microbiological and applications, Laboratory, Manual in General Microbiology by Benson, Mc Graw Publications. First edition 2007

3. Laboratory manual in microbiology by P. Gunasekharan, Newage international Publishers.

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

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **II Semester**

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, Types of Errors, Significant Errors, Significant figures, Precision and Accuracy, Methods of expressing Precision and Accuracy and Confidence Limits.

UNIT-II
Microscopy: Bright field, Dark field, Fluorescent, Phase contrast, Confocal microscopy, SEM & TEM Microscopy, Flow Cytometry.

UNIT-III
Spectroscopy and Methods of Structural Determination: Measurement of transmittance and absorbance - Beer's law - Spectrophotometer analysis - Qualitative and Quantitative absorption measurements. Types of Spectrometers: UV - Visible, IR, MS - Atomic absorption & Atomic emission, Raman spectroscopy and NMR. Instrumentation and Theory.

UNIT-IV
Separation methods: Introduction to Chromatography - models - ideal separation-retention parameters - Van - Deemter equation - Gas Chromatography - stationary phases - detectors - kovats indices - HPLC - pumps - columns - detectors - Ion Exchange chromatography - Size Exclusion Chromatography, 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-V
Radioactivity: Types of Radioactivity, Units of Radioactivity, 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 Analysis; Willard and .H. Merrit, Phi, 1999.

2. Instrumental Methods of Analysis, D. Skoog, 2003.

3. Instrumental methods of chemical analysis-Gurudeep R.Chatwal, Sham K.Anand, Himalaya publishing house.

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. Ewing, Instrumental Methods of Analysis, 1992.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **II Semester**

MASS TRANSFER OPERATIONS

UNIT-I
Introduction to Mass Transfer and Diffusion: Introduction to Mass Transfer Operations, Fick's first law of diffusion, Gas diffusion and Liquiddiffusion (one component transferring to non transferring component and equimolar counter diffusion), Distribution of gas and liquid components through solid, Diffusion of biological solutes in liquids, Diffusion in biological gels.

UNIT-II
Interphase Mass Transfer and Mass Transfer Coefficients: Interphase mass transfer with special reference to gas absorption, Convective mass transfer Coefficient (KL), Evaluation of KL using Sherwood number, Stanton number, Schmidt number and JD factor, Theories of mass transfer Film theory, Penetration theory and Surface renewal theory, Case study-Oxygen mass transfer in production of penicillin.

UNIT-III
Gas - Liquid Operations: Absorption- Definition, Solubilities of gases in liquids, Single stage (one component transferring) operation. Distillation-VLE, Single stage equilibrium system, Flash distillation, Differential distillation, Steam distillation, Continuous distillation (McCabe-Thiele method only).

LiquidLiquid Operations: Characteristics of solvent, Types of equilibrium systems, Single stage extraction, Multistage cross and counter current operations, Case study-Extraction of penicillin using butyl acetate/amyl acetate.

UNIT-IV
SolidLiquid Operations: Leaching- Single stage leaching, Biological applications, Adsorption- Physical adsorption, Chemisorption, Adsorption hysteresis, Adsorption isotherm, Single stage operation, Fixed-bed adsorption.

GasSolid Operations: Drying, Theory and principles of drying, Drying Kinetics, Drying rate, Mechanism of Batch drying - constant rate and falling rate periods, Various drying operations, Drying equipment, Criteria for selection of dryers, Case study-Drying of baker's yeast.

UNIT-V
Membrane Separation Processes: Dialysis, Hemodialysis, Gas permeation

process, Introduction to types of flow in gas permeation, Equipment Flat membrane module, Hollow fiber separation assembly, Reverse osmosis, Applications of reverse osmosis, Introduction to Ultra filtration and micro filtration.

Crystallization: Introduction to crystallization, Theory and principles, Various crystallization equipment, Case study Crystallization of citric acid.

Text Books

1. Robert E.Treybal, Mass Transfer Operations, 3rd edition, Mc.Graw Hill International, 1981.

2. Christi J. Geankoplis, Transport processes & Unit operations, 4th edition, Prentice Hall India Pvt.Ltd, 2003.

3. Mc Cabe, W.L, Smith J.C., and Harriot P., Unit operations of Chemical Engineering, 7th edition, Mc-Graw Hill, 2007.

Reference Books

1. Philip C. Wankat, Chapman and Hall, Rate Controlled Separations, 1985.

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

3. Judson King, Separation Processes, 2nd Edition, Mc Graw Hill Chemical Engineering series.

4. Philip A.Schweitzer, Handbook of Separation Techniques for chemical Engineering, 3rd edition, Mc Graw Hill.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **II Semester**

CHEMICAL AND BIOCHEMICAL THERMODYNAMICS

UNIT-I
Basic Concepts in Engineering Thermodynamics: First and Second law of thermodynamics; Calculation of Work, energy and property changes in reversible process , , Thermodynamics of flow processes; Power cycles and refrigeration cycles

UNIT-II
Thermodynamic Properties of Fluids: Volumetric properties of gases exhibiting non-ideal behaviour, Residual properties; Estimation of thermodynamic properties using equations of state; maxweil relationships and their applications; Calculation or flow processes based on actual property changes

UNIT-III
Phase Equilibria: Criteria for phase equilibria- Vapour-liquid equilibrium calculations for   binary mixtures,, liquid -Liquid equilibria and Solid-liquid equilibria

UNIT-IV
Chemical Reaction of 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

UNIT-V
Biochemical Thermodynamics: Energetics of Metabolic Pathways; Energy Coupling (ATP & NADH); Stoichiometry and energetic analysis of Cell Growth and Product Formation- elemental Balances, Degree of reduction concepts; available -electron balances; yield coefficients; Oxygen consumption and heat evolution in aerobic cultures; thermodynamic efficiency of growth.

Text Books
1. J M.Smith.H.C.Van Ness and M.M.Abbott. Introduction to Chemical Engineering Thermodynamics McGraw Hill

2. J.A. Roels. Kinpt'rs and Energetics in Biotechnology, Elsevier, 1983.

Reference Books

1. J. E. Bailey and D. F. Ollis, Biochemical Engineering Fundamentals, 2nd edition, McGraw Hill, 1986.

2. H.W. Blanch and D.S. Clark, Biochemical Engineering, 2nd edition, Marcel Dekker Publishers, 2007.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **II Semester**

PROBABILITY AND STATISTICS

UNIT-I
Probability: Basic concepts in Probability - Sample space, event, mutually exclusive and exhaustive events – The axioms of probability –Conditional probability and independence of events –Addition and Multiplication theorems for two events - Bayes theorem ,Boole's inequality.

Random variables: Definition of a random variable, discrete and continuous random variables – Distribution function , probability mass function, probability density function with illustrations - Joint, marginal and conditional distributions with illustrations - Mathematical expectation of a r.v and of a function of a r.v. and its properties –Addition and Multiplication theorems of expectation for two variables- Moment Generating Function and Characteristic function, statements of their properties .

UNIT-II
Distributions: Binomial, Poisson distributions, Mean, variance, moment generating function, fitting of these distributions - Uniform, Normal, Exponential distributions, properties of these distributions, fitting of Normal distribution.

Sampling distribution: Definition of Population and sample, Overview of types of sampling(Random, Purposive, SRS, Stratified and Systematic random samplings)
- Sampling distribution, standard error, sampling distribution of mean (known and unknown) and proportions.

UNIT-III
Estimation & Testing of Hypothesis: Point estimation – Interval estimation - Bayesian estimation- Confidence interval for mean, difference of means and for proportions. Concepts of Null hypothesis, Alternative hypothesis, Critical region, Type I and Type II errors, One tail and two-tail tests, Level of significance

Large Samples Tests: Tests of hypothesis for means (single and difference between means), Tests of hypothesis for proportions (single and difference between proportions),Chi-square test for testing goodness of fit, independence of attributes and single population variance.

UNIT-IV

Correlation & Regression: Product moment correlation coefficient, Spearman's rank correlation coefficient and their properties – Simple linear regression, Lines of Regression, Regression coefficient and their properties, Multiple regression for three variables only.

Small samples: Student's t-test for testing the significance of single mean, difference of means (independent samples and paired samples), significance of observed sample correlation coefficient - F-test for equality of variances and ANOVA(1-way &2-way),Concept and problem solving .

UNIT-V

Stochastic Process: Introduction to Stochastic Process-Markov process, Classification of states-Examples of Markov chains, stochastic matrix, limiting probabilities.

Queuing theory: Queue description, characteristics of a queuing model, Poisson process, concept of Birth and death process, steady state solutions of (M/M/1: "/ FIFO) and (M/M/1: N/FIFO).

Text Books

1. Probability and statistics for engineers (Erwin Miller and John E. Freund), R.A Johnson and C.B. Gupta.
2. Fundamentals of Stochastic process-B.R.Bhat
3. Probability, Statistics and Queuing Theory, 2nd Edition, Trivedi, John Wiley and Sons
4. Operations Research by Manmohan, Kantiswaroop &Gupta.

Reference Books

1. Fundamentals of Mathematical Statistics, S.C. Gupta, V.K.Kapoor
2. Probability, Statistics and Queuing Theory with computer applications-Arnold O.Allen
3. Introduction to Probability and Statistics, 12th edition, W. Mendenhall, R.J.Beaverand B.M. Beaver, Thomson. (Indian edition)
4. Probability and Statistics in Engineering, 4th Edition, William W.Hines, Douglas C.Montgomery, David M. Goldsman, Connie M. Borror, Wiley Student Edition.
5. Introduction to Probability and Statistics, J.S. Milton, Jesse C. Arnold, 4th edition, TMH.
6. Mathematical Statistics by Biswas & Srivatsava .

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **II Semester**

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 downstream) unit operations involved in bioprocesses, generalized process flow sheets.

UNIT-II
Fermentation Processes: General requirements of fermentation processes, Basic design and construction of fermentor and ancillaries, Main parameters to be monitored and controlled in fermentation process   Aerobic and Anaerobic fermentation processes and their application in the biotechnology industry, behavior of microbes in different reactors (air lift, batch, continuous, fed batch condition), solid substrate, slurry fermentation and its applications.

Media design: Medium requirements for fermentation processes, Media optimization techniques (Placket Burman Design)

UNIT-III
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,

Energy balances: Basic energy concepts, intensive and extensive properties, enthalpy and its calculation procedure, general energy balance equation, energy changes, non reactive process, procedure for energy balance without reactions, energy changes due to reaction, heat of reaction for system with biomass production, energy balance equations for unsteady state.

UNIT-IV
Metabolic Stoichiometry and Energetics: Stoichiometry of cell growh and product formation; Elemental balances; degree of reduction of substrate and biomass. available electron balance; yield coefficients of biomass and product formation, maintenance coefficients, Energetic analysis of microbial growth and product formation; thermodynamic efficiency of growth.

UNIT-V

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 productinhibition on cell growth and product formation, introduction to structuredmodels for growth and product formation.

Text Books

1. P. M. Doran, Biochemical process principles, 1st edition, Academic Press, 2008.

2. P.F.Stanbury, A.Whittaker, S.J.Hall, Principles of Fermentation technology,2nd Edition, Butter worth Heinemann

3. M. L. Shuler and F. Kargi, Bioprocess engineering, 2nd edition, Prentice Hall of India, 2009.

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

5. A.V.N. Swamy, Fundamentals of Biochemical Engineering,1st edition, BS Publications, 2007.

Reference Books

1. J. E. Bailey and D. F. Ollis, Biochemical Engineering Fundamentals, 2nd edition, McGraw Hill, 1986.

2. H.W. Blanch and D.S. Clark, Biochemical Engineering, 2nd edition, Marcel Dekker Publishers, 2007.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **II Semester**

ANALYTICAL METHODS IN BIOTECHNOLOGY LIST OF EXPERIMENTS

1. Verification of Beer - Lambert's law using UV Visible spectrophotometer.

2. Estimation of DNA by UV Visible spectrophotometer.

3. Estimation of RNA by UV Visible spectrophotometer.

4. Quantitative determination of proteins by UV Visible spectrophotometer.

5. Emission spectra of Anthracene using Spectrofluorimeter.

6. Separation of Amino acids by Paper chromatography.

7. Separation of Amino acids by Thin layer chromatography.

8. Separation of Proteins by Paper chromatography.

9. Estimation of turbidity using UV-Visible spectrophotometer.

10. Demonstration of HPLC.

Reference Books

1. K. Wilson and J. Walker, Principles and techniques of Practical Biochemistry, 5th edition, Cambridge University Press, Cambridge, 2000.

2. S.K. Sawhney and Randhir Singh, Introductory practical Biochemistry, 2nd edition, Narosa Publishing House, New Delhi, 2000.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   **II Semester**

BIOPROCESS ENGINEERING LAB LIST OF EXPRIMENTS

1. Microbial culture studies

   a. Growth of microorganisms, estimation of Monod's parameters.

   b. Isolation of Useful microorganisms from natural samples- Soil and Water or Rhizobia.

2. Media Formulation

   a. Formulation of simple and complex culture media.

   b. Media preparation for fermentation, sterilization of media.

3. Immobilized enzyme reactions

   a. Techniques of enzyme immobilization – matrix entrapment, ionic and cross-linking.

   b. Bioconversion studies with immobilized enzymes.

   c. Immobilization of whole cells (Yeast) using Calcium Alginate method.

4. Enzyme isolation and assay of enzymatic activity

   a. Extraction of commercially important enzymes & its assay. b. Quantification of enzyme activity & specific activity.

5. Enzyme kinetics

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

   b. Kinetic study of catalase.

6. Industrial Bioproducts

   a. Production of various products.

Text Books

1. Arnold, Manual of industrial Microbiology and Biotechnology, ASM, 2004.

2. J.Jayaraman, Laboratory manual in biochemistry, New age international publishers.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

II B.Tech (BT)   II Semester

PROCESS ENGINEERING LAB LIST OF EXPERIMENTS

1. Performance test on single stage centrifugal pump

2. Performance test on multiple stage centrifugal pump

3. Performance test on reciprocating pump

4. Calibration of Venturimeter

5. Calibration of orifice meter

6. Determination of Friction factor for a given pipe line

7. Determination of loss of head due to sudden contraction in pipe line

8. Determination of loss of head due to sudden expansion in pipe line

9. Determination of loss of head due to bends in pipe line

10. Determination of loss of head due to valves in pipe line

11. Determination of flow rate through "V" notch.

12. Verification of Bernoullis theorms

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).

Reference Books

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.

III-Year

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

III B.Tech (BT)   I Semester

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 viscocity (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
Thermal conductivity and the mechanisms of energy transport- measurement of thermal conductivity,Fourier's law, steady state conduction, analogy between heat and momentum transfer 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-IV
Mass Transport
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 Definition of binary mass transfer coefficients, transfer coefficients at high mass transfer rates- boundary layer theory, penetration theory.

UNIT-V
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 kLa - 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 Books

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

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

III B.Tech (BT)   **I Semester**

BIOCHEMICAL REACTION ENGINEERING

UNIT- I
Basic Concept
Definition of bioreactor, fundamental principles, Concept in energy and mass balances and in biological reaction modeling.

UNIT-II
Classification of reactors and their configurations, Application in submerged fermentation and solid state fermentation, classification based schuegerl, kafarov components of bioreactors and operation of bioreactors.

UNIT-III
Ideal Reactors
Concepts of reactors based on flow characteristics, design of ideal reactors using material and energy balance. Batch bioreactor design. Definition of chemostat, turbidostat, single flow single stage chemostat, single flow multistage chemostat, recycle flow in chemostat, concepts of dilution rate productivity analysis.

UNIT-IV
NON-Ideal Behaviour inReaction Systems
Reasons for non-ideality, concept of macro using RTD analysis (E-C-F functions), diagnosing the ills of non-ideal bioreactors.

UNIT-V
Specific Bioreactors Analysis and Scale-UP
Application tubular reactor concept in immobilized packed bed reactors, fluidized bed reactors. Design and analysis of fed-batch and air-lift bioreactors. Application in animal cell culture. Basic concept of scale-up, non-dimensional analysis.

Text Books
1. O.Levenspiel, Chemical Reaction Engineering. 3rd edition, Wiley Newyork,1992.

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

3. H.Scott Fogler Elements of chemical reaction Engineering 3rd edition, Prentice- Hall of India pvt ltd, 2004.

Reference Books
1. P.M.Doran Bioprocess Engineering Principles, Academic Press, 1995.

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INSTITUTE OF ENGINEERING AND TECHNOLOGY

III B.Tech (BT)   **I Semester**

BASIC INDUSTRIAL AND ENVIRONMENTAL BIOTECHNOLOGY

UNIT-I
Primary Metabolites
Brief outline of production processes: Organis acids (e.g. citric acid, lactic acid); Amino acids (Glutamic acid , Phenylalanine); and Alcohols (Ethanol, Butanol)

UNIT-II
Secondary Metabolites
Brief outline of production processes: Antibiotics (Penicillins, Cephalosporins streptomycinerythromycin) Vitamin (B12) and Steroids (no description of process)

UNIT-III
Production of Commercially Important Enzymes
Proteases, Amylases Lipases, Cellulases,   and other commercially important. Enzymes for the food pharmaceutical industries;

UNIT-IV
Biological treatment of waste Water – Aerobic and Anaerobic Systems
Biological processes for domestic and industrial waste water treatments; Aerobic systems - activated sludge process, trickling filters, biological filters, rotating biological contractors (RBC), Fluidized bed reactor (FBR), expanded bed reactor, Inverse fluidized bed biofilm reactor (IFBBR) packed bed reactors air- sparged reactors ; Anaerobic Systems - contact digesters, packed column reactors, UASB.

UNIT-V
Bioremediation and Hazardous Waste Management
Introduction, constraints and priorities of Bioremediation, Biostimulation of Naturally occurring microbial activities, Bioaugmentation, in situ, ex situ, intrinsic & engineered bioremediation,Solid phase bioremediation - land farming, prepared beds, soil piles, Phytoremediation. Composting, Bioventing & Biosparging; Liquid phase bioremediation - suspended bioreactors, fixed biofilm reactors. Xenobiotic compounds, biodegradation of Xenobiotics, biodegradation of Xenobiotics.

Text Books

1. Biotechnology, 3rd edition by John E. Smith. Cambridge low price editions.

2. Industrial Microbiology: - J. E. Casida;

3 Environmental Biotechnology by S. K. Agarwal

4 Biodegradation & Bioremediation (1999), Martin Alexander, Academic press.

Reference Books

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 Microbiology McMillan Publications, 1989.

4. Foster C.F., John Ware D.A., Environmental Biotechnology, Ellis Horwood Ltd.,1987.

5. Karrely D., Chakrabarty K., Omen G.S., Biotechnology and Biodegradation,

6. Advances in Applied Biotechnology Series, Vol.4, Gulf Publications Co. London, 1989.

7. Bioremediation engineering; design and application 1995 John. T. cookson,Jr.Mc Graw Hill, Inc.

8. Environmental Biotechnology by A.K. Chatterjee

9. Environmental Biotechno logy by S.N.Jogdand Himalaya Publishing.

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INSTITUTE OF ENGINEERING AND TECHNOLOGY

III B.Tech (BT)   **I Semester**

ENZYME ENGINEERING AND TECHNOLOGY

UNIT-I
Enzymes
Brief History: Definition; Enzymes as biocatalysts- Chemical nature of enzymes-
role of coenzymes   comparison of enzymes with chemical catalysts-
Classification with examples from each class; Functions of Enzymes; Theories of
Enzyme substrate complex formation- Fischer's template theory, Koshland's
theory,Sources of Enzymes;   Application of enzymes in industrial, medical,
pharmaceutical and food sectors.

Enzyme isolation, purification and assay methods.

UNIT-II
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, ionic strength, chemical agents and radiation.

UNIT-III
Enzyme Kinetics
Kinetics of single substrate reaction   Michelis-Menton equation; Brigg's-Halden
equation, Kinetics for reversible reaction. The turnover number, kinetics- bi
substrate reactions - ternary complex model, Ping- Pong mechanism.

UNIT-IV
Enzyme Inhibition and Mechanisms
Various types of enzyme inhibition, (Inhibited enzyme kinetics-reversible and
irreversible inhibition- kinetics of reversible enzyme inhibition- competitive, non-
competitive, uncompetitive inhibition) Substrate and product inhibition,
Mechanism of action of chymotrypsin, Glyceraldehyde 3-phosphate
dehydrogenase, Isoenzyme, Carboxy peptidase etc.

UNIT-V
Enzyme immobilization methods (Physical and Chemical techniques for enzyme
Immobilization   adsorption, matrix entrapment, encapsulation, cross-linking,
covalent binding)Advantages and disadvantages of different Immobilization
techniques, 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;

Text Books

1. Trevor Palmer, Enzymes: Biochemistry, Biotechnology and clinical chemistry, Affiliated East West Press.

2. Biochemical Engineering . H.W. Blanch and D.S. Clark, Marcel Dekker New york (1997).

3. Biochemical Engineering. J.M.Lee, Prentice- Hall, new Jersey (1992).

Reference Books

1. Biochemical engineering Fundaments. Bailey and Ollis. Second Edition, McGraw-Hill International Edition.

2. Mukesh Doble and Sathyanarayana N. Gummadi, Bochemical Egineering,Prentice Hall of India.2007

3. Enzymes : Dixon and Webb.(IRL Press) 2. Enzyme technology by Chaplin and Bucke. cambridge Univerity Press

4. Syed Tanveer Ahmed Inamdar, Biochemical Engineering- Principles and Concepst, Prentice Hall of India.2007

5. Pauline. M.Doran, Bioprocess engineering principles, Academic press. 1995

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

III B.Tech (BT)   I Semester

GENETIC ENGINEERING

UNIT- I
Gene Regulation and Expression
Prokaryotes: Lactose, Arabinose and Tryptophan operons, Repressors and activator, Sigma switch in Bacillus subtilis. Eukaryotic system: Gene regulation in Eukaryotic system, Repetitive DNA, Gene rearrangement, Promoters, enhancer elements, gene amplification.

UNIT-II
DNA Technology
Purification of genomic DNA from living cells, Manipulation of purified DNA: Isolation and purification of DNA & RNA; Host Controlled restriction enzymes, Restriction enzymes- classification, nomenclature. Modification enzymes-phosphatases, kinases and nucleases. Uses of restriction enzymes, target sites for restriction enzymes and Isoschizomers; Enzymes used in cloning-polymerases, ligases, Restriction modification - DNA methylation of enzyme and modification of restriction site

UNIT-III
Natural vectors for Gene Transfers: Plasmids, and Transposons: Plasmids- Definition, types, identification, classification and purifications and transfer of Plasmids. Host restriction in transfer.

Transposable elements: Definition, detection of transposition in bacteria, types of bacterial transposons, mechanisms of transposition and excision, applications of transposons. Retrotransposons.

UNIT-IV
Cloning: Engineered Vectors: Characteristic features of cloning vectors, Plasmid vectors- construction of prototype vector (pBR 322), pUC 18/19, Blue script vectors pBR322. Cosmids- Characteristic features; Phagemids- Ml3 derived vectors, Expression vectors- vectors for construction of cDNA library, Generation of genomic library and strategy. BACs, YACs, their use in construction of genomic library, Vector for cloning in plants. Enzymes involved in genetic engineering; Cloning strategies:- Ligation, Homopolymer tailing, Linker and DNA adapter molecules, Introduction of DNA into living cells. Methods of Gene transfer, Restriction mapping.
Expression and Detection of clones

Detection of clones and its expression: Expression of cloned genes in yeast & E. coli. Blot analysis - Southern, Northern & Western blot; dot and slot blot. Immunological techniques. DNA methylation, DNA hybridization. Genomic and cDNA library construction and application. DNA sequencing

UNIT-V
Applications of r-DNA Technology
PCR and its application, Principles, designing of primers, PCR methodology, RT - PCR, multiplex PCR, identification of PCR product, application of PCR technology.

Molecular markers- RFLP, RAPD, AFLP, 16s r-RNA typing, gene chip and micro array; applications in disease profile.

Gene cloning in medicine (Insulin, Blood clotting factor VIII) High level expression of proteins in different host systems (E. coli, yeast, Insect, mammalian cells)

Limitation and advantages and novel technologies- for generation of transgenic animals. Introduction to Gene therapy (Ex vivo & In vivo), case study of ADA as an example. Advantages and limitations of Gene therapy.

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.

Reference Books
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.
4. Molecular Cloning-A laboratory manual. 2 nd edition. Sambrook J., Fritsch FE. & Maniatis (1989) Vol I, II III. Cold Spring Harbour.NY.
5. Genes VIII by B. Lewin, Oxford University (2007).
6. Molecular Biotechnology: Principles and Applications of Recombinant DNA by Glick, Bernard R. / Pasternak, Jack J. Glick, Bernard R. / Pasternak, Jack J. Publisher: ASM Press. (2002).
7. Lewin's GENES X by Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick, 2011

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INSTITUTE OF ENGINEERING AND TECHNOLOGY

III B.Tech (BT)   **I Semester**

GENETIC ENGINEERING LAB LIST OF EXPERIMENTS

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

2.   Visualization of DNA on Agarose Gel Electrophoresis.

3.   Isolation and visualization of plasmids on Agarose gel.

4.   Restriction Enzyme digestion.

5.   Restriction mapping and ligation.

6.   Expression of Beta galactosidase and assay.

7.   Cloning of DNA into plasmid vector.

8.   Transformation, screening for recombinants.

9.   Characterization of secondary metabolites by Polyacrylamide gel

10.   Electrophoresis. Silver staining of protein gels.

11.   Blotting Techniques- southern blotting, western blotting.

12.   Amplification of DNA fragments by Polymerase Chain Reaction (PCR).

13.   Demonstration Chemical mutagenesis.

Reference Books

1.   Manual of methods for General Bacteriology- Phillip Gerhardt .pub ASM.

2.   Current Protocols in Molecular Biology, edited by F. M. Ausubel, R. Brent, R. E. Kingston, D. M. Moore, J. A. Smith and K. Struhl. Greene Publishing Associates, New York and Wiley-Interscience, New York.

3.   Current protocols in Molecular Biology by Maniatis.

GOKARAJU RANGARAJU
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III B.Tech (BT)   **I Semester**

ADVANCED ENGLISH   COMMUNICATIONS SKILLS LAB

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:

1.   Gather ideas and information, to organise ideas relevantly acoherently.
2.   Engage in debates.
3.   Participate in group discussions.
4.   Face interviews.
5.   Write project/research reports/technical reports.
6.   Make oral presentations.
7.   Write formal letters.
8.   Transfer information from non-verbal to verbal texts and vice versa.
9.   To take part in social and professional communication.

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

1.   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.
2.   Further, they would be required to communicate their ideas relevantly and coherently in writing.

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

1.   Functional English - starting a conversation – responding appropriately and relevantly – using the right body language – role play in different situations.
2.   Vocabulary building – synonyms and antonyms, word roots, one-word

substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases.

3. Reading comprehension – reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading.
4. Group Discussion – dynamics of group discussion , intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.
5. Presentation Skills- Oral presentations (individual and group) through JAM sessions/seminars and written presentations through posters/ projects/ reports/ PPTs/ e-mails/ assignments etc.
6. Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video conferencing.
7. Resume' writing – structure and presentation, planning, defining the career objective, projecting ones strengths and skill-sets, summary, formats and styles, letter-writing.
8. Technical Report writing – Types of formats and styles, subject matter – organization, clarity, coherence and style, planning, data-collection, tools, analysis.

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
The software consisting of the prescribed topics elaborated above should be procured and used.
 Clarity Pronunciation Power – part II

1. Oxford Advanced Learner's Compass, 7th Edition
2. DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
3. Lingua TOEFL CBT Insider, by Dreamtech
4. TOEFL & GRE(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
5. The following software from 'train2success.com'

   ✦ Preparing for being Interviewed,

   ✦ Positive Thinking,

   ✦ Interviewing Skills,

   ✦ Telephone Skills,

   ✦ Time Management

   ✦ Team Building,

   ✦ Decision making

6. English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

Text Books

1. Effective Technical Communication, M. Ashraf Rizvi, Tata Mc. Graw-Hill Publishing Company Ltd.

2. A Course in English communication by Madhavi Apte, Prentice-Hall of India, 2007. Communication Skills by Leena Sen, Prentice-Hall of India, 2005.

3. Academic Writing- A Practical guide for students by Stephen Bailey,

   Rontledge Falmer, London & New York, 2004.

4. English Language Communication : A Reader cum Lab Manual Dr A

   Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai

5. Body Language- Your Success Mantra by Dr. Shalini Verma, S. Chand, 2006.

6. DELTA's key to the Next Generation TOEFL Test: Advanced Skill

Practice, New Age International (P) Ltd., Publishers, New Delhi.

7. Books on TOEFL/GRE/GMAT/CAT by Barron's/cup

8. IELTS series with CDs by Cambridge University Press.

9. Technical Report Writing Today by Daniel G. Riordan & Steven E. Pauley, Biztantra Publishers, 2005.

10. Basic Communication Skills for Technology by Andra J. Rutherford, 2nd Edition,   Pearson Education, 2007.

11. Communication Skills for Engineers by Sunita Mishra & C. Muralikrishna, Pearson Education, 2007.

12. Objective English by Edgar Thorpe & Showick Thorpe, 2nd edition, Pearson Education, 2007.

13. Cambridge Preparation for the TOEFL Test by Jolene Gear & Robert Gear, 4th Edition.

14. Technical Communication by Meenakshi Raman & Sangeeta Sharma,

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III B.Tech (BT)   **I Semester**

NDUSTRIAL BIOTECHNOLOGY LAB LIST OF EXPERIMENTS

1.   Production of Enzymes

2.   Production of antibiotics

3.   Production of Drugs

4.   Production of Proteins

5.   Production of Food products

6.   Production of Acids

7.   Production of alcohol

8.   Production of Vitamins

9.   Production of Biofuels

Reference Books

1.   Arnold, Manual of Industrial Microbiology and Biotechnology, ASM, 2004

2.   J. Jayaraman, Laboratory manual in Biochemistry, New age Intl. Publishers.

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III B.Tech (BT)   II Semester

BIOINFORMATICS

UNIT-I
Introduction to Bioinformatics
Scope of Bioinformatics, Elementary commands and protocols, ftp, telnet, http. Special topics in Bioinformatics: Large scale sequencing methods Shotgun and Sanger method.

UNIT-II
Sequencing Alignment and Dynamic Programming
Alignment Local, Global alignment, Pair wise and multiple sequence alignments Dynamic programming in sequence alignments: Needleman-Wunsch & Smith-Waterman algorithm, Amino acid substitution Matrices (PAM, BLOSUM). Sequence similarity search with BLAST and FASTA

UNIT-III
Biological Batabases
PRIMARY DATABASES: Introduction to Biological databases, Organization and management of databases NCBL,EMBL, DDBJ , Structure databases - PDB (Protein Data Bank)

SECONDARY DATABASES: Introduction to Secondary Databases Organization and management of databases Swissprot, PIR

BIOCHEMICAL DATA BASES: organization and Management of databases KEGG, BRENDA

UNIT-IV
Phylogenetic Analysis and Tree Building
Introduction to Phylogenetics, Methods of Construction of Phylogenetic trees-Maximum Parsimony Method, Maximum likelihood method and Distance Methods, Significance of Multiple sequence alignment in phylogenetic analysis. Description of phylogenetic tress and Types of trees

UNIT-V
Introduction to Homology
Homology modelling of proteins (sequence to structure), Cn3D, Rasmol and SPDbV in homology modelling - case studies

Text Books

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

2. Bioinformatics. David Mount, 2000. CSH Publications

3. Bioinformatics A Practical guide to the Analysis of Genes and Proteins ANDREAS D.BAXEVANIS, B.F. FRANCIS OUELLETTE

4. Bioinformatics methods and applications S . C. Rastogi. PHI learning

Reference Books

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

2. Developing Bioinformatics Skills. Cynthia Gibbas & Per Jamberk

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

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

5. Bioinformatics Principles and Applications Harshawardhan P.Bal TATA MEGRAW HILL.

6. Bioinformatics Computer skills Cynthia Gibas O'Reille publishers

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III B.Tech (BT)   **II Semester**

PLANT BIOTECHNOLOGY

UNIT-I
Plant Tissue Culture
Introduction to plant tissue culture. Totipotency tissue culture lab requirements. Sterilization methods. Media preparation. Innoculation incubation embryogenesis organogenesis micropropagation.

UNIT-II
Application of Plant tissue Culture
Somaclonal variations, germplasm preservation. Haploids production.

UNIT-III
Secondary Metabolites
Suspension cultures, protoplast cultures .production of secondary metabolites.

UNIT-IV
Transgenic Plants
Gene transfer methods. Transgenic plants for insects, pests, herbicide, draught etc.,

UNIT-V
Molecular Pharming
Production of therapeutic proteins, plantibodies edible vaccines from plants.

Text Books
1. Text book of plant biotechnology by RAZDAN
2. Plant biotechnology by RAMAWAT
3. Biotechnology by KUMARESAN Saras publication

Reference Books
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 Cultur e: Application   and Limitations.Amsterdam,Elsevier,1900.
3. Bernard R.Glick and John E.Thompson,Methods in plant Molecular Biology and Biotechnology,CRC Press,1993.

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III B.Tech (BT)   **II Semester**

HEAT TRANSFER IN BIOPROCESSES

UNIT-I:Basics of Heat Transfer
Various modes of heat transfers, conduction, convection, and radiation. Mechanism of heat transfer by conduction, conductive heat transfer through a series of resistances.

UNIT-II:Conductive Heat Transfer
Steady state and unsteady state heat transfer by conduction. Heat transfer through slab and cylinder. Concept of log mean radius for transfer through pipes. Extended surface heat transfer through fins etc.

UNIT-III
ConvectionDimensional analysis, Forced convection in pipe and other geometries Natural convection - various correlation for evaluating heat transfer coefficients. Boiling and condensations. Mechanism of boiling: Film and nucleate boiling.

UNIT-IV: Heat Transfer Equipments
Double pipe heat exchangers, Shell and tube heat exchangers, pinfin heat exchangers-Overall transfer coefficient. Overview of various types of heat exchangers and concept of LMTD. Single and Multiple effect evaporators and problems on evaporators. Steam economy, Steam capacity, evaporators performance with various feedings viz, forward, backward and parallel.

UNIT-V
Analogy between heat, mass and momentum transfer. Applications of heat transfer in bioprocessing-batch sterilization and design of continuous sterilizer.
* Relevant basic numerical problems should be dealt in the units.

Text Books
1. W.L. Mc Cabe and JC Smith, Unit Operations of Chemical Engineering, Mc Graw Hill, 5th edition, 1993.
2. 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,
3. H.W.Blanch and DS Clark, Biochemical Engineering, Marced Dekav Inc.New York, 1996.

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III B.Tech (BT)   **II Semester**
IMMUNOLOGY

UNIT-I
Introduction to immune system.lymphatic system,lymph,lymph ducts. Innate and acquired immunity.

UNIT-II
Organs of the lymphatic system 1. Primary lymphatic organs-Thymus,bone marrow. Secondary lymphoid organs- Spleen,lymph node,mucosal system.

UNIT-III
Cells of the immune system.Classification,structure functions of various immune cells.

UNIT-IV
Humoral immunity: B-cells production activation,Antibody production, Nature, properties of antigens Ag-Ab interaction.Diagnostics importance.

UNIT-V
Cell mediated immunity T-cell production Activation,interactions,hypersensitivity reactions,Autoimmune disorders,Immunity in transplantation.

Text Books

1. Benjamin E and Leskowitz S, immunology A short Programme. Wiley LISS NY, 991.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

III B.Tech (BT)   II Semester

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

UNIT-I
Introduction & Demand Analysis: Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions.

Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

UNIT-II
Production & 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. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

UNIT-III
Markets & New Economic Environment: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.
Pricing: Objectives and Policies of Pricing. Methods of Pricing.
Business: Features and evaluation of different forms of Business Organisation, Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types,New Economic Environment: Changing Business Environment in Post-liberalization scenario.

UNIT- IV
Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital.
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-V
Introduction to Financial Accounting & Financial Analysis: Accounting concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance

Sheet with simple adjustments).Financial Analysis: Analysis and Interpretation of Liquidity Ratios, Activity Ratios, Capital structure Ratios and Profitability ratios. Du Pont Chart.

Text Books

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

2. Atmanand: Managerial Economics, Excel, 2008.

Reference Books

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2009.

2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 2009.

3. Lipsey & Chrystel, Economics, Oxford University Press, 2009.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

III B.Tech (BT)   **II Semester**

BIOINFORMATICS LAB LIST OF EXPERIMENTS

1. Knowledge of different biological databases

   Protein and gene sequence data bases (NCBI, EMBL, SWISS PROT,)

   Structure databases   (MMDB, PDB)

   Pathway Databases   (KEGG, BRENDA)

   Bibliographic database   (PUBMED, MEDLINE)

2. Sequence retrieval from biological database

3. Sequence similarity searching of nucleotide sequences

4. Sequence similarity searching of protein sequences

5. Multiple sequence alignment and phylogenetic analysis USING Clustal W

6. Gene finder (Prediction) - Genescan, Genscan

7. Restriction site analysis tools

8. Protein visualization tools (RASMOL)

Equipments

1. Computers

2. Internet facility

3. Bioinformatics software

Reference Books

1. Sequence Analysis In A Nutshell Oreilly

2. Current Protocols in Bioinformatics, Edited by A.D. Baxevanis et. al., Wiley Publishers 2005

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

III B.Tech (BT)   II Semester

IMMUNOLOGY LAB LIST OF EXPERIMENTS

1. Raising of antibodies in animals Polyclonal antibodies

2. Immunoprecipitation

   a. Ouchterlony's immuno diffusion technique.
   b. Measurement of Antibody Concentration by diffusion and electrophoresis method.

3. Counter current immuno electrophoresis.

4. Agglutination: Haemagglutination & Blood typing / grouping

5. Enzyme linked immunosorbant assay(ELISA).

6. Immunoglobulins purification

   a. Affinity Chromatography method
   b. Centrifugation Method

7. Differential (Identification of cell types) & Total leukocyte counts of blood.

8. Isolation & Viability determination of Lymphocytes from peripheral blood.

9. Lymphocyte proliferation with mitogen and migration with capillary tubes.

10. Identification of cell types by receptors Immunofluorsence.

Equipments

1. Haemocytometer.

2. ELISA reader.

3. Centrifuge.

4. Electrophoresis unit.

5. Microscope.

IV-Year

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **I Semester**

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, process design criteria for various classes of bioproducts (high volume, low value products and low volume, high Value products)

UNIT-II
Primary Separation and Recover Process: Physico-chemical basis of bio-separation processes.Cell disruption by (Mechanical and nonmechanical methods,Chemical lysis, Enzymatic lysis, physical methods, Sonication, Types of Homogenizers, flocculation and sedimentation, centrifugation and Separation of particulate by filtration, Rotary Vacuum Filtration.

UNIT-III
Enrichment Operations: Membrane-based separations (micro and ultra filtration), theory, design and configur ation of membrane separation equipment applications,Precipitation methods (with salts, organic solvents, and polymers, extractive separations, aqueous twophase extraction, supercritical extraction).

UNIT-IV
Product Resolution / Fractionation: Electrophoresis of proteins and nucleic acids, 1D-2D Gels, Types of Electrophoretic techniques (Capillar yand Pulse field)Chromatographic techniques- Paper, TLC, Adsorption, Ion exchange, Gel filtration, affinity chromatographic separation processes, GC, HPLC, FPLC, Chromatofocusing electrophoretic separations.

UNIT-V
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.

Reference Books

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

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT) **I Semester**

BIOETHICS, BIOSAFETY AND IPR

UNIT-I
Bioethics: Introduction to bioethics,Importance of bioethics in Biotechnology,Animal sciences Pharmacy &Society.

UNIT-II
Biosafety Concepts and Regulations: Biosafety methods in laboratories and industries GLP,GCP and GMP practies and regulatory affaris.

UNIT-III
Genetically Modified Organisms and their Usage in Society. Special regulations,protocals in releasing GMOS cartagena protocal. Biotechnology and food safety-case study-BT cotton, BT-bringal.

UNIT-IV
Intellectual property rights: Introduction to IPR, Importance-patent search,Drafting,filing patent, case studies,Basmatic rice,Turmeric etc.,

UNIT-V
Trade marks: IPR Trade secrets, copy rights. Trade marks, farmers rights. Legal implications.

Text Books

1. Sasson A,Biotechnologies and Development UNESCO Publications,1988.

2. Sasson A.Biotechnologies in developing contries present and future,UNESCO Publishers,1993.

Reference Books

1. Singh K. Intellectual Property Rights on Biotechnology,BC II,New Delhi.

2. P.Das and Gokul Das. Protection of Industrial Property Rights

3. V.Sree Krishna.Bioethics and Biosafety in Biotechnology.New Age International Publications.2007

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   I Semester

BIOPHARMACEUTICAL TECHNOLOGY

UNIT-I
Introduction to Pharmaceuticals: History and definition of drugs,Sources of drugs- plants,animals,microbes,minerals.Different dosage forms,Routes of drug administration.

UNIT-II
Pharmacodynamics: Physicochemical principles,mechanism of drug action, drug receptors, physiological receptors, structural and functional families.

UNIT-III
Pharmacokinetics and Dug Manufacturing processes: Drug absortion, Factors affecting drug absortion, Ditribution of drugs, Bioavailability and Biotranformation of drugs, Good manufacturing practices, Manufacturing facilities.

UNIT-IV
Production and analysis of biopharmaceuticals: Production of therapeutic proteins, Harmones, Cytokines, Interferons, Interleukins I and II, Tumor Necrosis Factor(TNF), Nucleic acids.

UNIT-V
Drug Delivery Systems, Applications of Biopharmaceuticals: Controlled and Sustained delivery of drugs, Biomaterial for sustained drug delivery, Liposome mediated drug delivery, Drug delivery methods for therapeutic proteins. Role of Biopharmaceuticals in treatment of various health disorders.

Reference Books

1. Biopharmaceuticals:Biochemistry n and Biotechnology-Gar Walsh(1988),John Wiley and Sons Ltd.

2. Remington's Pharmaceutical Sciences,(Mark Publications and Company Eston PA)(1980)

3. Theory and Practice of Industrial Pharmacy,(3rd   Ed)Leon Lachman,Lea and Febiger(1986).

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **I Semester**

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,weeds.

UNIT-III
Genetic Engineering for Increasing Crop Productivity
Genetic engineering for increasing crop productivity by manipulation of Photosyn- thesis, Nitrogen fixation, Nutrient uptake eficiency genetic engineering for abiotic stress, drought, flooding, salt and temperature Genetic engineering for biotic stress tolerance, Insects, fungi, bacteria, viruses, weeds

UNIT-IV
Genetic Engineering for Quality Improvement
Genetic engineering for quality improvement, Protein, lipids, carbohydrates, vitamins & mineral nutrients.

Introduction to Molecular breeding, constructing molecular maps; Molecular markers, RFLP, RAPD, STS, SCAR, SSCP, AFLP Molecular tagging of genes/traits

UNIT-V
Marker Assisted Aelection
Molecular marker-assisted selection of qualitative and quantitative traits, Map based cloning.

Text Books

1. Principles of crop production: Theory , and T echnology by George Acquahh.PHI Publications, 2004.

2. . Plant tissue culture by Bhojwani SS and Razdan MK. Elsevier , 2004

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **I Semester**

STRUCTURAL BIOLOGY
(Elective - I)

UNIT-I
Introduction: Levels of structures in Biological macromolecules, the chirality of biomolecules, proteins, nucleic acids, carbohydrates and lipids, cofactors, vitamins and hormones. 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 water structures; ionic interactions, disulphide bonds.

UNIT-II
Protein Folding & Bimolecular Interactions: 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,Molecular recognition, supra molecular interactions, Functional importance of Protein protein and protein nucleic acid interactions. Specific and non-specific DNA-protein complexes.

UNIT-III
Structural Analysis of Macromolecules: Prediction of protein structure; Sequence-structure relationships, 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-IV
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-V
Techniques for the Study of Biological Structure & Function : Size and shape of micro molecules: photons, chromophores, transition dipole moments, absorbance, and concentration. circular dichroism: molecular chirality and structural transitions of macromolecules, methods of direct visualization macromolecules as hydrodynamic particles - macromolecular diffusion ultra centrifugation , viscometry. X- ray crystallography; determination of molecular

structures, X- ray fiber diffraction, electron microscopy; neutron scattering - light scattering, NMR spectroscopy.

Text Books

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.

Reference Books

1. Introduction to Protein Architecture, by A.M. Lesk

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **I Semester**

CANCER BIOLOGY

UNIT-I
Fundamentals of Cancer Biology: Regulation of Cell cycle, Mutations that cause changes in signal molecules, Effects on receptor, Signal switches, Tumour suppressor genes, Modulation of cell cycle in cancer. Different forms of cancers, Diet and cancer.

UNIT-II
Principles of Carcinogenesis: Chemical Carcinogenesis, Metabolism of Carcinogenesis, Natural History of Carcinogenesis, Targets of Chemical Carcinogenesis, Principles of Physical Carcinogenesis, X - Ray radiation - mechanism of radiation Carcinogenesis.

UNIT-III
Molecular Cell Biology of Cancer: Oncogenes, Retroviruses and oncogenes, Detection of Oncogenes, Growth Factor and Growth Factor receptors that are Oncogenes and Growth factors related to transformations.

UNIT-IV
Principles of Cancer Metastasis: Clinical significances of invasion, Metastatic cascade, Basement Membrane disruption, Three-step theory of Invasion, Proteinases and tumour cell invasion.

UNIT-V
Cancer Detection & Cancer Therapy: Detection of Cancers, Prediction of aggressiveness of Cancer, Advances in Cancer detection, Different forms of therapy, Chemotherapy, radiation Therapy, and Immuno therapy: advantages and limitations.

Text Books

1. Maly B.W.J. Virology a practical approach, IRL Press, Oxford, 1987.

2. Scientific Publications. Oxford, 1988.An Introduction to Cellular and Molecular Biology of Cancer, Oxford Medical publications, 1991.

Reference Books

1. Dunmock N.J and Primrose.S.B., Introduction to modern Virology, Blackwel

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **I Semester**

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: Host defense against pathogens, clinical importance of understanding host defense, components of the host surface defences systems like skin, mucosa, eye, mouth, respiratory tract.
Components of the systemic defense like the tissues and blood.
UNIT-III
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-IV
Modula tion of Immune Response: Modulation of immune response by vaccines, properties of vaccines, other immuno modulators.

Paradigms of Pathogenesis: Diphtheria disease by colonisation; Disease without colonisation, Clostridium botulinum and Staphylococcus aureus; Intestinal infections, Shigella and E.coli infections; V ibrio cholera Salmonella infections; fungal infections

UNIT-V
Future Challenges: Gastric and duodenal ulcers - are they due to infections? L yme disease and Syphilis - unsolved mystery . Legionnaires disease-aftermath of comforts.T uberculosis 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 T r avers P . T . Immunobiology . Blackwell J Scientific Publishers, 1994.

Reference Books

1.   T alaro K. and T alaro A. Foundations in Microbiology ,   W .C. Brown Publishers, 1993.

2.   Roitt I. Essentials of Immunology , 8th edition, Blackwell Scientific Publishers, 1994.

3 . Austyn J.M. and Wood K.J. Principles Cellular and Molecular Immunology ,OxfordUniversityPress,1993.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **I Semester**

NANO BIOTECHNOLOGY
(Elective II)

UNIT-I: Basic Concept
Definition of nano scale with reference to biosystems, Scope and future prospects.

UNIT-II: Tools of Nanoscience
Scanning probe instrument, spectroscopy, electron microscopy.

Molecular synthesis, Self assembly, Polymerisation, Nanoscale lithography, e-beam lithography.

UNIT-III : Smart Materials
Heterogenous nano structre and composites, nanoscale biostructres.

Protein-hybrid computers, role of genetically engineered polymer proteins.

UNIT-IV: Applications
Drugs-Photodynamic therapy, molecular motors, neuroelecronic interphases, development of nanoluminiscent tags.

UNIT-V: Biosynthesis of Designer Compounds
Designer biopolymers, Procollagen, DNA Polynode, RNA topoisomerase, Protein magnetic materials.

Text Books

1. M.Ratner and D.Ratner,Nanotechnology a gentle introduction to the next big idea, Pearson education ,2007.

2. R.R.Birge, Proetin based computers, Scientific American , 1995.

Reference Books

1. L.E.Foster, Nanotechnology-Science, Innovation   and opportunity , Person eduction inc, 2007.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT) **I Semester**

BIO-SENSORS AND BIO-ELECTRONICS

UNIT-I
Introduction: WhatareBiosensors,variouscomponents ofbiosensors

UNIT-II
Typesofbiosensors: Biocatalysis based biosensors, bioaffinity based biosensors & microorganisms based biosensors, biologically active material and analyte.Types of membranes used in biosensor constructions.

UNIT-III
Transducers in Biosensors I: Various types of transducers; principles and applications - Calorimetric, optical, potentiometric / amperometric conductrometric/ resistormetric, Piezoelectric, semiconductor, impedimetric, mechanical and molecular electronics based transducers .Chemilumini science basedbiosensors.

UNIT-IV
Application and uses of biosensors I: Biosensors in clinical chemistry, medicine and health care, biosensors for veterinary, agriculture and food Low cost- biosensor for industrialprocessesbiosensorsforenvironmentalmonitoring.

UNIT-V
Molecular Electronics I: Potential advantages & Developments towards a bio molecular computer, development of molecular arrays as memory stores; molecular wires and switches Assembly of photonic biomolecular memory tore; Information processing; commercial   prospects for bimolecular computing systems.

Text Books

1. Aboul-Enein, H.V.,Stefan, R.andVanStaden, (1999)Chemiluminiscence - based biosensors - Anoverviewcrit Rev.Anal .Chem. 29,323-331.

2. Pearson,J.E.Gill, A., And VadgamaP.(2000) Analyticalaspects of biosensorsAnn Clin Biochem 37,119-145.

Reference Books

1. Roger,K.R and Gerlach, C.L.1~99. Updateone nvironmental forbiosensors. Env.Sci. Techno! 33 500A-506A.

2. Bilitewski,U.Turner, A.P.F.2000 Biosensorsfor environmental monitoring Harwood, Amsterdam.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   I Semester

DOWNSTREAM PROCESSING LAB LIST OF EXPERIMENTS

1. Cell disruption technique : Ultrasonicator

2. Solid separation methods-filtration, sedimentation, centrifugation, product enrichment operations,

3. Isoelectric precipitation- Determination of Isoelectric point of proteins and isolation of proteins from aqueous systems by pH change.

4. Salting out

5. Organic solvent mediated precipitation: Concentration of proteins from aqueous systems by addition of organic solvents

6. Ion exchange chromatography

7. Gel filtration (Molecular sieving)

8. Affinity chromatograph

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **I Semester**

PLANT TISSUE CULTURE LAB LIST OF EXPERIMENTS

1. Plant Tissue Culture Lab Requirements

2. Streilisation of Glass Ware

3. Media Preparation

4. Preparation of Natural Media and Harmones

5. Explant Sterilization

6. Inoculation and Incubation of Explants

7. Regeneration of Seed/Embryo

8. Culture of Vegetative Tissue

9. Culture of Explants

10. Callus Induction and Regeneration.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **I Semester**

BIOPHARMACEUTICAL TECHNOLOGY LAB LIST OF EXPERIMENTS

1. Limit test for Heavy Metals/Iron/Chlorides Impurities in Bulk pharmaceutical chemicals.

2. Estimation of Assay of Pure Drug

3. Evaluation of Marketed formulation

   a. Description
   b. Colour
   c. Shape
   d. Texture
   e. Visible Defect
   f. Thickness
   g. Diameter

4. Estimation of Potency of a Drug in a Marketed Sample.

5. Study of Morphological Characters of Herbal Drugs

   a. Stomatal index
   b. Calcium Oxalate Crystals
   c. Presence of Trichomes

6. Phytochemical study of Herbal Drugs

   a. Presence of Carbohydrates
   b. Presence of Tannins
   c. Presence of Proteins
   d. Presence of Lipids.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **II Semester**

ANIMAL CELL SCIENCE AND TECHNOLOGY

UNIT-I
Structure and Organization of animal cell: Equipments and materials for animal cell culture technology, Primary and established cell line cultures.

UNIT-II
Introduction to the balanced salt solutions and simple growth medium , Brief discussion on the chemical, physical and metabolic functions of different constituents of culture Medium, Role of carbon dioxide, Role of serum and supplements,Serum & protein free defined media and their application.

UNIT-III
Basic techniques of mammalian cell culture in vitro, disaggregation of tissue and primary culture, maintenance of cell culture,cell separation, Measurement of viability and cytotoxicity,Biology and characterization of the cultured cells.

UNIT-IV
Cell synchronization, Cell cloning and micromanipulation, Cell transformation,Application of animal cell culture, Scaling-up of animal cell Culture, Stem cell cultures, embryonic stem cells and their applications,Cell culture based vaccines.

UNIT-V
Organ and histotypic cultures, Measurement of cell death, Apoptosis, Three dimensional culture and tissue engineering.

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.

Reference Books
1. Cell Culture Lab Fax. Eds. M. Butler & M. Dawson, Bios Scientific PublicationsLtd., 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.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **II Semester**

FOOD SCIENCE AND TECHNOLOGY
(Elective III)

UNIT-I
Introduction to food science & technology: Fundamentals and Aims of food science and technology. Interdisciplinary approach, Nutritive value of foods,Food as a source of energy, Food Health and disease.

UNIT-II
Food Spoilage and Food borne Diseases: Biochemical changes caused by micro- organisms, deterioration of various types of food product. Fisheries, milk and meat during handling and processing. Food poisoning , Food borne infections and intoxications.

UNIT-III
Food Preservation: Principles of food preservation: Physical, chemical, and biological methods of preservations.

UNIT-IV
Food Biotechnology: Enzymes in foods and food industry, Nature and type of starters, Role of starters inFermented foods, Fermentation of Milk products-Fermented soy and peanut milk, Fruit and cereal based beverages, Non beverage plant products. Mycoprotein production. NutraceuticalsNatural sweeteners and artificial sweeteners and their role in controlling diseases and deficiencies, Pigments in food, food flavours, food additives and toxicants.

UNIT-V
Food Processing and Quality Assurance: Basic principles, unit operations, and equipment involved in the commercially important food processingmethods and unit operations; materials and containers used in food packaging. Methods of quality, assessment of food materials,fruits, vegetables, cereals, dairy products, meat, poultry. Food regulations, grades and standards, Concept of Codex almentarious/HACCP/USFDA/ISO 9000 series etc. Food laws and standards.

Text Books

1. Jay J.M. 1986. Modern Food Microbiology. 3rd Edn. VNR, New York.

2 . Food processing and Preservation PHI private ltd,New Delhi

3.   Food Microbiology fourth edition William C.Frazier, Tata Mc Graw Hill

4.   Food Microbiology 2nd Edition, Michael P.Doyle ,ASM press

5.   Fennema, O.R. Ed. 1976. Principles of Food Science: Part-I Food Chemistry. Marcel   Dekker, New York.

6.   Meyer, L.H. 1973. Food Chemistry. East-West Press Pvt. Ltd., New Delhi.

7.   Charalambous, G. and Inglett, G. 1981. The Quality of Foods and Beverages. (2 vol. set). Academic Press, New York.

8.   Krammer, A. and Twigg, B.A. 1970. Quality Control for the Food Industry. 3rd Edn. AVI, Westport.

9.   Ranganna, S. 1986. Handbook of Analysis and Quality Control for Fruits and Vegetable Products. TataMcGraw Hill, New Delhi.

10. Norman N.Potter, Joseph H.Hotchkiss. Food science.CBS Publishers, New Delhi.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT) **II Semester**

MOLECULAR MODELING AND DRUG DESIGN
(Elective III)

UNIT- I: **Introduction to Molecular Modelling**
Introduction to Molecular Modelling. What are models used for? Areas of application Single molecule calculation, assemblies of molecules. Reaction of the molecules. Drawbacks of mechanical models as compared to graphical models. Co-ordinate systems two matrix, potential energy surface.

UNIT-II: **Empirical Force Field Models**
Molecular Mechanisms, energy calculations, Bond stretch, angle bending, torsional term.
Electrostatic interaction- Van der waals interactions. Miscellaneous interaction.

UNIT-III: **Molecular Dynamics**
Introduction, Molecular Dynamics using simple models. Dynamics with continuous potentials. Constant temperature and constant dynamics. Conformation searching, Systematic search. Applications to protein folding

UNIT-IV: **Comparative Protein Modeling**
Modelling by Homology-the alignment, construction of frame work ,selecting variable regions, side chain placement and refinement, validation of protein models Ramchandran plot, threading and ab initio modeling. Analog Based Drug Design: Introduction to QSAR. lead module, linear and nonlinear modeled equations, biological activities, physicochemical parameter and molecular descriptors, molecular modelling in drug discovery.

UNIT-V: **Structure Based Drug Design**
3D pharmacophores ,molecular docking, De novo Ligand design, Free energies and solvation, electrostatic and non-electrostatic contribution to free energies.

Text Books
1. Principles and applications of modelling by Leach
2. Molecular Modelling by Hans Pieter,Heltje & Gerd Folkens, VCH.

Reference Books
1. Chemical Applications of Molecular Modelling by Jonathan Goodman.
2. Computational Chemistry by Guy H, Grant & W. Graham Richards, Oxford University Press. April 1985

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **II Semester**

BIOPROCESS OPTIMIZATION
(Elective III)

UNIT-I: Basic Concept
Overview of experimental design in biological processes, understanding of variables in biological processes.

UNIT-II: Optimization Approaches
Non-statistical, statistical and numerical optimization-fundamental theory.
STATISTICAL OPTIMIZATION
First order and second order designs, differences in approaches, general response surface analysis.

UNIT-III: First Order Designs
Statistical experimental procedures for plckett-burman taguchi's designs.

UNIT-IV: Determination of Optimal Conditions
Method of Ridge analysis, Nelder-Mead simplex method, optimization of multi response biological systems.

UNIT-V: Variance and Design
Variance minimizing design, mixed variable and multi response generalized distance function approaches for multiresponse optimization.

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

Text Books

1. B.volesky and J.votruba,Modelling optimization of fermentation processes,Elsevier,Amsterdam,1992.

2. A.I.Khruri and J.A.Cornell,Response surface design and optimization,Newyork,1987

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **II Semester**

CLINICAL TRAILS AND REGULATORY AFFAIRS
(Elective IV)

UNIT-I
Licensing authorities roles and responsibilites, ICH, GCP, FDA, EU Clinical Trials Data Protection Act and Regulations, guidelines and codes of practice Regulation of drug preparation and packaging, Ethics commiteshistory structure aregulation impact of ICH GCP Recent development with regard to the INDIA/USA/EU

UNIT-II
Defenitions of GCP, auditing , monitoring and inspection GCP auditing requirements from a regulatory perspective. Development of IGH GCP Roles and responsibilities and clinical research. Role of Sposer Monitor Investigator IRB/Iec Essential documentation The INDIAN/ USA / EU Directies on GCP in clinical trials.

UNIT-III
Latest developmenats in ICH Purpose Implications Guidances Ethics approval system. Overview. Recent developments current issues in Clinical Research Confidentiality issues Medecines for human use(clinical trials) regulations 2003 Good clinical practices, Central Drugs Standard Control Organisation, Govt. of India.

UNIT-IV
History of regulatory affairs Main concepts Regulatory affairs for studies in human subjects Current and future requirements and procedures in clinical research: Regulatory submissions for new product Requirements for gaining approval US perspective   Regulating control over marketing and sales of medical products Regulations Codes of practice.

UNIT-V
Latest developments in ICH Purpose Implications Guidance Inspections INDIAN/ USA/EU Ethics approval system.   Overview Recent developments Current issues in Clinical research. Confidentially issues Medecines for human use (clinial trials).

Text Books

1. Good Clinical Practices, Central Drugs Standard Control Organisation, Govt. of India.

2. Drugs and Cosmetics Act, 1940.

Reference Books

1. International Clinical Trial, Volume 1&2 Dominique P.Brunier and Gerhaedt Nahler, Interpharm Press, Denver, Clolorado.

2. Code of Federal Regulaion by USFDA-Download

3. ICH-GCP Guidelines-Download

4. Biosafety issue related to genetically modified organism, Biotech Consortium India Limited, New Delhi.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **II Semester**

CREATIVITY, INNOVATION AND PRODUCT DEVELOPMENT
(Elective - IV)

UNIT-I: Introduction
The process of technological innovation, factors contributing to successful technological innovation
The need for creativity and innovation, creativity 'and problem solving, brain storming- different techniques.

UNIT-II: Project Selection and Evaluation
Collection of ideas and purpose of project.- Selection criteria - screening ideas for new products (evaluation techniques).

UNIT III: New Product Development
Research and new product development Patents - patent search

UNIT-IV: Patent Laws
Patent laws International code for patents - Intellectual property rights (IPR).

UNIT-V: New Product Planning I
Design of proto type - testing - quality standards
Marketing research - introducing new products. GMP
Creative design - Model Preparation - Testing   cost   evaluation, Patent application- GLP.

Text Books

1.   HARRY B.WATTON - New Product Planning. Prentice-Hall Inc. 1992.

2.   P.N.KHANDWALLA - Fourth Eye (Excellence through Creativity) - Wheeler Publishing, Allahabad, 1992.

Reference Books

1.   HARRY NYSTROM - Creativity and innovation -John Wiley & Sons, 1979.

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **II Semester**

NEUROBIOLOGY AND COGNITIVE SCIENCES
(Elective-IV)

UNIT -I: Introduction to Nervous Systems
Central and Peripheral nervous systems

UNIT -II: Neuro anatomy I
Structure and functions of neurons, synapse. their function, signals produced by neurons, sensors function, Glial cells,

Molecular and cellular organization of neuronal differentiation, characterization of neuronal cells.

UNIT -III: Neurophysiology
Conduction of impulses by neurons, Correlation of sensory functions.

Pharmaceutical mediator, released by neurons. Hormones and their effect on neuronal function.

UNIT -IV: Neurological Disorders
Pathogenesis, Genetic basis of neurological disorders

UNIT -V: Behavioural Science
Neuronal mechanism of behaviour, Animal behaviour, Behaviour in various environments.

Reference Books

1. A.B. Schiebel Neurobiology of higher cognitive function Guilford Press 1990,

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

IV B.Tech (BT)   **II Semester**

FOOD TECHNOLOGY LAB LIST OF EXPERIMENTS

1. Determination of moisture content in food.

2. Determination of fat content in food.

3. Determination of protein content in food.

4. Vit C determination.

5. Preparation of casein from milk.

6. Determination of hardness in water

7. Qualitative and Quantitative analysis of food.

8. Enumeration and isolation of microorganisms in food.

9. Bacteriological examination of milk.

10. Enumeration of coliforms and E.Coli in foods using MPN method.

11. Production of any fermented food.

Text Books

1. Aneja K.R. Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom cultivation, New Age International, New Delhi.

2. Laboratory manual in microbiology by P. Gunasekharan, Newage international Publishers.

Reference Books

1. Food analysis laboratory manual by S.Suzanne Nielsen. Springer publication.