

**COURSE STRUCTURE
AND
DETAILED SYLLABUS**

for

B.Tech – I - IV Year –

in

BIOTECHNOLOGY

(BT)

(Applicable from the Academic Year 2010-2011)



SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY

(An Autonomous Institution approved by UGC and affiliated to JNTUH)

Yamnampet, Ghatkesar, R.R.District-501 301.

SREENIDHI INSTITUTE OF SCIENCE & TECHNOLOGY (Autonomous)**B. Tech Biotechnology****I Year I Semester Course Structure**

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101EN01	English I	3	-	-	3	30	70
2	101PH01	Engineering Physics - I	3	1	-	3	30	70
3	101 IT 01	Computer Programming	3	1	-	3	30	70
4	101ME01	Engineering Drawing - I	2	-	4	4	30	70
5	101MA02	Mathematics for Biotechnology - I (For Bi.P.C students)	3	1	-	3	30	70
6	101BT01	Fundamentals of Biology (For MPC Students)						
7	101CH02	Chemistry for Biotechnology	2	1	-	2	30	70
8	101EN71	English Language Lab - I	-	-	2	1	25	50
9	101PH71	Engineering Physics Lab	-	-	3/2	1	25	50
10	101CH71	Engineering Chemistry Lab			3/2	1	25	50
11	101 IT 71	Computer Programming Laboratory	-	-	3	2	25	50
12	101ME71	Engineering Workshop – I	-	-	3/2	1	25	50
13	101 IT 72	IT Workshop - I	-	-	3/2	1	25	50
Total			16	4	15	25	330	720

B. Tech Biotechnology**I Year II Semester Course Structure**

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101EN02	English II	2	-	-	2	30	70
2	101CS01	Data Structures and C++	3	1	-	3	30	70
3	101ME02	Engineering Drawing – II	1	-	2	2	30	70
4	101EE41	Basic Electrical Engineering	3	1	-	3	30	70
5	101MA04	Mathematics for Biotechnology - II	3	1	-	3	30	70
6	101BT02	Process Engineering Calculations	3	1	-	3	30	70
7	101ME05	Mechanical Engineering for Biotechnology	4	-	-	4	30	70
8	101EN72	English Language Lab - II	-	-	2	1	25	50
9	101CS71	Data Structures and C++ Lab	-	-	3	2	25	50
10	101ME72	Engineering Workshop – II	-	-	3/2	1	25	50
11	101 IT 73	IT Workshop - II	-	-	3/2	1	25	50
Total			19	4	10	25	310	690

B. Tech Biotechnology**II Year I Semester Course Structure**

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101EC04	Basic Electronics Engineering	3	1	-	3	30	70
2	101MA08	Mathematical Methods for Biotechnology	3	1	-	3	30	70
3	101BT03	Biochemistry	4	1	-	4	30	70
4	101BT04	Microbiology	3	1	-	3	30	70
5	101BT05	Cell Biology	3	1	-	3	30	70
6	101BT06	Thermodynamics for Biotechnologists	3	1	-	3	30	70
7	101EN73	Functional and Communicative Written English	-	-	2	2	25	50
8	101BT71	Biochemistry Lab	-	-	3	2	25	50
9	101BT72	Microbiology & Cell Biology Lab	-	-	3	2	25	50
Total			19	6	8	25	255	570

B. Tech Biotechnology
II Year II Semester Course Structure

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101CH 03	Environmental Studies	3	1	-	3	30	70
2	101MA11	Probability and Statistics for Biotech	3	1	-	3	30	70
3	101BT07	Momentum & Heat Transfer in Bioprocess	3	1	-	3	30	70
4	101BT08	Genetics and Molecular Biology	3	1	-	3	30	70
5	101BT09	Instrumental Methods of Analysis	3	1	-	3	30	70
6	101BT10	Bioprocess Engineering	3	1	-	3	30	70
7	101EN74	Effective English Communication and Soft Skills	-	-	2	2	25	50
8	101BT11	Comprehensive viva	-	-	-	1	-	50
9	101BT73	Bioprocess Engineering Lab	-	-	3	2	25	50
10	101BT74	Instrumental Methods of Analysis Lab	-	-	3	2	25	50
Total			18	6	8	25	255	620

B. Tech Biotechnology**III Year I Semester Course Structure**

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101BT12	Instrumentation and Bioprocess Control	3	1	-	3	30	70
2	101BT13	Biochemical Reaction Engineering	3	1	-	3	30	70
3	101BT14	Genetic Engineering	3	1	-	3	30	70
4	101BT15	Bioinformatics	3	1	-	3	30	70
5	101BT16	Mass Transfer and Separations	3	1	-	3	30	70
6	101BT17	Industrial and Environmental Biotechnology	3	1	-	3	30	70
7	101MA71	Logical Reasoning - I	-	-	2	2	25	50
8	101BT75	Group Project	-	-	3	1	25	50
9	101BT76	Genetics, Molecular Biology & Genetic Engineering Lab	-	-	3	2	25	50
10	101BT77	Bioinformatics Lab	-	-	3	2	25	50
Total			18	6	11	25	280	620

B. Tech Biotechnology**III Year II Semester Course Structure**

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101MB01	Managerial Economics and Financial Analysis	3	1	-	3	30	70
2		Open Elective – I (Foreign language)	3	1	-	2	30	70
3	101BT18	Plant Biotechnology	3	1	-	3	30	70
4	101BT19	Immunology	4	1	-	4	30	70
5	101BT20	Computational Molecular Biology	3	1	-	3	30	70
6		Professional Elective – I	3	1	-	3	30	70
7	101MA72	Quantitative Aptitude	-	-	2	2	25	50
8	101BT21	Comprehensive Viva	-	-	-	1	-	100
9	101BT78	Plant Biotechnology Lab	-	-	3	2	25	50
10	101BT79	Immunology Lab	-	-	3	2	25	50
Total			19	6	8	25	255	620

Subject code	Open Elective – I	Subject code	Professional Elective – I
101FL01	Spanish	101BT22	Cancer Biology
101FL02	French	101BT23	Clinical Research and Regulatory Affairs
101FL03	German	101BT24	Biopharmaceutical Technology

* **Industry Oriented Mini Project** has to be carried out by all students in summer vacation of B. Tech III/IV, II-Semester for a period of one month. The Mini project report must be submitted in B. Tech IV/IV I-semester and will have to be defended. **50** Marks are allotted with **two** credits.

B. Tech Biotechnology
IV Year I Semester Course Structure

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101MB02	Management Science	3	1	-	3	30	70
2		Open Elective - II	3	1	-	3	30	70
3	101BT25	Downstream Processing	3	1	-	3	30	70
4	101BT26	Animal Biotechnology	3	1	-	3	30	70
5		Professional Elective – II	3	1	-	3	30	70
6		Professional Elective - III	3	1	-	3	30	70
7	101MA73	Logical reasoning - II	-	-	2	2	25	50
8	101BT33	Pre Project Seminar	-	-	-	2	50	-
9	101BT34	Industry Oriented Mini Project	-	-	-	2	25	50
10	101BT80	Downstream Processing Lab	-	-	3	2	25	50
11	101BT81	Animal Biotechnology Lab	-	-	3	2	-	100
Total			18	6	8	28	305	670

Subject Code	Open Elective – II	Subject Code	Professional Elective – II	Subject Code	Professional Elective - III
101MB03	Banking Operations, Insurance & Risk management	101BT27	Molecular Pathogenesis	101BT30	Phytochemicals and Herbal Medicine
101MB06	Entrepreneurship & Innovation	101BT28	Biotechnology for Crop Improvement	101BT31	Food Science & Technology
101CS03	OOPS through Java	101BT29	Biosensors and Bioelectronics	101BT32	Nano Biotechnology

B. Tech Biotechnology**IV Year II Semester Course Structure**

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101BT35	Bioethics, Biosafety & IPR	4	1	-	4	30	70
2	101BT36	Bioreactor and Plant Design	4	1	-	4	30	70
3	101BT38	Project	-	-	-	10	50	150
4	101BT39	Comprehensive viva	-	-	-	2	-	50
5	101BT40	Technical Seminar	-	-	-	2	25	-
Total			8	2	-	22	135	340

I Year I Semester

L	T	P/D	C
3	-	--	3

(101EN01) ENGLISH – I (A Communicative Approach)
(Common to all branches)

UNIT I: NOBLE THOUGHT:

1. **Reading** : The Last Leaf – O. Henry
2. **Writing** : Paragraph writing
3. **Listening** : Listening for sounds
4. **Speaking** : Greeting, taking leave and introducing
5. **Grammar** : Naming words
6. **Vocabulary** : Homonyms, homophones, homographs, synonyms and antonyms

UNIT II: BIOGRAPHY:

1. **Reading** : Sri C.V. Raman- Shubashree Desikan
2. **Writing** : Work-related correspondence
3. **Listening** : Listening for words
4. **Speaking** : Making requests
5. **Grammar** : Naming words specific (Part I)
6. **Vocabulary** : Word Formation

UNIT III: HUMAN INTEREST:

1. **Reading** : The Connoisseur- Nergis Dalal
2. **Writing** : Summarizing
3. **Listening** : Listening for word stress
4. **Speaking** : Apologizing and inviting
5. **Grammar** : Making naming words specific (part 2)
6. **Vocabulary** : Collocations

UNIT IV: DISASTER MANAGEMENT:

1. **Reading** : The Cuddalore Experience-Anu George
2. **Writing** : Basics of Essay Writing
3. **Listening** : Listening for theme
4. **Speaking** : Congratulating, offering sympathy, condolences and making complaints
5. **Grammar** : Tenses
6. **Vocabulary** : Phrasal verbs

UNIT V: HUMOUR :

1. **Reading** : The Luncheon – Somerset Maugham
2. **Writing** : Note making
3. **Listening** : Listening for details and taking notes
4. **Speaking** : Interview skills
5. **Grammar** : Adverbials and modal verbs
6. **Vocabulary** : Idioms

UNIT VI: OUTLOOK :

1. **Reading** : Indian Crowds – Nirad C. Choudhary
2. **Writing** : Information transfer
3. **Listening** : Listening to announcements and directions
4. **Speaking** : Making presentations
5. **Grammar** : Conjunctions and prepositions
6. **Vocabulary** : Business vocabulary

TEXT BOOKS:

1. Enjoying Everyday English : A Rama Krishna Rao, Sangam Books, HYD.

REFERENCES:

1. Business Vocabulary In Use -Bill Mascull, Cambridge University Press.
2. How to build a better vocabulary –Nurnberg Maxwell & Morris Rosenblum: Grand Central Publishers
3. Word power made easy – Norman Lewis, W.R.Goyal Publishers.
4. How to read better and faster: Norman Lewis, W.R.Goyal Publishers, New Delhi

I Year I Semester

L	T	P/D	C
3	1	--	3

(101PH01) ENGINEERING PHYSICS - I

(Common to all branches)

UNIT - I

Crystallography and Crystal Structures: Space Lattice, Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices, Miller Indices, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Diamond and hcp Structures, Structures of NaCl, ZnS, CsCl.

UNIT-II

X-ray Diffraction: Basic Principles, Bragg's Law, Laue Method, Powder Method, Applications of X-ray Diffraction.

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

UNIT- III

Elements of Statistical Mechanics: Phase space, Ensemble, Difference between micro, canonical & grand canonical ensemble, Maxwell - Boltzman Statistics, Bose – Einstein Statistics, Fermi – Dirac Statistics with derivations.

UNIT-IV

Free electron theory of Metals: Classical free electron theory (Drunde and Lorentz), Electrical conductivity of a metals, Relaxation time, Collision time and mean free path, Success of classical free electron theory, Breakdown of free electron theory, Fermi – Dirac distribution function- variation with temperature, The quantum free electron theory.

UNIT-V

Principles of Quantum Mechanics: Waves and Particles, de Broglie Hypothesis , Matter Waves, Davisson and Germer's Experiment, G. P. Thomson Experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time Independent Wave Equation -Physical Significance of the Wave Function -Particle in One Dimensional Potential Box.

UNIT-VI

Band Theory of Solids: Bloch Theorem, Kronig-Penny Model (Qualitative Treatment), Origin of Energy Band Formation in Solids, Classification of Materials into Conductors, Semi Conductors & Insulators.

Text Books:

1. Introduction to Solid State Physics, by Charles Kittel
2. Engineering Physics P K Palanisamy

Reference Books:

1. Solid State Physics Neil by W. Ashcroft , N. David Mermin
2. Statistical Mechanics by Donald Allan McQuarrie
3. Statistical Mechanics by Sathya Prakash
4. Quantum Mechanics by John L Powel
5. Principles of quantum Mechanics by Ramamurti Shanker
6. Applied Physics by M Chandrashekar and P Appla Naidu
7. Modern Engineering Physics by K. Vijaya Kumar, S Chandralingam

I Year I Semester

L	T	P/D	C
3	1	--	3

(101IT01) COMPUTER PROGRAMMING
(Common to all Branches)

UNIT – I

Computer fundamentals – Computer architecture (block diagram), CPU, Memory, Types of memory, I/O devices.

Software Development Steps - Algorithms, pseudo code, flowcharts, Software Development Life Cycle.

UNIT – II

C fundamentals – History of C Language, Features of C, Structure of C, Character set, identifiers, constants, variables and keywords.

Simple data types – char, int, float, double. Data type modifiers and qualifiers. Memory allocation for these types.

Operators – Unary, binary and ternary, precedence and association rules among operators. **Decision control structures** – if..else, dangling else, switch statement.

Repetitive control structures - while, do..while, for, break and continue statements, Nested structures.

UNIT – III

Functions – Function definition, arguments, return value, prototype, arguments and parameters.

Parameter passing – Call by value and call by reference.

Recursive functions – Definition, examples, advantages and disadvantages.

Macros – Definition, examples, comparison with functions.

Arrays – Definition, initialization, strings as character arrays, two dimensional and multidimensional arrays. Passing arrays as arguments to functions.

UNIT – IV

Pointers – Definition, Pointer variable, Pointer to a pointer, Memory mapping, arithmetic operations on pointers, relationship between arrays and pointers, pointers as arguments and return type of a function, pointers to a function, array of pointers and pointers to arrays, dynamic memory allocation.

Strings – Input output functions, string handling functions.

Structures – Declaring a structure, array of structures, nested structures, unions, passing structures as arguments to a function and structure as a return type of a function.

UNIT – V

Files – Data Organization, file operations, file opening modes, creating, storing, retrieving, appending, editing, copying files, Examples illustrating counting characters, tabs, spaces, string (line) I/O in files, record I/O in files, text files and binary files, command line arguments, error handling functions in files random access files.

UNIT – VI

Applications – Case study of simple bank transactions and program development.

Preprocessor directives – Macro expansion, file inclusion, condition compilation, miscellaneous directives.

Graphics in C – Line drawing, Rectangle, ellipse, working with image, move to function, and graphic related library functions.

Text Books:

1. Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.
2. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education.

References:

1. Let us C by Yashwanth P. Kanetkar 8th edition BPB publications.
2. Understanding pointers in C by Yashwanth P. Kanetkar.
3. Computer programming for teens by Mary Farrell.
4. Working with C by Yashwanth P. Kanetkar.
5. Graphics under C by Yashwanth P. Kanetkar.
6. The complete reference, 4th edition, Herbert Schmidt.
7. C Faqs by Steve Summit.

I Year I Semester

L	T	P/D	C
2	-	4	4

(101ME01) ENGINEERING DRAWING - I**UNIT – I**

INTRODUCTION TO ENGINEERING DRAWING: Drawing Instrument and their use Types of lines, use of pencils, Lettering, Rules of dimensioning.

Construction of polygons: Inscription and superscription of polygons given the diameter

SCALES: Scales used in Engineering Practice and Representative Fraction – construction of Plain, diagonal, Vernier Scales.

Curves used in Engineering Practice and their Constructions.

- Conic Sections including the Rectangular Hyperbola-General method only.
- Cycloid, Epicycloid and Hypocycloid
- Involute

UNIT – II

DRAWING OF PROJECTIONS OR VIEWS ORTHOGRAPHIC PROJECTION IN FIRST ANGLE PROJECTION ONLY: Principles of Orthographic Projections – Conventions – First and Third Angle Projections, Projection of Points, Projection of Lines - inclined to both planes, True lengths, traces.

UNIT – III

PROJECTIONS OF PLANES: Projections of regular Planes, Traces, Oblique planes. Introduction to Auxiliary planes

UNIT –IV

PROJECTIONS OF SOLIDS:

Projections of Regular Solids – Regular Polyhedra, solids of revolution, Axis inclined to both planes – Alteration of position and Auxiliary plane method.

UNIT –V

SECTIONS OF SOLIDS:

Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views

UNIT –VI

DEVELOPMENT OF SURFACES:

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

TEXT BOOKS:

- Engineering Drawing, N.D. Bhat / Charotar
- Engineering Drawing, Narayana and Kannaiah / Scietech publishers.

REFERENCES:

- Engineering Drawing, K.Venugopal/G.Sreekanjana, New Age International Publishers.

I Year I Semester

L	T	P/D	C
3	1	--	3

(101MA02) MATHEMATICS FOR BIOTECHNOLOGY - I**(FOR BiPC STUDENTS)**

UNIT I: Differential Calculus-Introduction to Sets, Relations, Functions, Fundamentals of trigonometry, Concept of Limits, Continuity, Differentiation, product rule, quotient rule. Differentiation of trigonometric, logarithmic, exponential functions.

UNIT II: Applications of Differentiation-Errors and approximation, problems on tangent, sub tangent, normal, sub normal.

UNIT III: Introduction to Partial Differentiation-Euler's theorem, Maxima and Minima.

UNIT IV: Integral Calculus-Introduction, Integration of different functions, Methods of Integration, Integration by parts

UNIT V: Definite integrals-Applications of Definite Integrals on areas.

UNIT VI: Ordinary Differential equations-Forming of differential equations by eliminating arbitrary constants, Methods of solving of first order and first degree Differential Equations – variables and separables, exact, homogeneous, linear and Bernoulli's equations.

TEXT BOOKS:

1. Text books of XI & XII by Tata Mcgraw Hill.
2. A Text Book of Engineering Mathematics, B.S.Grewal

REFERENCE BOOKS:

1. Advanced Engineering Mathematics (eighth edition), Erwin Kreyszig, John Wiley & Sons (ASIA) Pvt. Ltd, 2001.
2. Differential Calculus, Shanti Narayan & P.K.Mittal, S.Chand Publications.
3. Integral Calculus, Shanti Narayan & P.K.Mittal, S.Chand Publications.

I Year I Semester

L	T	P/D	C
3	1	--	3

**(101BT01) FUNDAMENTALS OF BIOLOGY
(FOR MPC STUDENTS)**

UNIT I: Introduction to Biology: Origin of life, Diversity in biological systems, Kingdom systems of classification, General characters, brief account on ecology, morphology, nutrition, locomotion and reproduction, useful and harmful effects of Bacteria, Viruses, Algae, Fungi and Protozoans

UNIT II: Biology of Plants: Classification of Plant Kingdom, Concepts of Growth, Meristems, Development of different plant organs; Plant Growth Regulators; Economic Importance of Plants, Biology of Pests in relation to Rice, Cotton, Sugarcane and Groundnut, Photosynthesis – overview

UNIT III: Biology of Animals: Classification of Animal Kingdom, General Characters of Chordates and Non-chordates, Protozoan Parasites (*Plasmodium*, *Entamoeba histolytica*), Helminth parasites (*Taenia solium*, *Ascaris*)

UNIT IV: Human Biology: Introduction to human body, Digestive, Respiratory, Circulatory, Nervous, Endocrine, Excretory and Reproductive system

UNIT V: Biomolecules: Classes of Biomolecules, Overview of Carbohydrates, Amino acids, Proteins, Lipids and Nucleic acids

UNIT VI: Introduction to Biotechnology: Scope and Importance, Applications of Biotechnology-Drugs and Chemicals from Plants & Animals, Commercially important Enzymes, Biofuels, Biofertilizers, Biopesticides, Bioindicators and Biosensors

TEXT BOOKS:

1. Introduction To Biology And Biotechnology by Vaidyanath K. , K. Patrap Reddy, BS publications, Second Edition
2. Basic Biotechnology, Second Edition, by Colin Ratledge and Bjorn Kristiansen, Cambridge University Press.

REFERENCES

1. Dr. C.C. Chatterjee, Human Physiology (11th Edition) Vol I and II, Medical Allied Agency, Kolkata, 1987.
2. H.G. Rehm and G. Reed, Biotechnology Volume I & 2

I Year I Semester

L	T	P/D	C
2	1	--	2

(101CH02) CHEMISTRY FOR BIOTECHNOLOGY

Unit-I: Water Technology: Hardness-temporary and permanent hardness. Units and inter conversions of Units. Estimation of Hardness; EDTA method Analysis of water – Alkalinity. Water Treatment: Internal treatment, External treatment – Lime – Soda Process, Zeolite Process, Ion-Exchange Process – Numerical Problems Lime – Soda Process.

Unit II: Electrochemistry: Conductance-types, Electrolytic conductance-specific, equivalent and molar conductance, ionic conductance, ionic mobilities, Kohlrausch's law and its applications. EMF: Galvanic Cells, types of Electrodes, Reference Electrode (SCE), Redox electrode (Quinhydrone electrode), Ion Selective Electrodes (Glass Electrode) Nernst equation and its applications, Potentiometric titrations, Numerical problems. Batteries: Primary and secondary cells, (Ni-Cd cell, Lithium ion cells, lead-Acid cell,). Applications of batteries, Fuel cells – Hydrogen – Oxygen fuel cell, Advantages of fuel cells.

Unit III: Corrosion and its Control: Definition of corrosion, oxidation corrosion, mechanism of oxidation corrosion, electrochemical corrosion, mechanism of electrochemical corrosion, formation of anodic and cathodic areas, galvanic corrosion, waterline corrosion, soil corrosion, Factors affecting rate of corrosion control. Cathodic protection: Sacrificial anodic protection method, impressed current protection method, Protective coatings-metallic coatings, electroplating, Organic surface coatings – paints constituents and functions.

Unit-IV: Polymer Technology: Polymers, terminology, Polymerization- Types of Polymerization – Addition and Condensation and Co-Polymerization. Plastics – Thermosetting and Thermoplastics – Preparation, Properties and applications of the following: PVC, Teflon, Bakelite, Nylon 6:6, Polyester. Rubber-natural and artificial rubber, Vulcanization of natural rubber, Buna S, Buna N, Thiokol. Conducting Polymers: Poly acetylene, polyaniline and their applications.

Unit – V: Fuels and Lubricants: Fuels: Classification- Characteristics of a good fuel, **Calorific value:** gross calorific value, net calorific value, determination of calorific values by bomb calorimeter.

Solid fuels: Coal, analysis of coal - proximate analysis and ultimate analysis

Liquid fuels: Petroleum –Refining, fractional distillation of crude oil, octane number, cetane number.

Gaseous fuels: Advantages of gaseous fuels, analysis of flue gases – Orsat's apparatus

Lubricants: Functions of Lubricants – Types of Lubrication and Mechanism – Thick Film or Hydrodynamic Lubrication. Thin Film or Boundary Lubrication. Extreme pressure lubrication, Classification and Properties of Lubricants.

Unit-VI: Biomolecules and Heterocyclics: Structure, properties and reactions of mono- and di-saccharides, physicochemical properties of amino acids and peptides, structural features of proteins, nucleic acids. Heterocyclic compounds: Structure, preparation, properties and reactions of furan, pyrrole, thiophene and pyridine.

Text Books:

1. Engineering Chemistry: P.K. Jain and M.K. Jain, Dhanpathrai Publications – 14th Edition.
2. Organic Chemistry, Vol. I – I. L. Finar, Tata Mc Hill Publications

Reference Books:

1. Essentials of Physical chemistry; Baul & Tuli; S. Chand Publications.
2. Text of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co, New Delhi (2006)
3. R J Simmonds, "Chemistry of Bio molecules"-Royal Society of Chemistry.
4. Heterocyclic chemistry"-R. K. Bansal.
5. Text Book of Engineering Chemistry – Shashi Chawla, Dhantpat Rai publishing Company, New Delhi (2008).
6. Engineering Chemistry by R. P. Mani, K. N. Krishna B. Rama Devi Cengage Learning New Delhi (2010).
7. Engineering Chemistry by Shiva Shankar Tata McGraw Hill (2010).

I Year I Semester

L	T	P/D	C
-	-	2	1

(101EN71) ENGLISH LANGUAGE LAB – I**Introduction:**

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

OBJECTIVES:

1. To expose the students to a variety of self-instructional, learner-friendly modes of language learning.
2. To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams such as GRE, TOEFL, GMAT etc.
3. To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
4. To train them to use language effectively to face interviews, group discussions, public speaking.
5. To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.

SYLLABUS:

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

1. Introduction to the Sounds of English – Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues/Role Play
4. Oral Presentations-Prepared and Extempore
5. 'Just A Minute' Sessions (JAM)
6. Describing Objects/Situations/People
7. Information Transfer
8. Debate

MINIMUM LAB REQUIREMENTS

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:

- 1) P-IV Processor
 - a) Speed – 2.8 GHZ
 - b) RAM -512 MB Minimum
 - c) Hard Disk – 80 GB
- 2) Headphones of High quality

SOFTWARE:

- * Pro Power Pronunciation Software
- * Hi Class system Monitoring Software.
- * A.P.State Council of Higher Education Software (Foundation Course in communication skills)
- * Face to Face elementary and Pre –intermediate CDs.
- * Cambridge Advanced Learners' English Dictionary with CD
- * Learn to speak English book + CD set. (Set of 4 CDs)
- * Mastering English (CD).
- * DOKI English CD

REFERENCES:

1. English Conversation Practice by Grant Taylor, Tata Mc.Graw Hill
2. Speaking Effectively, Cambridge University Press
3. A text book of English Phonetics for Indian Students by T. Balasubramanian Mac Millan

I Year I Semester

L	T	P/D	C
-	-	3/2	1

(101PH71) ENGINEERING PHYSICS LABORATORY

1. Calculation of error - Error estimation.
2. Determination of wavelength of a given laser source of light by using diffraction Grating.
3. To find the frequency of a Tuning fork - Melde's Experiment.
4. To find the frequency of ac signal generator - A.C. Sonometer.
5. Electrical conductivity of a given material
6. To study the Characteristics of a Thermistor.
7. R.C. Network.
8. L.C.R. series and parallel resonance.
9. Energy gap of a semiconductor
10. Planck's constant

I Year I Semester

L	T	P/D	C
-	-	3/2	1

(101CH71) ENGINEERING CHEMISTRY LABORATORY**Chemistry Experiments: Minimum any Six of the following Experiments**

1. Estimation of MnO_2 in Pyrolusite.
2. Estimation of Hardness of water.
3. Estimation of Mn^{+2} / Cu^{+2} ions by colorimetry.
4. Estimation of acid by conductometric titrations.
5. Estimation of acid by potentiometric titrations.
6. Determination of viscosity.
7. a) Preparation of Aspirin
b) Preparation of Polymer (Thiokol rubber).
8. Determination of Flash and Fire point of a fuel using Abel's / Pensky – Martin's Apparatus.
9. Determination of Calorific value of a solid fuel by Bomb Colorimeter.
10. Grease penetration Test.

I Year I Semester

L	T	P/D	C
-	-	3	2

(101IT71) COMPUTER PROGRAMMING LABORATORY**1. Unit I (Cycle 1)**

- 1.1. Write an algorithm for converting a given Celsius temperature to its equivalent Fahrenheit temperature and draw a flowchart using RAPTOR tool and test it using the data: 0°C , 35°C , 55.35°C , and 100°C .
- 1.2. Write an algorithm to find the largest of three given numbers and draw a flowchart using RAPTOR tool and test it for data: (5, 7, 2), (3.5, 5.8, 9.2), (112, 19.6, 82.7).
- 1.3. Write an algorithm and draw a flowchart for finding the roots and nature of roots of a quadratic equation, given its coefficients and test it for data: (1, 3, 2), (2, 1, 6), (6, 5, 1).

2. Unit I (Cycle 2)

- 2.1. Write an algorithm and draw a flowchart for computing the sum of the digits of a given integer and test it for the data: 3259, 89725, 10092.
- 2.2. Write an algorithm and draw a flowchart to test whether a given integer is a prime number or not. Test for the data: 29, 35, 89.
- 2.3. Write an algorithm and flowchart for printing the first n Fibonacci numbers, give n. Test using the data: 10, 25, 50.

3. Unit II (Cycle 3)

- 3.1. Write an algorithm, flowchart, and C program for:
 - 3.1.1. Finding the area and circumference of a circle of given radius.
 - 3.1.2. Finding the volume of a sphere of given radius.
 - 3.1.3. Finding the lateral surface area of a right circular cone of given base radius and height.
 - 3.1.4. Finding selling price of an item, given its cost price and profit percent.
 - 3.1.5. Finding the interest on a given principal for a given period of time at a given rate of per year.
- 3.2. Write a C program to display all the sizes of data types in C.
- 3.3. Write a C program to display a given decimal integer into an equivalent octal number and hexadecimal number.

4. Unit II (Cycle 4)

- 4.1. Write a C program to find the roots and nature of the roots of a quadratic equation, given its coefficients.
- 4.2. Write a C program for finding the largest of three given numbers.
- 4.3. A salesman gets a commission of 5% on the sales he makes if his sales is below Rs.5000/- and a commission of 8% on the sales that exceeds Rs.5000/- together with Rs.250/-. Write an algorithm or a flowchart and develop C program for computing the commission of the salesman, given his sales.

5. Unit II (Cycle 5)

- 5.1. Write a program that reads a letter given by the user and prints whether it is a vowel or not.
- 5.2. An institution gives grades to its students as follows:
 - a. Grade A if he gets 80 or more marks
 - b. Grade B if he gets between 60 and 79 (both inclusive)
 - c. Grade C if he gets between 50 and 59 (both inclusive)
 - d. Grade D if he gets between 40 and 49 (both inclusive)
 - e. Grade F otherwise.
 Marks of student are always an integer ranging from 0 to 100. Use case structure to print the grade obtained by the candidate, given his marks.
- 5.3. Write three C programs to print a multiplication table for a given number using while, do..while, and for loops.

6. Unit II (Cycle 6)

- 6.1. Write a C program to compute the sum of:
 - 6.1.1. $1+x+x^2+x^3+\dots+x^n$, given x and n.
 - 6.1.2. $1!+2!+3!+\dots+n!$, given n.
 - 6.1.3. $1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10! + \dots$ to n terms where the n^{th} term becomes less than 0.0001.
- 6.2. Write a C program in the menu driven style to perform the operations +, -, *, /, % between two given integers.
- 6.3. Write a C program to find the largest and the least of some numbers given by the user.

7. Unit III (Cycle 7)

7.1. Write C functions for the following:

- 7.1.1. A function that takes an integer n as argument and returns 1 if it is a prime number and 0 otherwise.
- 7.1.2. A function that takes a real number x and a positive integer n as arguments and returns x^n .
- 7.1.3. A function that takes a positive integer n as an argument and returns the n^{th} Fibonacci number.

7.2. Using recursion write C functions for the following:

- 7.2.1. Factorial of a non-negative integer n .
- 7.2.2. Number of combinations of n things taken r at a time.
- 7.2.3. Greatest Common Divisor of two integers.
- 7.2.4. Least Common Multiple of two integers.

8. Unit III (Cycle 8)

- 8.1. Write a menu driven style program to compute the above functions (cycle 7) on the choice of the function given by the user.
- 8.2. Write a C program to solve the problem of Towers of Hanoi.
- 8.3. Write a program to generate Pascal's triangle.
- 8.4. Write a program to count the number of letters, words, and lines in a given text.

9. Unit III (Cycle 9)

- 9.1. Write a program to store the numbers given by the user in an array, and then to find the mean, deviations of the given values from the mean, and variance.
- 9.2. Write a C program to initially store user given numbers in an array, display them and then to insert a given number at a given location and to delete a number at a given location.
- 9.3. Write a program to store user given numbers in an array and find the locations of minimum and maximum values in the array and swap them and display the resulting array.
- 9.4. Define macros for the following and use them to find sum of the squares of the minimum and maximum of two given numbers.
 - 9.4.1. Larger of two numbers.
 - 9.4.2. Smaller of two numbers.
 - 9.4.3. Sum of the squares of two numbers.

10. Unit IV (Cycle 10)

- 10.1. Write a function to swap two numbers.
- 10.2. Write a function to compute area and circumference of a circle, having area and circumference as pointer arguments and radius as an ordinary argument.
- 10.3. Write a C program to implement the operations of matrices – addition, subtraction, multiplication.
- 10.4. Write a program to find whether a given matrix is symmetric, lower triangular, upper triangular, diagonal, scalar, or unit matrix.

11. Unit IV (Cycle 11)

- 11.1. Define a structure for complex number. Write functions on complex numbers (addition, subtraction, absolute value, multiplication, division, complex conjugate) and implement them in a menu driven style.
- 11.2. Define a structure point. Write a program to find the distance between two points.

12. Unit IV (Cycle 12)

- 12.1. Define a structure student having members roll no., name, class, section, marks. Create an array of 10 students give the data and find the average marks, section-wise.
- 12.2. Define functions – length of the string, copy, concatenate, convert into upper case letters, compare two strings for alphabetical order – over strings and implement them in a program.

13. Unit V (Cycle 13)

- 13.1. Write a program to:
 - 13.1.1. Create a file by the name given by the user or by command line argument and add the text given by the user to that file.
 - 13.1.2. Open the file created above and display the contents of the file.
 - 13.1.3. Copy a file into some other file, file names given by the user or by command line arguments.
 - 13.1.4. Append a user mentioned file to another file.
 - 13.1.5. Reverse the first n characters of a file.

14. Unit V (Cycle 14)

14.1. Store the marks of the students of a class into file and the display the results as per the rules of your institution.

14.2. In the above file search a student by roll no. and display the particulars.

15. Unit VI (Cycle 15)

15.1. Write a program to draw figure of your liking with appropriate colors.

Write a program to implement simple bank transactions – opening an account, closing an account, deposit money into an account, withdraw money from an account, maintaining the customer database, and daybook.

I Year I Semester

L	T	P/D	C
-	-	3/2	1

(101ME71) Engineering Workshop – I

(Alternate weeks)

1. House Wiring

- To connect the Tube Light as per circuit diagram
- To connect the Calling Bell as per circuit diagram

2. Home Appliances

Study of circuits and systems used in various home appliances such as Fans, Mixers, Washing machines etc.,

3. Welding

- To prepare a Lap Joint
- To prepare a Butt Joint

4. Machine Shop (demonstration)

Operations performed on Lathe, Drilling, Milling and grinding machines

I Year I Semester

L T P/D C
- - 3/2 1

(101IT72) IT WORKSHOP – I
(Alternate weeks)

Week 1 : Introduction to computers, identify the peripherals of a computers, componenets in a CPU & its functions, draw the block diagram of the cpu along with the configuration of each peripherals.

Week 2 : disassemble & assemble the PC back to working condition [video, manual], Hardware troubleshooting.

Week 3 Introduton to operating system [Basics], Installation of Windows XP.

Week 4 : DOS (Internal & External) commands, work on that commands, comparisions of windows & open source OS.

Week 5 :Installation of Linux O.S [Advanced debian, ubuntu], Basic Linux Commands, work on that commands.

Week 6 : Software troubleshooting, Identify the system software problems & fix it to get the computer back to working conditions.

Cyber Hygeine : Installation of Antivirus software, Configure their personal firewall & windows update on their computer, customize the browsers to block POP UPS, block active x downloads to avoid viruses and worms.

Week 7 : Introduction to Internet & LAN

Browsing the Net : Connect the LAN and access the Internet, Know how to acces the websites and email.

Search Engines:

Introduction to search engines, types of search engines, uses of search engines, how to use search engine. Give few topics to students for which they need to search on GOOGLE.

I Year II Semester

L T P/D C
2 - -- 2

(101EN02) ENGLISH – II
(English Language Teaching Through Literature)

UNIT – I :

1. Speech : Swami Vivekananda
2. Short Story : The Lottery Ticket: Anton Chekhov
3. Letter Writing

UNIT – II :

1. Speech : Polonious Speech –An extract from Shakespeare’s *Hamlet*
2. Short Story : Ha’ Penny – Alan Paton
3. Sentence Construction

UNIT – III :

1. Biography : Sam Pitroda
2. Short Story : Subha – Rabindranath Tagore
3. Letter : Abraham Lincoln’s Letter to His Son’s Teacher

UNIT – IV :

1. Biography : Mother Theresa
2. Short Story : The Only American From Our Village by Arun Joshi
3. Note-Making

UNIT – V :

1. Poem : The Gift of India – Sarojini Naidu
2. Short story : Diamond Rice - Ranga Rao S.S
3. Analogies

UNIT –VI :

1. Poem : La Belle Dame sans Merci – John Keats
2. Short Story : Luck – Mark Twain
3. Reading Comprehension

TEXT BOOKS:

1. Inspiring Speeches and Lives; B. Yadava Raju, Maruthi Publications, Guntur.
2. Vignettes of Life (A collection of short stories by T. Padma), McMillan India Ltd.

REFERENCES:

1. Barron’s TOEFL; Barron, Galgotias Publication Pvt. Ltd.
2. A Modern Approach to Verbal And Non Verbal Reasoning – R S Aggarwal, S.Chand Publications.

I Year II Semester

L	T	P/D	C
3	1	--	3

(101CS01) DATA STRUCTURES AND C++**UNIT – I**

Introduction to data structures: Abstract data type(ADT), Stacks and Queues circular queues and their implementation with arrays.Stack applications: infix to post fix conversion, postfix expression evaluation. Applications of queues.

UNIT – II

Singly linked lists, doubly linked lists, circular list and their operations, representing stacks and queues with linked lists.

UNIT – III

Trees- Binary trees, terminology, representation, traversals, Minimal Spanning trees.
Graphs- terminology, representation, graph traversals (dfs & bfs).

UNIT - IV

Searching - Linear and binary search methods.
Sorting - Bubble sort, selection sort, Insertion sort, Quick sort, merge sort.

UNIT – V

Introduction to c++ programming-object oriented programming concepts, Structured Vs OOP.
Classes and objects-class definition, Objects, class scope and accessing members, access functions and utility functions.

UNIT – VI

Constructors-default constructor, parameterized constructor, constructor initialization list, copy constructor.
Destructors, Static class members this pointer, friend functions and classes, Dynamic memory management with operators new and delete.

Overloading-function overloading, Operator overloading, restrictions on operator overloading, overloading unary and binary operators, type conversion, templates, inheritance.

TEXT BOOKS :

- 1.Data Structure Through C by Yashavant Kanetkar.
- 2.The complete reference C++ By Herb Schildt.

REFERENCES :

1. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft. *Data Structures and Algorithms*. Addison Wesley, 1983.
2. Data Structures using c Aaron M.Tenenbaum , Yedidyah Langsam,Moshe J Augenstein.
3. Introduction To Data Structures In C By Kamtane

I Year II Semester

L	T	P/D	C
3	1	--	3

(101ME02) ENGINEERING DRAWING-II
(Common to all Branches)

UNIT – I

INTERSECTION OF SIMILAR SOLIDS:

Line method, Cutting plane method, Intersection of prism Vs prism, Cylinders Vs Cylinder, Cone Vs Cone

UNIT – II

INTERSECTION OF DIS-SIMILAR SOLIDS:

Cylinder Vs prism, Cylinder Vs cone, Cone Vs Prism

UNIT – III

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.

UNIT –IV

TRANSFORMATION OF PROJECTIONS: Conversion of Orthographic Views to Isometric Views and Vice-Versa.

UNIT –V

PERSPECTIVE PROJECTION:

Principle, Perspective elements, Perspective View of Points, Lines, Plane Figures and Simple Solids, Vanishing Point Method, Visual ray method.

UNIT –VI

Introduction to computer aided Drafting: Generation of points, lines, curves, polygons, simple solids, dimensioning.

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhat / Charotar
2. Engineering Drawing, Narayana and Kannaiah / Scietech publishers.

REFERENCES:

1. Engineering graphics with Auto CAD- R.B Choudary / Anuradha Publishes
2. Engineering Drawing, K.Venugopal/G.Sreekanjana, New Age International Publishers.

I Year II Semester

L	T	P/D	C
3	1	--	3

(101EE41) BASIC ELECTRICAL ENGINEERING
(Common to MECH, CSE, IT, BT)

Unit – I: Introduction to electrical Engineering: Ohm’s Law, basic circuit components, Kirchhoff’s Laws. Types of sources, source transformation, Voltage – current relationship for passive elements. Series parallel circuits, star delta and delta star transformation. Network theorems, superposition, Thevenin’s Maximum power transfer theorems and simple problems. Faradays laws of electromagnetic induction, concept of self and mutual inductance.

Unit – II: Principle of ac voltage, waveforms and basic definitions, r.m.s. and average values of alternating currents and voltage, form factor and peak factor, phasor representation of alternating quantities, the J operator and phasor algebra, analysis of ac circuits with single basic network element, single phase series circuits.

Unit – III: DC Generators: Principle of operation of dc machines, types of D.C. generators, e.m.f equation of D.C. Generator. Principle of operation of dc motors, types of D.C. motors, losses and torque equation, losses and efficiency calculation in D.C. Generator.

Unit – IV: Transformers : Principles of operation, Constructional Details, Ideal Transformer and Practical Transformer, Losses, Transformer Test, Efficiency and Regulation Calculations (All the above topics are only elementary treatment and simple problems)

Unit – V: A.C. Machines: Three phase circuits – phase sequence, star and delta connection, relation between line and phase voltages and currents in balanced system. Three phase induction motor, principle of operation, slip and rotor frequency, torque (simple problems).

Unit – VI: Basic Instruments: Introduction, classification of instruments, operating principles, essential features of measuring instruments, Moving coil permanent magnet (PMMC) instruments, Moving Iron of Ammeters. And voltmeters (elementary Treatment only).

Text Books:

1. Basic electrical Engineering – By M.S.Naidu and S.Kamakshiah – TMH
2. Basic Electrical Engineering – By T.K.Nagesarkar and M.S.Sukhja Oxford University Press.

References:

1. Theory and problems of Basic electrical Engineering by D.P.Kotahari & L.J.Nagrath PHI.
2. Principles of Electrical Engineering by V.K.Mehta, S.Chand Publications.

I Year II Semester

L	T	P/D	C
3	1	--	3

(101MA04) MATHEMATICS FOR BIOTECHNOLOGY - II

UNIT – I: Review of Differential equations Ordinary Different equations, review, exact, linear and Bernoullis Equation, applications to Newton’s law of cooling, law of natural growth and decay, orthogonal trajectories and geometrical applications

UNIT – II: Higher Order Differential Equations Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x , $e^{ax} V(x)$, $x V(x)$, Methods of variation of parameters. Solving of simultaneous Differential Equations. Simple Applications of Second order Differential Equations.

UNIT – III: Introduction to Partial differential Equations, solutions to first order linear and non-linear equations, classification of second order linear PDE, separation of variables method

UNIT- IV: Fourier series Fourier series of functions in the interval $(0, 2\pi)$ $(-\pi, \pi)$. Fourier series of even and odd functions. Half- Range series,

UNIT – V: Laplace transforms Laplace transform of standard functions – inverse transform – First shifting theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem - Dirac’s delta function, Inverse laplace transforms Shifting Theorems,– Periodic function – Differentiation and integration of transforms, Partial fractions, convolution theorem – Application of Laplace transforms to ordinary differential equations.

UNIT – VI: Vector Calculus: Gradient, divergence, curl and their related properties, Laplacian and second order operators, line integral, surface integral, Stoke’s and Gauss’ divergence thoerems

Text Books :

1. Higher Engineering Mathematics, B.S.Grewal.
2. Engineering Mathematics, B.V.Ramana

Reference Books:

1. Advanced Engineering Mathematics, Jain & SRK Iyengar, Narosa Publications
2. A text Book of KREYSZIG’s Engineering Mathematics, Dr. A. Ramakrishna Prasad, Wiley Publications

I Year II Semester

L	T	P/D	C
3	1	--	3

(101BT02) PROCESS ENGINEERING CALCULATIONS

UNIT-I: Introduction to Engineering calculations: measurement conventions, density, mole, chemical composition, mass fraction, mole fraction, volume fraction, standard conditions and ideal gas, physical and chemical property data, Technique of solving problems, the chemical equation and stoichiometry.

UNIT-II: Properties of gases, liquids and solids, ideal gaseous mixtures, real gas relationships, equations of state, compressibility factors, vapor pressure, its change with temperature and pressure, saturation, partial saturation and humidity

UNIT-III: Material Balances: Conservation of mass, types of material balance, procedure for material balance calculations, application of material balance to filtration, mixing, fermentation, distillation, evaporation, crystallization, drying. Material balance with recycle, by-pass and purge systems, Material balance with chemical reaction.

UNIT-IV: Energy balances: Intensive and extensive properties, enthalpy, calculation of enthalpy changes, general energy balance equations, enthalpy calculation procedures, state properties, non-reactive and reactive systems, change of phase, mixing and solution, energy balance calculations without reaction, heat of combustion, heat of reaction at nonstandard conditions, heat of reaction for processes with biomass production, energy balance for cell cultures, basic numerical calculations

UNIT-V: Combined material and energy balances: simultaneous material and energy balances of steady state, enthalpy-concentration charts-construction and application, graphical use of enthalpy-concentration charts, humidity charts and their use, some examples

UNIT-VI: Unsteady state material and energy balances: Unsteady state material and energy equations, material balance in batch distillation, with chemical reaction, unsteady state energy balance with graphical integration, unsteady state equation for biological systems in CSTR, fed batch and plug flow reactors

TEXT BOOKS:

1. Himmelblau, "Basic Principles and calculations in chemical engineering", VI ed. Prentice Hall.1999.
2. Pauline M Doran, " Bioprocess Engineering Principles", Academic Press,1995.

References:

1. Bhatt and Vora "Stoichiometry", IV ed. Tata McGraw Hill 2006.
2. Himmelblau, "Basic Principles and calculations in chemical engineering", I ed. Prentice Hall.1999.

I Year II Semester

L	T	P/D	C
4	-	--	4

(101ME05) MECHANICAL ENGINEERING FOR BIO-TECHNOLOGY**UNIT – I**

Fuels and Combustion: Introduction, Classification, Solid, Liquid and gaseous fuels, combustion equations, calorific value and its measurement, flue gas analysis by Orsat apparatus.

Internal combustion engines and gas turbines: Internal combustion engines, definitions, classification, components, working of two- stroke, four stroke cycle engines, SI and CI Engines, performance parameters, simple problems, cooling, and lubrication of IC engines.

UNIT – II

Steam generators: Classification of boilers, differences between fire tube and water tube boilers, Cochran and Lancashire boilers, Locomotive boiler, Babcock – Wilcox boiler and High pressure boilers - Benson and La-Mount boilers only.

Steam and Gas Turbines: Layout of steam power plant, types of steam turbines, differences between impulse and reaction turbines, description of impulse and reaction turbines, methods of reducing turbine speed (compounding), Schematic of gas turbine power plants - closed and open cycle types, methods to improve performance of open cycle plant.

UNIT – III

Refrigeration and Air Conditioning: Definition, Refrigeration and Air conditioning, Schematic and description of vapour compression refrigeration and vapour absorption systems, Domestic Refrigerator, Summer and winter air conditioning systems.

UNIT – IV

Pumps compressors and water turbines: Centrifugal pumps (without velocity diagrams), reciprocating pumps, types and operation classification of reciprocating compressors, stages, rotary compressors, types and operation, classification of water turbines, principle of operation of Pelton wheel, Francis turbine, Axial flow and reaction turbines.

UNIT- V

Metal casting: Casting methods and their characteristics, advantages, limitations and applications.

Welding: Types of welding - arc welding, gas welding & gas cutting, resistance welding, soldering and brazing.

UNIT - VI**Mechanical working of metals:**

Hot working and cold working processes, Press working, differences, basic processes and their characteristics, advantages, limitations and applications.

Machine Tools:

Principles of working of different types of machine tools - lathe, shaper, drilling, milling, grinding, and NC Machines - Operations performed and Applications.

TEXT BOOKS :

1. Mathur, M.L., Mehta, F.S. and Tiwari, R.P., Elements of Mechanical Engineering, Jain Brothers, New Delhi, 2005.
2. R.K. Rajput, "Elements of Mechanical Engineering", Laxmi Publications, 1994.

REFERENCES :

1. P.N.Gupta, M.P. Poonia, "Elements of Mechanical Engineering", Standard Publishers Distributors Nai Sarak, Delhi.
2. R.C.Gupta, "Mechanical Engineering", Khanna Publishers, Delhi.

I Year II Semester

L	T	P/D	C
-	-	2	1

(101EN72) ENGLISH LANGUAGE LAB-II**INTRODUCTION:**

The introduction of the English Language lab is considered essential at third 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 globalize context.

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

- Gather ideas and information, to organize ideas relevantly and coherently
- Engage in debates
- Participate in group discussions
- Face interviews
- Write project/research reports/technical reports
- Make oral presentations
- Write formal letters
- Transfer information from non-verbal to verbal texts and vice versa
- To communicate effectively in informal and formal situations

OBJECTIVES:

The 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:

1. Functional English –Starting a conversation-responding appropriately and relevantly-using the right body language-role plays based on different situations
2. Vocabulary building – Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, etymology, analogy, idioms and phrases
3. Reading Comprehension – Reading for facts, guessing meanings from the context, scanning, skimming, inferring meaning and critical reading
4. Report Writing Strategies– Types of formats and styles, subject matter – organization, clarity, coherence, and style, planning, data collection, tools and analysis
5. Debate

MINIMUM LAB REQUIREMENT:

The English language lab shall have two parts:

- a. 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.
- b. The Communication Skills lab with movable chairs and audio visual aids with a PA system. A T V, Digital stereo-audio and video system and camcorder etc.

SOFTWARE:

- ❖ Hi Class system Monitoring Software
- ❖ Globberena English Lab Plus software
- ❖ GRE Computer based test (booklet + CD)
- ❖ GMAT Computer based test (booklet + CD)
- ❖ GRE computer based test (booklet + CD)
- ❖ IELTS preparatory guide CD

REFERENCES:

1. Communicate or Collapse: A Handbook of Effective Public Speaking
2. Group Discussions and Interviews by Pushpa Lata & Kumar, Prentice Hall of India
3. Academic Writing – A practical Guide for students by Stephen Bailey, Rontledge Falmer, London and New York, 2004

I Year II Semester

L	T	P/D	C
-	-	3	2

(101CS71) DATA STRUCTURES AND C++ LABORATORY

1. Write a C program that implement stack and its operations using arrays
2. Write a C program that implement Queue and its operations using arrays.
3. Write a C program that uses Stack operations to perform the following:
 - i) Converting infix expression into postfix expression
 - ii) Evaluating the postfix expression
4. Write a C program that uses functions to perform the following operations on singly linked list.:
 - i) Creation ii) Insertion iii) Deletion iv) Traversal
5. Write a C program that uses functions to perform the following operations on doubly linked list.:
 - i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways
6. Write a C program that uses functions to perform the following:
 - i) Creating a Binary Tree of integers
 - ii) Traversing the above binary tree in preorder, inorder and postorder.
7. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers :
 - i) Linear search ii) Binary search
8. Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:
 - i) Bubble sort ii) Quick sort
9. Write C programs that implement the following sorting methods to sort a given list of integers in ascending order:
 - i) Insertion sort ii) Merge sort iii) SelectionSort
10. Write a C++ program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a,b,c and use the quadratic formula. If the descremainant b^2-4ac is negative, display a message stating that there are no real solutions.
11. A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 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.
12. Write a C++ program that checks whether a given string is pallindrome or not.

TEXT BOOKS :

- 1.Data Structure Through C by Yashavant Kanetkar.
- 2.The complete reference C++ By Herb Schildt

I Year II Semester

L T P/D C
- - 3/2 1

(101ME72) ENGINEERING WORKSHOP –II

Engineering Workshop – II
(Alternate weeks)

1. Fitting

- To make a Step Fitting as per the dimensions
- To make a Half Round Fitting as per the dimensions

2. Tin Smithy

- To prepare a T-Joint
- To prepare a Corner Joint

3. Smithy

- Fabrication of S - Shape
- Fabrication of Hook shape

4. Plumbing (demonstration)

Preparation of pipes, Elbow joint, T-joint, assembly of Gate valve, non-return valves, couplings, taps.

I Year II Semester

L	T	P/D	C
-	-	3/2	1

(101IT73) IT WORKSHOP-II
(Alternate weeks)

Week 1 : Introduction to S/W's difference b/w hardware and software. Introduction MS-Office & Latex and its importance.

Using latex & word – Accessing, overview of toolbars saving files, rulers, format painter.

Features : Formatting fonts, Drop cap, Applying text effects, character spacing, Borders, colors, inserting Header & Footer & Date & Time options.

Week 2 : Creating Project

Formatting styles, Inserting Table, Bullets & Numbering, Changing Text Direction, Cell Alignment, Footnote, Hyperlink, Symbols, Spell check, Track changes.

Creating News letters :

Table of content, Newspaper columns, Images from files & Clip Art, Drawing toolbar & Word Art, Formatting Images, Textboxes, Paragraphs & Mail merge.

Week 3 :

Basics of PP

Features : PPT Orientation, Slide layouts, Inserting Text, Word Art, Formatting Text, Bullets & Numbering, Autosshapes, Lines & Arrows, Hyperlinks, Inserting Images, ClipArt, Audio, Video, Objects, Tables & Charts, Master layouts (Slide template & Notes) types of views (basic, Presentation, slide slotter, notes), Inserting – Background, text Design Templates, Hidden slides.

Week 4 : Excel

Introduction to Excel

Features :

Accessing, Overview at toolbars, Saving excel files, Gridlines, Format cells, Summation, Auto fill, formatting text.

Week 5 :

Formula in excel – Avg, std Dev, Charts, Roaming & Inserting worksheets, Hypoer linking, count function, loopup / Vlookup, sorting, Conditional formatting.

Week 6:

Introduction to MS-Access,

Features :

Create a db, Create a table, Adding data, create Form, modify a Form, Create a query, Modify a query, create a macro.

Week 7:

Conversation Access Database to excel, Introduction of MS-Outlook – Introduction to outlook, Different views in outlook.

Features :

Reviewing msg's in the Inbox, replying to msg, forarding a msg, envelopes moving from msg to msg in the Inbox, prompting a msg, Address books, contacts, Adding Names to contacts, Personal Distribution lists, Folders Making a msg's to folders, Recovering & deleting a msg calander.

II Year I Semester

L	T	P/D	C
3	1	-	3

(101EC04) BASIC ELECTRONICS ENGINEERING

UNIT-I Electronic Ballistics : Principles of CRT (Cathode Ray Tube), Deflection, Sensitivity, Electrostatic and Magnetic deflection, Applications of CRO - Voltage, Current and frequency measurements.

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

UNIT III: TRANSISTORS-Bipolar junction transistor - CB, CE, CC - Configurations and characteristics – Biasing circuits - Field Effect Transistor - Configurations and characteristics - FET amplifier - UJT - characteristics and simple applications - switching transistors - concept of feed back - negative feed back - application in temperature and motor speed control.

UNIT IV: AMPLIFIERS-Elementary treatment of voltage amplifier - Class A, B and C power amplifiers - principles of Tuned amplifiers.

UNIT V: SIGNAL GENERATORS AND LINEAR IC'S-Sinusoidal oscillators - positive feed back - RC phase shift, Hartley, Colpitt's, Wien bridge Oscillators - multivibrators - operational amplifier - adder, multiplier, integrator and differentiators -Integrated circuits.

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

TEXT BOOKS :

1. Electronic Devices and Circuits – J.Millman, C.C.Halkias, and Satyabratha Jit Tata McGraw Hill, 2nd Ed., 2007.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall,9th Edition,2006.
3. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.

REFERENCES :

1. Microelectronics – Millman and Grabel, Tata McGraw Hill, 1988.
2. Electronic Devices and Circuits – Dr. K. Lal Kishore, B.S. Publications, 2nd Edition, 2005.
3. Electronic Devices and Circuits- Prof GS N Raju I K International Publishing House Pvt .Ltd 2006
4. Modern Digital Electronics-R.P Jain,TMH,3rd Edition

II Year I Semester

L	T	P/D	C
3	1	-	3

(101MA08) MATHEMATICAL METHODS FOR BIOTECHNOLOGY

Unit-I : Matrices and Linear systems of equations: Elementary row transformations-Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods- LU Decomposition- LU Decomposition from Gauss Elimination –Solution of Tridiagonal Systems-Solution of Linear Systems

Unit – II: Eigen values, eigen vectors: Properties – Cayley-Hamilton Theorem - Inverse and powers of a matrix by Cayley-Hamilton theorem and its applications. Diagonalization.

Unit – III: Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

Unit-IV Interpolation: Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols- Differences of a polynomial-Newton’s formulae for interpolation – Central difference interpolation Formulae – Gauss Central Difference Formulae –Lagrange’s Interpolation formula.

Unit – V: Numerical Integration: Simpsons and Trapezoidal Rule. Curve fitting: Fitting a straight line – Second degree curve-exponential curve-power curve by method of least squares.

Unit – VI: Numerical solution of Ordinary Differential equations: Solution by Taylor’s series-Picard’s Method of successive Approximations-Euler’s Method-Runge-Kutta Methods

Text Books :

1. Higher Engineering Mathematics, B.S.Grewal.
2. Engineering Mathematics, B.V.Ramana

Reference Books:

1. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt. Ltd.
2. Advanced Engineering Mathematics, Jain & SRK Iyengar, Narosa Publications
3. Engineering Mathematics, N P Bali, Laxmi Publications
4. A text Book of KREYSZIG’s Engineering Mathematics, Dr. A. Ramakrishna Prasad, Wiley Publications

II Year I Semester

L	T	P/D	C
4	1	-	4

(101BT03) BIOCHEMISTRY

UNIT I: Carbohydrates- Structure, properties, classification and biological functions- monosaccharides, disaccharides, oligo and polysaccharides, Glycolysis, aerobic and anaerobic fate of pyruvate, Respiratory chain, Aerobic and anaerobic respiration

UNIT II: Amino acids - Structure, properties, classification and biological functions- Nitrogen Cycle, Nitrogen Balance, reductive amination & Transamination & Urea cycle, Biosynthesis of amino acids - Glutamate and Shikimate pathway

UNIT III: Proteins: Structure, properties, classification and biological functions, Protein types (globular and fibrous), protein folding, protein degradation, protein targeting

Unit IV: Enzymes: Introduction, properties, classification and biological functions, IUB & EC nomenclature, enzyme specificity, enzyme inhibition, Regulatory enzymes -allosteric enzymes, enzyme catalysis-acid-base catalysis, covalent catalysis, metal ion catalysis

UNIT V: Lipids: Structure, properties, classification and biological functions- Sphingolipids, phospholipids, fatty acid metabolism, β -oxidation, Steroids, cholesterol structure and function. Lipoproteins – classification & function, Lipid Profile assays, Lipids as surfactants in industry

UNIT VI: Nucleic Acids: Structure, properties and biological functions, Forms of DNA and RNA, purine and pyrimidine metabolism

TEXT BOOKS:

1. Lehninger A.L, Nelson O.'L, M.M. Cox, Principles of Biochemistry, 3rd Edition, 2000 CBS Publications, 1993. ,
2. Fundamentals of Biochemistry J.L. Jain S. Chand Publishers

REFERENCES:

1. Voet D, Voet J. G, Biochemistry, Second Edition, John C Wiley and Sons, 1994.
2. L. Stryer, J.M. Berg, JL Tymoczko Biochemistry 5th edition, WH Freeman & Co 2002.
3. Biochemistry by K. Mathews, K.E. Van Holde, Kevin G Ahern, Pearson Education.
4. Protein's Structure and function. Daviel Whitford John Wiley Publications.
5. Biochemistry by Cristopher K.Mathews, K.E.Van Holde, Pearsons education.
6. Principles of Biochemistry, Horton,Moran,Scrimgeour, Printice Hall,4th edition, 2006.

II Year I Semester

L	T	P/D	C
3	1	-	3

(101BT04) MICROBIOLOGY

UNIT I: Introduction To Microbiology: Pioneers and their discoveries in Microbiology: Antony von Leuwenhoeck, Louis Pasteur, Edward Jenner etc, Theory of spontaneous generation, Germ theory of diseases, Major contributions and events in the field of Microbiology, Scope and relevance of microbiology

UNIT II: Major Groups Of Microorganisms: General characteristics of Bacteria, Archaea and Eubacteria, Classification systems-Phylogenetic, Phenetic, Taxonomic ranks, Major characteristics used in Taxonomy-Morphological, Physiological, Ecological, Biochemical, Immunological, Genetical and Molecular

UNIT III: Nutrition and Cultivation:

a) Nutrition of microorganisms, nutritional classes of microbes, Macro and micro nutrients, their sources and physiological functions of nutrients, Growth factors and their functions in metabolism, Aerobic and anaerobic metabolism

b) Cultivation of microorganism: culture media, synthetic, complex media, solidifying agents, types of media-selective, differential and enrichment and enriched media, pure culture methods-spread plate, pour plate and streak plate, special techniques for cultivation of anaerobes

c) Influence of environmental factors on growth-solutes, water activity, pH, temperature, oxygen, osmotic pressure, radiation etc

UNIT IV: Bacterial Growth and Control:

a) Physiology of growth, bacterial growth curve, methods for determining bacterial numbers, mass and cell constituents. Exponential growth and generation time. Bacterial growth in batch and continuous culture (chemostat and turbidostat) synchronous growth

b) Control of microorganisms-General concepts, Inhibition of growth and killing, sterilization and disinfection: physical (moist and dry heat, radiation and filtration), chemical (disinfectants, antiseptics, antibiotics and other chemotherapeutic agent), antiseptics, sanitation, Evaluation of antimicrobial activity- bacteriostatic and bacteriocidal

UNIT V: Identification, Control and Preservation of Microbes:

a) Microbe shapes and Colony characteristics, staining techniques, Fixation, Principle dyes, simple staining, differential staining, spore staining, flagellar staining

b) Biochemical tests-Sugar fermentations, IMVIC tests, Catalase production

c) Preservation of Microorganisms: working and primary stock cultures, agar slants, agar stabs, spore preparation, use of sterile soil, cryopreservation, Lyophilization, Application and limitation of various methods

UNIT VI: Introduction to Viruses: Virus properties, Structure of viruses, Classification of viruses-Bacteria, plants and animals, Viral replication, Bacterial, plant and animal replication in cytoplasm and nucleus with 1 example each (DNA and RNA viral replication), Cultivation of viruses-overview, Applications of Viruses in Biotech Industry

TEXT BOOKS:

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

REFERENCES:

1. Biology of Microorganisms. BROCK, Prentice Hall, International Inc.
2. General Microbiology. Hons. G.Schlege. Combridge university press.
3. General Microbiology. Roger Y stanier, Macmillan.

II Year I Semester

L	T	P/D	C
3	1	-	3

(101BT05) CELL BIOLOGY**UNIT I: Introduction to Cell**

Discovery of cells; Basic properties of cells; Cell theory; Cell complexity – Cell size & shape; Different classes of cells; Prokaryotic & Eukaryotic cells

UNIT II: Cell Composition

Chemistry of the cell- Importance of carbon and water; Plasma membrane- structure and function; Cytoplasm; Cytoskeleton - Microtubules, microfilaments & intermediate filaments, cell motility – cilia & flagella

UNIT III: Cell Organelles

Structure and functions of Nucleus, Endoplasmic Reticulum, Golgi complex, Lysosomes, Peroxisomes, Chloroplast & Mitochondria. Protein Glycosylation, Intracellular protein traffic & targeting.

UNIT IV: Membrane Transport

Passive and Active Transport, Uniport, Symport, Antiport, Permeases, P- Type & V- Type Pumps, Na⁺/K⁺ ATPase, Lysosomal & Vacuolar membrane ATP dependent Proton Pumps, Endocytosis and Exocytosis, Transport into Prokaryotic Cells

UNIT V: Cell Cycle & Regulation

Overview of the Cell Cycle, Interphase, Mitosis, Meiosis & Cytokinesis. Animal Cell & Yeast Cell Division, Cell Cycle Control & Checkpoints, General Characteristics of Cell Differentiation, Embryonic and adult stem cells and its Biological Importance. Characteristics of Cancer cells, Benign & Malignant tumor, Metastasis

UNIT VI: Receptors & Signal Transduction

Intracellular signaling, types of signal receptors - Cytosolic, Nuclear & Membrane bound receptors, Chemo receptors of Bacteria (Attractants & Repellents), Signal Transduction by hormones - Steroid / Peptide hormones; Concept of Secondary messengers, cAMP, cGMP, Protein Kinases, G Proteins; Receptors & Non - receptors associated tyrosine kinases.

TEXT BOOKS:

- 1) The Cell by Cooper.
- 2) Cell and Molecular biology – De Robertis and De Robertis (1998) Waverly Pvt. Ltd.

References:

- 1) Cell & Molecular Biology by Gerald Karp (2nd Ed.) Wiley publishers.
- 2) The World of the cell by Becker, Reece, Poenie (3rd edition) Benjamin Publishers.
- 3) Molecular Biology of the cell by Bruce Alberts.
- 4) The Biochemistry of Cell Signalling-Ernst J.M.Helmreich. Oxford Press.

II Year I Semester

L	T	P/D	C
3	1	-	3

(101BT06) THERMODYNAMICS FOR BIOTECHNOLOGISTS

Unit-I: First law of Thermodynamics, basic concepts, control-mass analysis of elementary processes, calculation of work, energy and property changes in reversible processes, control-mass analysis of transient flow processes, control-volume analysis of steady-flow and transient flow process.

Unit-II: Second law of Thermodynamics, heat engine, heat pump, Statements of Kelvin-Planck and Clausius, Carnot cycle, thermodynamic temperature scale, Clausius inequality, entropy and its calculation, entropy change for an ideal gas, principle of entropy increase, second law for a flow process.

Unit-III: Power and refrigeration cycles Carnot cycle on a T-S diagram, Carnot power cycle, Rankine cycle, practical rankine cycle, internal combustion engines, Otto cycle, Diesel cycle Refrigeration cycles, calculation of COP, vapor –compression cycle, absorption refrigeration.

Unit-IV: Estimation of thermodynamic properties using equations of state; Maxwell relationships and their applications; Calculation of flow processes based on actual property changes, Residual properties, Partial molar properties.

Unit V: Concepts of chemical potential and fugacity, Ideal and non ideal solutions, Gibbs Duhem equation; Excess properties of mixtures: Activity Coefficient, Criteria for phase equilibrium; Vapour-liquid equilibrium calculations for binary mixtures, liquid –Liquid equilibrium and Solid –liquid equilibrium.

Unit VI: Equilibrium criteria for homogeneous chemical reactions, Evaluation of equilibrium constant and effect of pressure and temperature on equilibrium constant, Calculation of equilibrium conversions and yields for single and multiple chemical reactions.

TEXT BOOKS:

- 1.Y.V.C.Rao Chemical Engineering Thermodynamics, University Press.
- 2.J.M.smith, H.C.Van Ness and M.M.Abbott. Introduction to chemical Engineering Thermodynamics McGraw Hill.

References:

1. P.K.Nag “ Engineering thermodynamics” ,The McGraw Hill Companies, IV ed.

II Year I Semester

L	T	P/D	C
-	-	2	2

(101EN73) FUNCTIONAL AND COMMUNICATIVE WRITTEN ENGLISH**COURSE DESCRIPTION**

This course provides a platform to the learners to practice written communication to excel and sustain in the industry. It emphasizes on the techniques of collecting, organizing, and presenting the information in formal settings. The focus is also on the use of appropriate vocabulary using different formats and templates to communicate in different professional situations.

LEARNING OBJECTIVES

By the end of this course, students will be equipped with:

1. Good written communication skills
2. Will perform all written tasks with clarity and coherence
3. Effective written employment communication
4. Report Writing and documentation skills
5. Become adept using electronic communication

UNIT I :**An introduction to Technical writing**

- **The writing process: an overview**
- **The process in practice**
- **Objectives in Technical Writing**

UNIT II :**Correspondence**

- **Memos**
- **Letters**
- **Résumé**

UNIT III :**Visual Appeal**

- **Document Design**
- **Graphics**
- **Three dimensional graphics**
- **Criteria for effective graphics**
- **Types of graphics**

UNIT IV :**Electronic Communication**

- The Internet- The “Information Superhighway”
- The Internet – A Company’s Internal Web
- The Extranet – A Web within a Web

UNIT V:

Technical Applications

- **Technical Description**

- **Instructions and User's Manuals**

UNIT VI:

Report Strategies

- **The Summary**

- **Reports**

- **Proposals**

TEXTBOOK:

1. Technical Writing: Process and Product by Sharon J Gerson; Fifth edition. Pearson Publishers.

REFERENCES:

1. Strategies for Engineering Communication: Stevenson Susan and Steve Whitmore: Wiley, India.
2. Technical Report Writing Today
3. How to build a better vocabulary –Nurnberg Maxwell & Morris Rosenblum: Grand Central Publishing
4. Six weeks to words of power –Funk Wilfred: W.R.Goyal Publishers & Distributors
5. Word power made easy – Norman Lewis
6. Norman Lewis, How to read better and faster: W.R.Goyal Publishers, New Delhi

II Year I Semester

L	T	P/D	C
-	-	3	2

(101BT71) BIOCHEMISTRY LABORATORY

1. Units, Volume & Weight measurements. Concentration units, pH Measurement. Preparation of buffers
2. Qualitative analysis of carbohydrates
3. Quantitative estimation of Reducing sugars by the DNS / Benedict's method.
4. Qualitative analysis of Amino Acids
5. Quantitative estimation of Amino Acids by Ninhydrin method
6. Quantitative estimation of Proteins by Biuret /Lowry method
7. Saponification value of oils
8. Quantitative estimation of cholesterol
9. Qualitative analysis of nucleic acids
10. Quantitative Estimation of DNA/RNA
11. Biochemical Preparation of Glycogen, β -Carotene, Lycopene
12. Isolation of urease / alkaline phosphatase

TEXT BOOK:

1. Laboratory Manual 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.

II Year I Semester

L	T	P/D	C
-	-	3	2

(101BT72) MICROBIOLOGY AND CELL BIOLOGY LABORATORY

1. Introduction to microscope and Sterilization techniques (lecture/demonstrations)
2. Identification of Animal, Plant and their cell organelles
3. Identification of Bacterial cells by simple staining
4. Micrometry
5. Examination of different stages of mitosis in onion root tips
6. Identification of microorganisms by differential staining – Grams
7. Identification of sporulating bacteria by staining with malachite green
8. Determination of motility of bacteria by hanging drop method
9. Preparation of culture Media – Agar & Broth
10. Culturing of microorganisms: (a) Broth (b) Pure culture techniques:- Streak plate, pour plate methods, spread plate techniques
11. Biochemical testing of bacteria - IMVIC test, Catalase test, Coagulase test, Gelatinase test, Oxidase test.
12. Determination of Bacterial growth curve
13. Factors effecting the bacterial growth – effects of temperature, pH.
14. Determination of colony count and cell number of bacteria
15. Antibiotic test - Disc diffusion method, minimum inhibitory concentration.
16. Microbiological examination of water by MPN method

TEXT BOOKS:

1. Microbiological and applications, Laboratory, Manual in General Microbiology by Benson, Mc Graw Publications.
2. Laboratory exercises in Microbiology by Prescott – Harley, 5th edition, 2002

REFERENCES:

1. J.G. Cappucin and N. Sherman, A Laboratory manual, 4th edition, Addison & weslay, 1999.
2. Practical Manual in microbiology, Plant tissue culture and pathology – K.R. Aneja , New age Publication, 2001

II Year II Semester

L	T	P/D	C
3	1	-	3

(101CH03) ENVIRONMENTAL STUDIES

UNIT I: ECOLOGY AND ECOSYSTEMS: Component of nature, Definition, S Scope and importance, Eco system Definition and concept, Structure and function, Food chain and food web, Ecological pyramids, Biogeo chemical cycles, Ecological niche and succession, Classification (forest, grass land, desert, pond, river, marine, estuarine, wet lands). Environmental organizations (UNEP, WWF, IPCC, MOEN, TERI), Environmental activists- Sunderlal Bahuguna , Baba Amte, Anna Hazare, Medha Patkar, Arundathi Roy, AL Gore.

UNIT II: METAL IONS IN BIOLOGICAL SYSTEM: Nitrogen Fixation, Oxygen transport (Hemo globin, Mayoglobin), Electron transfer reaction, Porphyrines (Chlorophyl), Metallo enzymes, photo system (PSI, PS II).

UNIT III: ENVIRONMENTAL CHEMISTRY: Atmosphere definition, layers, state(weather and climate) acid rain, Green house effect, PAN, Smog, Preliminary concepts of climate change, Ozone layer depletion, Seasons in India, Monsoons, El Nino, ENSO, Global warming, Kyoto protocol, Montreal Protocol, Carbon Trading, Hydrosphere-definition, Types (surface and ground water), Distribution, Water conservation, Use and over exploitation, Floods, Drought, dams-benefits and problems, Conflicts over water, Litho sphere- chemical composition of earth (core,montle,crust), Minerals resources- Environmental Effects of mining, Rocks and Soils, Plate tectonics.

UNIT IV: BIO DIVERSITY AND ITS CONSERVATION: Introduction, Definition, Genetic species and Eco system diversity, Value of bio diversity, Hot spots, Threats to bio diversity, Conservation strategies: Insitu and Exsitu conservation, Biological Diversity Act 2002, Wild life Protection Act.

UNIT V: ENVIRONMENTAL POLLUTION: Air pollution definition, causes, Effects and Control measures, Environment protection Act, Air (prevention and control of pollution) Act 1981, Case study: Bhopal gas tragedy, London Smog, Chernobyl disaster, Water pollution- Definition, types, Characteristics of domestic and industrial effluents-water quality parameters, BOD, COD, DO, Drinking Water treatment and Standards.

UNIT VI: POLLUTION CONTROL: Waste water treatment, Case studies: Ganga water pollution, Mercury pollution- Minamatabay disease, Water (prevention and control of pollution) Act 1974, Definition, Causes, Effect and Control measures: Soil pollution, Noise Pollution and Marine Pollution, Waste management- Solid waste Hazardous waste and E-Waste Management, Disaster Management Floods, Earth quakes and Cyclones.

Text Books

1. INTRODUCTION TO ENVIRONMENTAL SCIENCE –by Dr.Y.Anjaneyulu, B.S.Publications 2004.
2. ENVIRONMENTAL STUDIES by Erach bharucha 2005, University grants commission, University press.

Reference Books

3. ENVIRONMENTAL SCIENCES-A NEW APPROACH by Purohit, shammi and Agarwal, Agrobios (India) 2004.
4. ENVIRONMENTAL SCIENCES-A Text book for Undergraduate by Dr. K.Mukkanti, S. Chand & Company Ltd., 2010.

II Year II Semester

L	T	P/D	C
3	1	-	3

(101MA11) PROBABILITY AND STATISTICS FOR BIOTECHNOLOGY**UNIT – I**

Probability Sample spaces and Events – Counting – Probability – The Axioms of probability – some Elementary Theorems – Conditional probability – Baye’s Theorem .

UNIT – II

Probability Distributions Random variable – Discrete and continuous – Distribution – Distribution function – Distributions, Expectation. Binomial, Poisson and normal distributions – related properties.

UNIT – III

Sampling Distributions: Populations and samples – Sampling distribution of the Mean (known) – The sampling distribution of the mean (unknown), proportions, sums and differences . Applications of central Limit Theorem

UNIT – IV

Estimation: Point estimation – Interval estimation – Bayesian estimation

Inferences Concerning Means And Proportions : Tests of Hypotheses, type –I and type-II errors, , Hypotheses concerning means and proportions for large size samples

UNIT – V

Test of significance-Student t-test, F-tests, χ^2 test, goodness of fit, independence of attributes.

UNIT – VI

Linear Programming: Introduction, Formulation of LPP ,Graphical method, Simplex method, Big-M method, Two Phase Method, Duality Principle.

Text Books:

1. Higher Engineering Mathematics, B.S. Grewal , Khanna Publications, New Delhi.
2. Engineering Mathematics, B.V.Ramana, Tata McGraw Hill Publishing Company Ltd.

Reference Books:

1. Probability and Statistics for Engineers: Miller and John E. Freund, PHI Publishers, 6th Edition.
2. Probability and Statistics –M.Venkata Krishna & G.Shankar Rao, BS Publications
3. Fundamentals of Mathematical Statistics: Gupta and Kapoor – S. Chand and Co.
4. Probability and Statistics for Engineers- Walpole and Meyer.

II Year II Semester

L	T	P/D	C
3	1	-	3

(101BT07) MOMENTUM AND HEAT TRANSFER IN BIOPROCESS**Relevant basic numerical problems should be dealt in the units**

Unit-I : Units and dimensions, classification of fluids, fluid statics, energy balance in fluid flow through pipes and conduits, Bernoulli's equation and its application, flow measuring devices-manometers, orifice and venturimeter and Rota meter.

UNIT-II: Flow through pipes, average velocity, flow regimes boundary layer concepts, laminar and turbulent flow, Reynolds number, pressure drop in laminar and turbulent flows, friction factor chart, losses in pipe fittings, flow through porous media.

UNIT-III: Rheology of fluids- Newton's law of viscosity, concepts of Newtonian and Non-Newtonian fluids, classification, two parameter models, viscosity measurement, factors affecting broth viscosity, mixing equipment, flow patterns, mechanism of mixing and power requirements.

UNIT-IV: various modes of heat transfer, their mechanism, 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.

UNIT-V: Convection-Dimensional analysis, forced convection in pipes and other geometries, natural convection-various correlations for evaluating the heat transfer coefficients.

UNIT-VI: Analogy between heat, mass and momentum transfer. Applications of heat transfer in bioprocessing batch sterilization and design of continuous sterilizer, overview of various types of heat exchangers, concept of LMTD, types of evaporators.

TEXT BOOKS:

1. Smith J.C.Hrriot P "Unit Operations of chemical Engineering " Mc. Cabe W.L.,Mc.Graw Hill, 3rd ed., 1993.
2. Pauline M Doran," Bioprocess Engineering Principles", Academic Press,1995.

References:

- 1.. Christie.J.Geankoplis "Transport processes and separation process principles" Prentice Hall Professional Technical Reference, 2003
2. D.G.Rao "Introduction to Biochemical Engineering" Tata McGraw-Hill, 2005

II Year II Semester

L	T	P/D	C
3	1	-	3

(101BT08) GENETICS AND MOLECULAR BIOLOGY**UNIT – I: Mendelian Genetics**

Mendel's Laws of inheritance, Incomplete dominance and co-dominance, multiple alleles, epistasis, lethal genes, Genes and environment, sex determination, Sex-linked inheritance, extra chromosomal inheritance

UNIT – II: Molecular Genetics - I

Evidences for Nucleic acids as genetic material - Hershey Chase, Avery and McLeod, General Features, Ultrastructure of eukaryotic chromosome, Types of Chromosomes, Variation in chromosome number, Definition & Classification of mutations

UNIT – III: Molecular Genetics - II

Linkage & crossing over, Recombination, chromosomal mapping, Karyotyping, Allele frequencies and genotype frequencies, Random mating and Hardy-Weinberg principle, Quantitative inheritance

UNIT – IV: DNA Replication

Models of DNA replication: semi conservative Mechanism of DNA replication in bacteria, Enzymes involved in replication. D-loop, Rolling circle, M13 & Φ X173 replication, DNA damage and repair mechanisms, Telomeres and telomerase

UNIT – V: Transcription

m-RNA, r-RNA, t-RNA structures, Transcription, RNA polymerases and proteins involved in transcription, Post transcriptional processing of RNA's

UNIT – VI: Translation

Genetic code and Wobble Hypothesis, Protein synthesis in prokaryotes and eukaryotes, Post translational modifications

TEXT BOOKS

1. Molecular Biology of the Gene, James D Watson, Pearson-Benjamin Cummings
2. Molecular Biology, 1987, David Freifelder, Jones and Bartlett Publishing Home
3. Principles of Genetics, 1991, E.J. Gardner, M.J.Simmons & D P Shustad.

REFERENCES:

1. Molecular Cell Biology, 2003, Lodish, H., Berk A., Zipursky, S.L. Matsudaria, P. Baltimore, D. and Darnell, J. W.H. Freeman and Company.
2. Cell and Molecular Biology 1996. De Robertis and De Robertis, Waverly Pvt. Ltd. New Delhi.
3. Genetics, 1985, Goodenough U, Hold International
4. Genetics by Strickberger
5. Genetics from Genes to Genomes-Leland H. Hartwell, Leroy Hood, Mc Graw Hill.

II Year II Semester

L	T	P/D	C
3	1	-	3

(101BT09) INSTRUMENTAL METHODS OF ANALYSIS**UNIT I: Introduction**

Types of Analytical Methods – Instruments for Analysis, classification of instrumental methods, Errors, Precision and Accuracy, Sensitivity and detection limit for instruments

UNIT II: Microscopy

Bright field, Dark field, Fluorescent, Phase contrast, Electron Microscopy

UNIT III: Spectroscopy

Radiation, energy and atomic structure- types of spectra and their biochemical usefulness, Electromagnetic radiation & Spectrum, Beer – Lambert's Law and apparent deviations; UV - VIS Spectrophotometer, Spectrofluorimetry, Atomic absorption & Atomic emission spectroscopy,

UNIT IV: Separation Techniques - I

Sedimentation, Centrifugation, Filtration, Dialysis, Salting in & Salting out, Electrophoresis of proteins and nucleic acids, pulse field, capillary and 2 D Gel, Flow cytometry

UNIT V: Separation Techniques - II

Paper and Thin Layer & Gas Chromatography, Gel filtration, Ione exchange and Affinity Chromatography, Principles and Operation of HPLC

Unit VI: Radioactivity

Use of Radioactive and stable isotopes and their detection in biological systems half-life decay counters and autoradiography

TEXT BOOKS:

1. A Biologist Guide to principles and techniques of practical Biochemistry. By Keith Wilson, Kenneth H. Goulding 3rd ed. ELBS Series
2. Skoog & West, Fundamentals of Analytical Chemistry, 1982

REFERENCES:

1. Vogel, Text Book of Quantitative Inorganic Analysis, 1990
2. Ewing, Instrumental Methods of Analysis, 1992
3. Hobert H Willard D. L. Merritt & J. R. J. A. Dean, Instrumental Methods of
4. Analysis, CBS Publishers & Distributors, 1992
5. F. Settle. Hand book of Instrumental techniques for Analytical Chemistry, Prentice Hall, 1997.

II Year II Semester

L	T	P/D	C
3	1	-	3

(101BT10) BIOPROCESS ENGINEERING

UNIT I: 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: General requirements of fermentation processes, Basic design and construction of fermentor and ancillaries, Main parameters to be monitored and controlled in fermentation processes; An overview of aerobic and anaerobic fermentation processes and their application in the biotechnology industry, solid-substrate, slurry fermentation and its applications, whole cell immobilization, behaviour of microbes in different reactors (air lift, fluidized, batch, continuous fed batch condition)

UNIT III: Medium requirements for fermentation processes, carbon, nitrogen, minerals, vitamins and other complex nutrients, oxygen requirements, medium formulation for optimal growth and product formation, examples of simple and complex media, design and usage of various commercial media for industrial fermentations. Introduction to medium optimization techniques- Placket Burman Design.

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

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

UNIT VI: Production of enzymes in submerged and solid-state processes, extraction and purification of enzymes, methods of characterization, specific activity and activity definitions.

All relevant units will have basic numerical problems.

TEXT BOOKS

1. P.M. Doran, "Bioprocess Engineering Principles", Academic Press, 1995.
2. Stanbury, Whitaker, Hall "Principles of fermentation Technology, Second Edition

References:

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

II Year II Semester

L	T	P/D	C
-	-	2	2

(101EN74) EFFECTIVE ENGLISH COMMUNICATION AND SOFT SKILLS**Course Description**

This course empowers the students for career opportunities, thus enhancing professional and personal growth. Effective communication and interpersonal skills are crucial to increase employment opportunities and to compete successfully in the business environment.

Soft skills provide students with a strong conceptual and practical framework to build, develop and manage teams. They play an important role in the development of the students' overall personality, thereby enhancing their career prospects. The soft skills training provides strong practical orientation to the students and helps them in building and improving their skills in communication, the effective use of English, business correspondence, presentations, team building, leadership, time management, group discussions, interviews, and inter-personal skills. This training also helps students in career visioning and planning, effective resume writing and dealing with placement consultants and headhunters.

The training is conducted in a very informal, interesting, and interactive manner, which gives ample scope for the students to interact with each other and face a wide variety of issues, topics, and situations that they are likely to come across as entry-level managers.

Learning Objectives:

By the end of the soft skills training program, the students will be able to:

- Develop effective communication skills (spoken and written).
- Develop effective presentation skills.
- Conduct effective business correspondence and prepare business reports which produce results.
- Become self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills.
- Develop all-round personalities with a mature outlook to function effectively in different circumstances.
- Develop broad career plans, evaluate the employment market, identify the organizations to get good placement, match the job requirements and skill sets.
- Take part effectively in various selection procedures adopted by the recruiters.

UNIT – I Soft Skills

Unit –II Body Language

Unit –III Group Discussion

UNIT – IV Interview Skills

UNIT – V Etiquette and Manners

UNIT – VI Developing Positive Attitude

Prescribed Text: Soft Skills: Know Yourself and know the World by Dr.K.Alex - S. Chand Publishing

REFERENCES:

1. Prof. Kevnair's - Fluency Dictionaries
2. Kleiser Grenville-Common Errors in English:Aph publishing corporation
3. Shaw Harry and Collins- Errors in English Language and ways to correct them.
4. Funk Wilfred-Six Weeks to Words of Power: W.R. Goyal Publishers & Distributors.
5. Body Language – Your success Mantra by Shalini Verma, S Chand, 2006

II Year II Semester

L	T	P/D	C
-	-	3	2

(101BT73) BIOPROCESS ENGINEERING LABORATORY

1. Extraction of commercially important enzymes from natural source
2. quantification of enzyme activity and specific activity
3. Effect of various parameters on enzyme activity
 - pH,
 - temperature,
 - enzyme and
 - concentration of substrate
4. Estimation of Michaelis - Menten parameters
5. Immobilization of cells using gel entrapment and calculation of average diameter of bead.
6. Estimation of Monod's parameters μ_{max} and k_s
7. Plackett-Burman design practice
8. Demonstration of Batch, Fed-batch reactors.
9. Production and estimation of ethanol from Glucose using *Sacharomyces cerevisiae* in batch reactor
10. Production of wine
11. Production and estimation of citric acid by *Aspergillus niger*
12. Preparation of Bread
13. Determination of BOD
14. Production and assay of antibiotic

II Year II Semester

L	T	P/D	C
-	-	3	2

(101BT74) INSTRUMENTAL METHODS OF ANALYSIS LABORATORY

1. Demonstration of viable cells using Phase Contrast Microscopy
2. Verification of Beer Lambert's Law & Determination of Molar Extinction Coefficient by UV – VIS spectrophotometer
3. Absorption Spectra of Nucleic acids & Amino Acids
4. Estimation of turbidity using Nephelometer
5. Emission spectra of Anthracene using Spectrofluorimeter
6. Estimation of proteins by U.V. Spectrophotometric method
7. Estimation of nucleic acids by U.V. Spectrophotometric method.
8. Separation of compounds by Paper Chromatography
9. Separation of compounds by Thin layer Chromatography
10. Agarose gel Electrophoresis
11. SDS Polyacrylamide gel electrophoresis
12. Dialysis

REFERENCES

1. I. D. Campbell and R. T. Dwek, Biological Spectroscopy, Benjamin Cummings & Co., 1986.
2. F. Settle. Handbook of Instrumental Techniques for Analytical Chemistry, Prentice Hall, 1997.
3. W. Botton, Instrumentation and Process Measurements, University Press, 1993.

SREENIDHI INSTITUTE OF SCIENCE & TECHNOLOGY (Autonomous)**B. Tech Biotechnology
I Year I Semester Course Structure**

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101EN01	English I	3	-	-	3	30	70
2	101PH01	Engineering Physics - I	3	1	-	3	30	70
3	101 IT 01	Computer Programming	3	1	-	3	30	70
4	101ME01	Engineering Drawing - I	2	-	4	4	30	70
5	101MA02	Mathematics for Biotechnology - I (For Bi.P.C students)	3	1	-	3	30	70
6	101BT01	Fundamentals of Biology (For MPC Students)						
7	101CH02	Chemistry for Biotechnology	2	1	-	2	30	70
8	101EN71	English Language Lab - I	-	-	2	1	25	50
9	101PH71	Engineering Physics Lab	-	-	3/2	1	25	50
10	101CH71	Engineering Chemistry Lab	-	-	3/2	1	25	50
11	101 IT 71	Computer Programming Laboratory	-	-	3	2	25	50
12	101ME71	Engineering Workshop – I	-	-	3/2	1	25	50
13	101 IT 72	IT Workshop - I	-	-	3/2	1	25	50
Total			16	4	15	25	330	720

B. Tech Biotechnology**I Year II Semester Course Structure**

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101EN02	English II	2	-	-	2	30	70
2	101CS01	Data Structures and C++	3	1	-	3	30	70
3	101ME02	Engineering Drawing – II	1	-	2	2	30	70
4	101EE41	Basic Electrical Engineering	3	1	-	3	30	70
5	101MA04	Mathematics for Biotechnology - II	3	1	-	3	30	70
6	101BT02	Process Engineering Calculations	3	1	-	3	30	70
7	101ME05	Mechanical Engineering for Biotechnology	4	-	-	4	30	70
8	101EN72	English Language Lab - II	-	-	2	1	25	50
9	101CS71	Data Structures and C++ Lab	-	-	3	2	25	50
10	101ME72	Engineering Workshop – II	-	-	3/2	1	25	50
11	101 IT 73	IT Workshop - II	-	-	3/2	1	25	50
Total			19	4	10	25	310	690

B. Tech Biotechnology**II Year I Semester Course Structure**

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101EC04	Basic Electronics Engineering	3	1	-	3	30	70
2	101MA08	Mathematical Methods for Biotechnology	3	1	-	3	30	70
3	101BT03	Biochemistry	4	1	-	4	30	70
4	101BT04	Microbiology	3	1	-	3	30	70
5	101BT05	Cell Biology	3	1	-	3	30	70
6	101BT06	Thermodynamics for Biotechnologists	3	1	-	3	30	70
7	101EN73	Functional and Communicative Written English	-	-	2	2	25	50
8	101BT71	Biochemistry Lab	-	-	3	2	25	50
9	101BT72	Microbiology & Cell Biology Lab	-	-	3	2	25	50
Total			19	6	8	25	255	570

B. Tech Biotechnology
II Year II Semester Course Structure

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101CH 03	Environmental Studies	3	1	-	3	30	70
2	101MA11	Probability and Statistics for Biotech	3	1	-	3	30	70
3	101BT07	Momentum & Heat Transfer in Bioprocess	3	1	-	3	30	70
4	101BT08	Genetics and Molecular Biology	3	1	-	3	30	70
5	101BT09	Instrumental Methods of Analysis	3	1	-	3	30	70
6	101BT10	Bioprocess Engineering	3	1	-	3	30	70
7	101EN74	Effective English Communication and Soft Skills	-	-	2	2	25	50
8	101BT11	Comprehensive viva	-	-	-	1	-	50
9	101BT73	Bioprocess Engineering Lab	-	-	3	2	25	50
10	101BT74	Instrumental Methods of Analysis Lab	-	-	3	2	25	50
Total			18	6	8	25	255	620

B. Tech Biotechnology**III Year I Semester Course Structure**

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101BT12	Instrumentation and Bioprocess Control	3	1	-	3	30	70
2	101BT13	Biochemical Reaction Engineering	3	1	-	3	30	70
3	101BT14	Genetic Engineering	3	1	-	3	30	70
4	101BT15	Bioinformatics	3	1	-	3	30	70
5	101BT16	Mass Transfer and Separations	3	1	-	3	30	70
6	101BT17	Industrial and Environmental Biotechnology	3	1	-	3	30	70
7	101MA71	Logical Reasoning - I	-	-	2	2	25	50
8	101BT75	Group Project	-	-	3	1	25	50
9	101BT76	Genetics, Molecular Biology & Genetic Engineering Lab	-	-	3	2	25	50
10	101BT77	Bioinformatics Lab	-	-	3	2	25	50
Total			18	6	11	25	280	620

B. Tech Biotechnology**III Year II Semester Course Structure**

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101MB01	Managerial Economics and Financial Analysis	3	1	-	3	30	70
2		Open Elective – I	3	1	-	2	30	70
3	101BT18	Plant Biotechnology	3	1	-	3	30	70
4	101BT19	Immunology	4	1	-	4	30	70
5	101BT20	Computational Molecular Biology	3	1	-	3	30	70
6		Professional Elective – I	3	1	-	3	30	70
7	101MA72	Quantitative Aptitude	-	-	2	2	25	50
8	101BT24	Comprehensive Viva	-	-	-	1	-	100
9	101BT78	Plant Biotechnology Lab	-	-	3	2	25	50
10	101BT79	Immunology Lab	-	-	3	2	25	50
Total			19	6	8	25	255	620

Subject code	Open Elective – I	Subject code	Professional Elective – I
101FL01	Basic Spanish Language	101BT21	Cancer Biology
101FL02	Basic French Language	101BT22	Clinical Research and Regulatory Affairs
101FL03	Basic German Language	101BT23	Biopharmaceutical Technology
101MB54	Logistics and supply chain management		
101MB57	Total Quality Management		

* **Industry Oriented Mini Project** has to be carried out by all students in summer vacation of B. Tech III/IV, II-Semester for a period of one month. The Mini project report must be submitted in B. Tech IV/IV I-semester and will have to be defended. **50** Marks are allotted with **two** credits.

B. Tech Biotechnology
IV Year I Semester Course Structure

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101MB02	Management Science	3	1	-	3	30	70
2		Open Elective - II	3	1	-	3	30	70
3	101BT25	Downstream Processing	3	1	-	3	30	70
4	101BT26	Animal Biotechnology	3	1	-	3	30	70
5		Professional Elective – II	3	1	-	3	30	70
6		Professional Elective - III	3	1	-	3	30	70
7	101MA73	Logical reasoning - II	-	-	2	2	25	50
8	101BT33	Pre Project Seminar	-	-	-	2	50	-
9	101BT34	Industry Oriented Mini Project	-	-	-	2	25	50
10	101BT80	Downstream Processing Lab	-	-	3	2	25	50
11	101BT81	Animal Biotechnology Lab	-	-	3	2	-	100
Total			18	6	8	28	305	670

Subject Code	Open Elective – II	Subject Code	Professional Elective – II	Subject Code	Professional Elective - III
101MB55	Entrepreneurship	101BT27	Molecular Pathogenesis	101BT30	Phytochemicals and Herbal Medicine
101MB56	Banking Operations, Insurance & Risk management	101BT28	Biotechnology for Crop Improvement	101BT31	Food Science & Technology
101CS03	OOPS through Java	101BT29	Biosensors and Bioelectronics	101BT32	Nano Biotechnology

B. Tech Biotechnology**IV Year II Semester Course Structure**

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	101BT35	Bioethics, Biosafety & IPR	4	1	-	4	30	70
2	101BT36	Bioreactor and Plant Design	4	1	-	4	30	70
3	101BT38	Project	-	-	-	10	50	150
4	101BT39	Comprehensive viva	-	-	-	2	-	50
5	101BT40	Technical Seminar	-	-	-	2	25	-
Total			8	2	-	22	135	340

III Year I Semester**(101BT12) INSTRUMENTATION AND BIOPROCESS CONTROL**

L	T	P/D	C
3	1	-	3

UNIT I: Elements Of Instruments: Elements of instruments, Static and Dynamic Characteristics of Instruments, Basic concepts of response of first order type instruments, mercury in glass thermometer, response of thermometer. Thermo electricity, industrial thermocouples, measurement of temperature using thermocouples.

UNIT II: Measuring Instruments: Head flow meters-Venturi, Orifice; Area Flow Meters-Rotameter; Open-Channel Meters, Velocity meters, Quantity meters-Nutating disk meter.

UNIT III: Biosensors: Types, transducers in biosensors – calorimetric, optical, potentiometric / amphoteric, conductometric / Resistometric, piezoelectric, semi conductor, mechanical and molecular electronics based, molecular wires and switches,

UNIT IV: First And Second Order Systems: Introduction to Laplace transform, Response of First order systems, Transfer function, Transient response to step, impulse, sinusoidal inputs, physical examples of First order systems, Liquid level, mixing process, concept of time constant. Response of second order systems to step, impulse, sinusoidal inputs. Transportation lag control systems, Servo and Regulatory control problems.

UNIT V: Controllers And Stability: Development of block diagram, Ideal transfer function of operational, P, PI, PD and PID controllers. Reduction of physical control system to block diagram. Closed loop transfer functions for servo regulators problems. Overall Transfer function for multi loop control systems. Stability and control system by Routh's criterion.

UNIT VI: Frequency Response: Introduction, generalization and transportation lag, Bode diagrams for - Controllers ,first order system, First order system in series,.

TEXT BOOKS:

1. Industrial Instrumentation, Donald P. Eckman.
2. Process Systems Analysis and Control Donald Coughnowr, Second edition McGraw Hill, International Ed.1991.

REFERENCE:

1. Chemical Process Control, Stephanopoulos G., Prentice Hall, N.Delhi, 1990.

III Year I Semester**(101BT13)BIOCHEMICAL REACTION ENGINEERING**

L	T	P/D	C
3	1	-	3

UNIT I: Introduction To Reaction Kinetics: Concepts of Reaction Kinetics, Types of reaction, order of reaction, Effect of temperature and pH on reaction rate. Rate equations and Reaction mechanisms; Interpretation of batch reactor data, constant volume batch reactor, integral method of analysis of data for reversible and irreversible reactions.

UNIT II: Reaction Mechanism And Growth Kinetics: Searching for mechanism - Arrhenius equation - Batch reactor analysis for kinetics, (synchronous growth and its application in product production). Growth Kinetics: Batch growth quantifying cell concentration, growth profiles and kinetics in batch culture, fed batch growth, continuous growth, chemostat growth

UNIT III: Multiple Reactions: Parallel series, series – parallel reactions, calculation of yield and selectivity, role of thermodynamic parameters, maximizing the desired product in Parallel Reactions in Batch Reactor and P F R, maximizing the desired product in series Reactions in CSTR.

UNIT IV: Mechanisms And Kinetics Of Enzyme Action: Mechanisms of Enzyme Action; Concept of active site and energetics of enzyme Kinetics, substrate complex formation; Specificity of enzyme action; Kinetics of single substrate reactions; turnover number; estimation of Michaelis-Menten parameters. Importance of K_M , Multi-substrate reaction mechanisms and kinetics. Types of Inhibition- kinetic models; Substrate and Product Inhibition; Allosteric regulation of enzymes; Deactivation kinetics.

UNIT V: Ideal and Non-Ideal Reactors: Concepts of reactors based on flow characteristics, design of ideal reactors, Design of Batch bioreactor. Reason for Non-Ideality, RTD studies (E, C & F curves), Diagnosis of Ills of Flow reactors, Modelling of Non-Ideal reactors.

UNIT VI: Multiphase Bioreactors: Differences and similarities between chemical and bioreactors, classifications of bioreactors, fluidized bed reactor, Packed bed reactor, Bubble column reactors and Air lift reactors. Bioreactor for plant and animals cells

TEXT BOOKS:

1. H. Scott Fogler, Elements of Chemical Reaction Engineering, II Edition, Prentice Hall of India Pvt.Ltd
2. P.M. Doran, “Bioprocess Engineering Principles”, Academic Press, 1995.

REFERENCES:

1. M.L. Shuler and F. Kargi Bioprocess Engineering: basic concepts.
2. D.G.Rao, Introduction to Biochemical Engineering, McGraw-Hill,2005

III Year I Semester**(101BT14) GENETIC ENGINEERING**

L	T	P/D	C
3	1	-	3

UNIT I: Gene Regulation: Prokaryotic system: The operon model, Lactose, Arabinose & Tryptophan operons, Sigma Switches (*Bacillus subtilis*) Eukaryotic system: Repetitive DNA, Gene rearrangement, Promoters, Repressors and Activator and enhancer elements, gene amplification.

UNIT II: Plasmids and Transposons: Definition, Types, Classification, Identification and Transfer of Plasmids. Host restriction in transfer in bacteria, Isolation purification and quantification of Plasmid DNA, Transposons: Definition, detection of transposition in bacteria, types of bacterial transposons, mechanisms of transposition and excision, Applications of transposons, Retrotransposons.

UNIT III: Vectors: Introduction to vectors and types of vectors. Plasmid Vectors, construction of prototype plasmid vector -pBR 322 and pUC 19, Phage vectors -M13, λ , Cosmid, sv 40 and boculovirus, Expression vector-pGem, Yeast cloning vectors-2 μ m Plasmid, Yep, YAC.

UNIT IV: DNA Manipulations: Nucleases, Types of Nucleases, Endonuclease, Types of Endonucleases, DNA modifying enzymes. Restriction digestion and mapping of DNA. Ligases, Linkers, Adaptors and Homopolymer tailing, DNA transferring into living cells, Gene transfer Techniques-Electroporation, Microinjection, Biolistics etc.

UNIT V: Expression And Detection Of Clones: Expression of cloned genes in yeast and E.coli, Blot analysis - Southern, Northern & Western blot; dot and slot blot, DNA methylation, Purification of Genomic DNA, Genomic and cDNA library construction and screening.

UNIT VI: PCR and Molecular Markers: Principles, designing of primers, PCR methodology, RT - PCR, multiplex PCR, identification of PCR product, Application of PCR technology, Molecular markers: RFLP, SNP, RAPD, AFLP, 16s r-RNA typing, Gene Therapy (Case Study ADA) Gene Silencing.

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. From Genes to Clones by Winnacker. PANIMA
2. Molecular Biotechnology by Pasternack and Glick.
3. From Genes to Genomes: Concepts & Applications of DNA Technology by J.W. Dale & M.V. Schartz.
4. Gene Cloning & DNA Analysis: An Introduction (4th edition) by T.A. Brown.
5. Molecular Cloning by Sambrook, *et al.*
6. Principles of Gene Cloning by Old and Primrose.

III Year I Semester**(101BT15) BIOINFORMATICS**

L	T	P/D	C
3	1	-	3

UNIT I: Scope Of Bioinformatics: History, definition,, importance and applications of bioinformatics, Elementary commands and protocols, ftp, telnet, http .

UNIT II: Biological Databases: Introduction to biological data, Organization and management of databases, Nucleotide databases (Genbank, DDBJ), Protein Databases (SWISS PROT, PDB, SCOP, CATH)

UNIT III: Specialised Databases: Genome Databases, Metabolic Pathway databases-KEGG, BioCyc, BRENDA, and Pfam, PROSITE.

UNIT IV: Sequence Alignment: Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, and paralogues. Dynamic Programming, Dot Matrix analysis, Smith-Waterman Algorithm, Neddleman-Wunsch Algorithm, Scoring matrices: PAM and BLOSUM matrices

UNIT V: Multiple Sequence Alignment And Phylogenetic Analysis: Basic concepts of various approaches for MSA (e.g. progressive, hierarchical etc.). Algorithm of CLUSTALW and its application Taxonomy and phylogeny: Definition and description of phylogenetic trees and various types of trees.

UNIT VI: Genomics And Proteomics: Human Genome Project, DNA sequencing, Sanger and Shotgun Sequencing methods, Primary. Secondary, Supersecondary, Tertiary and quaternary structure of proteins; Significance of Ramachandran Plot, protein folding

TEXT BOOKS:

1. Bioinformatics. David Mount, 2000. CSH Publications

REFERENCES:

1. Bioinformatics: A Machine Learning Approach P. Baldi. S. Brunak, MIT Press 1988.
2. Genomics and Proteomics-Functional and Computational aspects. Springer Publications. Editor-Sandor Suhai.
3. Bioinformatics- Methods and Protocols-Human Press. Stephen Misener, Stephen A. Krawetz.
4. Bioinformatics – A Practical guide to the Analysis of Genes and Proteins – Andreas D.Baxevanis, B.F. Francis Ouellette.

III Year I Semester**(101BT16) MASS TRANSFER AND SEPARATIONS**

L	T	P/D	C
3	1	-	3

UNIT I: Principles Of Mass Transfer: Introduction to Mass Transfer and Diffusion, Molecular diffusion in gases, Molecular diffusion in Liquids, Molecular Diffusion in Biological solutions and gels, Molecular Diffusion in solids. Numericals relevant to above topics.

UNIT II: Principles Of Convective Mass Transfer: Introduction to Convective Mass Transfer, Types of Mass Transfer coefficients and relation between them. Flow past single solids. Analogies: Reynolds Analogy, Chilton-Colburn j-factor, Interface mass transfer, gas phase controlling, and liquid phase controlling operations.

UNIT III: Absorption: Definition, Solubilities of gases in liquids, single stage (one component transferring) operation, Material balances, counter current multi stage operation continuous contact equipments. Numericals relevant to above topics.

UNIT IV: Distillation: Relative volatility, single stage equilibrium distillation, simple distillation, Rayleigh equation and steam distillation operation; continuous distillation, continuous multi stage tray towers, McCabe and Thiele Method, Graphical procedure to calculate number of trays (theoretical plates), Numericals relevant to above topics.

UNIT V: Liquid-Liquid Extraction: Types of equilibrium system, Single stage extraction, Multi stage cross and counter current operations. Drying theory, drying kinetics, mechanism of batch drying, various drying operations, Spray drier, Fluidized Bed drier, Pneumatic drier.

UNIT VI: Adsorption: Physical adsorption, Chemisorptions, adsorption isotherms, Single stage operation, Fixed bed adsorption, Adsorption wave. Case Studies with immobilized cell/enzyme systems, Dialysis; Hemodialysis;

TEXT BOOKS:

1. Robert E. Treybal, Mass Transfer Operations III Edition, Mc. Graw Hill International.
2. Christi J. Geankoplis, Transport process & UNIT operations, III ed., Prentice Hall India Pvt. Ltd.

REFERENCES:

1. Judson King: Separation Processes, II Edition, Mc Graw Hill Chemical Engineering series.
2. Philip A. Schweitzer, Handbook of separation Techniques for chemical Engineering, III Edition, Mc. Graw Hill.
3. Philip C. Wankat Rate, Controlled separations, Chapman and Hall, 1985.

III Year I Semester**(101BT17) INDUSTRIAL AND ENVIRONMENTAL BIOTECHNOLOGY**

L	T	P/D	C
3	1	-	3

UNIT I : Production of Primary metabolites: Bioprocess-overview, Organic acids - Citric acid, Lactic acid, Amino acids -Glutamic acid, Alcohols –Ethanol, Strain improvement

UNIT II: Production Of Secondary Metabolites: Antibiotics-Penicillin, Cephalosporins, Streptomycin, Erythromycin, Dual or multiple fermentation, Vitamin B₁₂, Biotransformation of steroids.

UNIT III: Enzymes and Recombinant Proteins: Production and applications of Industrial Enzymes - Proteases, Amylases, Lipases, and Cellulases. Enzymes in food and pharmaceutical industries; Production of recombinant proteins - Insulin, IL2, recombinant vaccines- Hepatitis-B

UNIT IV: Wastewater Treatment: Characteristics of wastewater, domestic, distilleries, dairy, pharmaceutical industries, Primary treatment, Secondary and tertiary treatment, Aerobic treatment -Activated sludge process, Trickling filters, Anaerobic treatment - contact digesters

UNIT V: Bioremediation: Concept, Factors and types of bioremediation: *in-situ*, *ex-situ*, Phytoremediation, Solid and Liquid Phase bioremediation, Biotechnological applications of Hazardous waste management, Detoxification of toxic organics -phenols

UNIT VI: Eco-friendly Products: Biodiesel from microalgae, Bioplastics –PHB, Polylactide (PLA) ,Biofertilizers – *Rhizobium*, *Azotobacter*, *Azospirillum*, Phosphate solubilizing microorganisms, vermicompost, *Mycorhizae*, biopesticides – *Trichoderma*, *Bacillus thuringensis*.

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.

REFERENCES:

1. Microbiology: - Prescott and Dunn.
2. Microbial biotechnology: Glazer, A.N. and Nikaido, H. 1995 W.H. Freeman &Company, NY
3. Industrial Microbiology:- A. H. Patel., Stanier R. Y., Ingram J.L., Wheelis M.L., Painter R.R.,
4. General Microbiology McMillan Publications, 1989.
5. Environmental Biotechnology by S.N. Jogdand Himalaya Publishing
6. Environmental Microbiology 2001. Raina M. Maier, Ian L. Pepper, Academic Press.

III Year I Semester**(101MA71) Logical Reasoning – I**

L	T	P/D	C
-	-	2	2

UNIT I: Series Completion: Number Series, Alphabet Series, Alpha – Numeric Series.

UNIT II: Analogy: Completing the Analogous Pair, Simple Analogy, Choosing the Analogous pair, Double Analogy, Word Analogy, and Number Analogy.

UNIT III: Classification / Odd One Out: Word Classification, Number Classification, Letter Classification.

UNIT IV: Coding – Decoding: Letter Coding, Number Coding, Matrix Coding, Substitution, Deciphering Message Word Codes, Jumbled Coding.

UNIT V: Blood Relations: Deciphering Jumbled up Descriptions, Relation Puzzle – Direction sense test.

UNIT VI: Number, Ranking & Time Sequence Test – Arithmetical Reasoning – Mathematical Operations.

TEXT BOOK:

1. Verbal and Non Verbal Reasoning by R.S.Agarwal.

III Year I-SEM

(101BT75) Group Project

L T P/D C

- - 3 1

III Year I Semester**(101BT76) GENETICS, MOLECULAR BIOLOGY AND GENETIC
ENGINEERING LAB**

L	T	P/D	C
-	-	3	2

1. Problems on Mendelian and Non Mendelian genetics.
2. Problems on Sex linked inheritance and Multiple alleles.
3. Isolation of Plant, Bacterial and animal Genomic DNA.
4. Separation of DNA by Agarose gel electrophoresis.
5. Yield analysis of purity of DNA samples.
6. Separation and visualization of plasmid on Agarose gel.
7. Cloning of DNA into plasmid vector (GFP cloning)
8. Restriction digestion and restriction mapping
9. Ligation.
10. Transformation and screening of recombinants.
11. Southern Blotting
12. Characterization of proteins by SDS-PAGE.

REFERENCES:

1. Current protocols in Molecular Biology by Maniatis.

EQUIPMENTS:

1. Autoclave.
2. Laminar air flow chamber.
3. Water bath present to the optimum temperature for restriction endonuclease digestion.
4. Balance.
5. Deepfreeze (-20).
6. pH Meter.
7. Microfuge.
8. Micropipettes
9. Submarine gel electrophoresis UNIT with power pack.
10. U.V.Transilluminator.
11. Vacuum oven.
12. Vertical slab gel electrophoresis equipment.
13. U.V.Transilluminator.

III Year I Semester**(101BT77) BIOINFORMATICS LABORATORY**

L	T	P/D	C
-	-	3	2

1. Retrieval of information from Biological databases NCBI, SWISS PROT
2. Protein structure databases – PDB, SCOP, CATH
3. Pathway Databases – KEGG, BIOCYC
4. Demonstration of BLAST, FASTA and other search engines
5. Multiple sequence alignment Using ClustalW/ X,
6. Phylogenetic analysis using Tree View and NJ PLOT
7. ORF finder (Gene Prediction)
8. Restriction site analysis tools
9. Protein visualization tools RASMOL
10. Protein structure and Function analysis using SPDBV
11. Cheminformatics tool - Mol Inspiration
12. Protein ligand docking using Argus Lab

EQUIPMENTS:

1. Computers
2. Internet facility
3. Bioinformatics software

III year II Semester**(101MB01) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

L	T	P/D	C
3	1	-	3

UNIT I: Introduction To Managerial Economics: Definition, Nature and Scope of Business Economics– Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand and Demand Forecasting.

UNIT II: Theory Of Production And Cost Analysis: Production Function – Isoquants and Isocosts, Internal and External Economies of Scale, Laws of returns. Cost Analysis: Cost concepts, different types of costs, cost control and cost efficiency. Break-even Analysis BEA)-Determination of Break-Even Point (Simple problems).

UNIT III: Introduction To Markets: Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Pricing strategies, transfer pricing and performance measurement, Price-Output Determination in case of Perfect Competition and Monopoly. Business Environment: forms of Business organization, Features of Joint Stock Company, Public Enterprises and their types. Liberalization, Globalization and Privatization (LPG).

UNIT IV: Fundamentals Of Financial Accounting: Concepts and conventions, principles of Double-Entry, Book Keeping, Journal, Ledger, Trial Balance, Final Accounts - Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments.

UNIT V: Capital Budgeting Techniques: Nature and scope of Capital Budgeting, Methods of Capital Budgeting: Traditional methods and Discounting Cash Flow methods.

UNIT VI: Ratio Analysis: Introduction to Ratio analysis – Leverage ratios – Liquidity ratios – Turnover ratios – Profitability ratios, Du-point chart. (Simple problems)

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.

REFERENCES:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4th Ed.
3. Suma Damodaran, Managerial Economics, Oxford University Press.
4. Lipsey & Chrystel, Economics, Oxford University Press.

III year II Semester**(101FL01) Basic Spanish Language
Course Contents**

L	T	P/D	C
2	2	-	3

UNIT-I	<p>Functional Aspects Greetings, introductions, identifying others; tools to ask meaning, pronunciation and spellings; different nationalities and their languages; Hispanic names, family relations and professions; days of the week, Months.</p> <p>Grammatical Aspects Basic structure of spelling and pronunciation; present indicative of the regular verbs ('ar/er/ir) and 'querer'; subject pronouns; interrogative sentences with 'Por que', and 'quien'; causal phrase with 'porque'; 'ser' and 'estar'; negative sentences; adjectives of nationality.</p>
UNIT-II	<p>Functional Aspects Ordinal and cardinal numbers: quantities; to go shopping, identifying Material, color, size etc; to go to a restaurant, food habits of Spanish and Latin American people.</p> <p>Grammatical Aspects Gender and number of nouns and adjectives; the verb 'tener'; interrogative Sentences; demonstrative and qualitative adjectives.</p>
UNIT-III	<p>Functional Aspects To express opinions on something contradict someone in modest ways; Suggest something, to value things aesthetically and intellectually; Expression of likes and dislikes; expression and reaction to certain things, (agreement or disagreement)</p> <p>Grammatical Aspects Qualitative adjectives, forms and usage, gradations, superlative adjectives, Exclamatory sentences; the verb 'gustar', forms and syntax; personal Pro0nouns; definite and indefinite pronouns, direct object pronouns Prepositions; verbs like 'parecer' and 'encontrar and preferir, their form And syntax, interrogative pronouns.</p>
UNIT-IV	<p>Functional Aspects Invitations; accepting and rejecting invitations; how to fix an appointment; Inviting through e-mail or telephone</p> <p>Grammatical Aspects Present indicative of irregular verbes, expressions with 'tener' and estar Prepositional pronouns; interrogative sentences</p>

UNIT-V **Functional Aspects**
Expression of time; Spanish and Latin American time tables and
Comparison with Indian time tables, festivals Indian and Hispanic
Grammatical Aspects
Time with 'ser', expressions relating to festivals.

UNIT-VI **Functional Aspects**
Expressions relating to climate, weather of the day seasons, vacations,
planning of holiday and brochures, hotel reservations, offers
Grammatical Aspects
Expressions with verbs, 'ser' and 'hacer' and other verbs.

Text Book:

1. NOUVEAU ELE INICIAL 1

Reference Books:

1. Espanol sin Fronteras, A. Sanchez, M. Rios, J.A. Metella, SGEL. Madrid, 1997
2. Entre Nosotros A. Sanchez, M. Rios, J.A. Metella, SGEL. Madrid, 1997

III year II Semester**(101FL02) Basic French Language
Course Contents**

L	T	P/D	C
2	2	-	3

UNIT – I :

Professions et nationalités, vie quotidienne et loisirs, descriptions physiques et psychologiques, nombres cardinaux. Articles définis et indéfinis, genre et nombre des noms et des adjectifs, interrogation et négation, conjugaison du présent.

UNIT– II

Intonation, liaison, voyelles orales et nasales. Faire connaissance, inviter et répondre à une invitation, décrire les personnes.

UNIT – III

Paris, monuments et lieux publics. La vie de quatre parisiens de professions différentes. Logement et nourriture, vêtements et couleurs, fêtes et faits divers, nombres ordinaux.

UNIT – IV

Articles partitifs, adjectifs démonstratifs et possessifs, prépositions et adverbes de quantité et de lieu, pronoms toniques, l'impératif, verbes pronominaux. Intonation, semi-voyelles, liaison, consonnes sonores et sourdes.

UNIT – V

Exprimer l'ordre et l'obligation, demander et commander, évaluer et apprécier, féliciter et remercier. Une région de France: la Bourgogne, vie quotidienne à la campagne.

UNIT – VI

Teaching passé composé through the above lessons.

Text Book:

1. Dominique, Philippe, *et al.* 1999. *Le Nouveau sans Frontières -I* (Including Exercise Book). Paris: Clé, International (Indian Edition).

Reference Books:

1. Alter Ego I & II. Published by Hachette
2. Connexion I & II. Published by Didier
3. Echo I & II. Clé International publishers
4. Latitude I & II. Published by Didier

III year II Semester**(101FL03) Basic German Language
Course Contents**

L	T	P/D	C
2	2	-	3

UNIT –I

- Definite and Indefinite articles(including negation)
- Noun: Gender and Plural forms, cases (nominative, accusative, dative & genitive)

UNIT –II

- Verb: Strong and Weak verbs, Verbs with separable and inseparable prefixes, modal verbs, position of verb in the main and subordinate clauses, auxiliary verbs, reflexive verbs in accusative and dative cases, imperative constructions

UNIT –III

- Pronouns: personal, possessive, reflexive, interrogative and demonstrative
- Prepositions: with the accusative, dative and with both these cases

UNIT –IV

- Adjective :declension with the
 - Indefinite article
 - Definite article
 - Without article
 - With the indefinite pronoun
 - Degrees of comparison (also adverbs),ordinal numbers, adjectives as nouns
- Conjunctions: subordinating and coordinating with respect to the position of the verb

UNIT –V

- Pretaritim of sein and haben
- Perfect tense

UNIT –VI

- Negatin :of a sentence and words therein.
- Sentence structure: general principles observed in German Language.

Text Book

1. Hermann Funk, Christina Kuhn, Oliver Bayerlein., Studio d A 1.2005 Comelsen Verlag, Berlin.

Reference Books

1. Rosa –Marie Dallapiazza, Eduard von Jan, Till Schonherr,unter Mitarbeit von Jutta Orth-Chambah Tangram aktuell 1 –Lektion 1-4, Lektion 5 - 8
Max Hueber Verlag. Munchen. 2009
2. Jutta Muller, Thomas Storz, 2006. Laguna. Heuber Veerlag, Ismaning. Deutschland

III year II Semester**(101MB54) LOGISTICS AND SUPPLY CHAIN MANAGEMENT**

L	T	P/D	C
3	1	-	2

The objective of the course is to give the student an overview of Supply Chain management principles and practices

Prerequisite for the course: Knowledge of Production and Operations Management, Marketing Management and Basics of QABD

UNIT I

Logistics and Competitive strategy Understanding the Supply Chain. Objective and Importance of Supply Chain Process View of Supply Chain. Competitive and Supply Chain Strategies, Achieving Strategic Fit, Expanding Strategic Scope.

UNIT II

Supply Chain Drivers and Metrics :Drivers for Supply Chain Performance, Framework for Structuring drivers. Facilities, inventory, transportation, information, sourcing and pricing. Obstacles to Achieving fit. Designing the Supply Chain Network. Role of distribution in the Supply Chain, Factors influencing network design, the role of network in the Supply Chain Frame work for Network design decisions models for facility location and capacity allocation, network design in uncertain environment.

UNIT III

Demand Forecasting in Supply Chain Components of forecast and forecasting methods. Role of IT in forecasting. Aggregate Planning in Supply Chain Planning Supply and Demand in A Supply Chain, Managing Predictable Variability.

UNIT IV

Logistics and Supply chain relationships: Benchmarking the logistics process and SCM operations –Mapping the supply chain processes – Supplier and distributor benchmarking –setting benchmarking priorities –identifying logistics performance indicators –Channel structure – Economics of distribution –channel relationships – logistics service alliances.

UNIT V

Planning and Managing inventories in Supply Chain : managing Economies of Scale in Supply Chain, managing Uncertainty in a Supply Chain, Safety Inventory , determining optimal level of product inventory. Designing and Planning Transportation Networks, Transportation in a Supply Chain, Managing Cross Functional Drivers in a Supply Chain: Sourcing decisions in a Supply Chain, Pricing and Revenue Management in a Supply Chain, Information Technology and Coordination in a Supply chain..

UNIT VI

Managing global logistics and global supply chains: Logistics in a global economy – views of global logistics- global operating levels – interlinked global economy – The global supply chains -Global supply chain business processes –Global strategy –Global purchasing – Global logistics – Channels in Global logistics –Global alliances –Issues and Challenges in Global supply chain Management – case studies.

Books Recommended:

- Sunil Chopra and Peter Meindl: *Supply chain Management: Strategy, Planning and Operation, 3/e*, Pearson Education, New Delhi 2007.
- Donald J. Bowersox and David J. Closs, *Logistical Management: The Integrated Supply Chain Process*, Tata McGraw Hill, 2006.

References:

- Martin Christopher, *Logistics and Supply Chain Management*, Pitman, London.
- B.S. Sahay, *Supply Chain Management for Global Competitiveness*, Macmillan, New Delhi. 2003.
- Philip B. Schary, Tage Skjott-Larsen: *Managing the Global Supply Chain*, Viva, Mumbai, 2006.
- Monczka: *Purchasing and Supply Chain Management* Thomson, 2006.
- Ballou, *Business Logistics/Supply chain Management 5/e* Pearson Education.
- David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi, *Designing and Managing The Supply Chain 2nd ed.* Tata McGraw Hill Publishing Company Ltd., 2006

III year II Semester**(101MB57) TOTAL QUALITY MANAGEMENT**

L	T	P/D	C
3	1	-	2

UNIT - I:

Introduction: The concept of TQM, Quality and Business performance,' attitude and involvement of top management, communication, culture and management systems. Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs, Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

UNIT – II:

Customer Focus and Satisfaction: Process Vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer - Supplier relationships. Bench Marketing: Evolution of Bench Marketing; meaning of Bench marketing, benefits of bench marketing, the bench marketing process, pitfalls of bench marketing.

UNIT – III:

Organizing for TQM: The systems approach, Organizing for quality implementation, making the transition from a traditional to a TQM organizing, Quality Circles.

UNIT - IV:

Productivity, Quality and Reengineering: The leverage of Productivity and Quality, Management systems V s. Technology, Measuring Productivity, Improving Productivity Re-engineering.

UNIT - V:

The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost Information, Accounting Systems and Quality Management.

UNIT - VI:

ISO9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQCQ-90. Series Standards, benefits of ISO9000 certification, the third party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

REFERENCE BOOKS:

1. "Total Quality Management" by Joel E.Ross.
2. "Beyond TQM" by Robert L.Flood.
3. "Statistical Quality Control" by E.L.Grant.

III year II Semester**(101BT18) PLANT BIOTECHNOLOGY**

L	T	P/D	C
3	1	-	3

UNIT I: Introduction To Cell And Tissue Culture: Concept of Totipotency, Tissue culture media (composition, preparation); Initiation and maintenance of callus and cell suspension culture, Somatic embryogenesis, Organogenesis; Clonal propagation

UNIT II: Tissue Culture Applications: Protoplast isolation, culture fusion and somatic hybridization; Haploid Production, its application and limitations; Somaclonal variations; Short term and long term Germplasm conservation

UNIT III: Production Of Phytochemicals: Production of chemicals and other important compounds from plant cell cultures; Strategies for enhancing product yield; Bioreactor systems for mass cultivation of plant cells and production of Phyto-pharmaceuticals (Shikonin, Berberine, Ginsenosides)

UNIT IV: Transformation Technology: Basic concept and essential steps of the genetic transformation process; *Agrobacterium* mediated gene transfer; Direct gene transfer methods - chemical methods, electroporation, microinjection and particle bombardment

UNIT V: Transgenic Plants: Production of transgenic plants for Abiotic (Drought, temperature, salt) and Biotic (Herbicide resistance, Insect resistance, Disease resistance, Virus resistance) stress tolerance

UNIT Vi: Molecular Farming: Application of Plant biotechnology for the production of quality oil, Industrial enzymes, Therapeutic proteins, Antigens (edible vaccine) and Plantibodies.

TEXT BOOKS:

1. Roberta Smith, Plant Tissue Culture: Techniques & Experiments. 2nd ed., Acad. Press, 2000.
2. Bhojwani, S.S. and Razdan, Plant Tissue Culture: Theory and Practice. Elsevier Science, 2004
3. H. S. Chawla, Introduction to Plant Biotechnology, 3rd Edition, Sci. publishers, 2009

REFERENCES:

1. Bhojwani, S.S., Plant Tissue Culture: Application and Limitations. Amsterdam, Elsevier, 1990.
2. Charles Cunningham and Andrew J.R. Porter, Recombinant Proteins from Plants: Production & Isolation of Clinically Useful Compounds (Methods in Biotechnology), Humana Press, 1997.
3. Bernard R. Glick & John E. Thompson, Methods in Plant Mol. Biology & Biotechnology, CRC Press, 1993.
4. I. Potrykus and G. Spangenberg, Gene Transfer to Plants (Springer Lab Manual), Springer Verlag, 1997.
5. John Hammond, Peter Mc Garvey, Vidadi Yusibov, Plant Biotechnology: New products and applications, Springer verlag, 1999.

III year II Semester**(101BT19) IMMUNOLOGY**

L	T	P/D	C
4	1	-	4

UNIT I: The Immune System and its biology: Introduction, Innate and acquired immUNITY. **Immunochemistry:** Immunogens, antigens, their chemical nature, Properties influencing immunogenicity, Haptens, adjuvants. **Cells of the Immune System:** Haematopoiesis, lymphocyte trafficking, T and B lymphocytes, Macrophages, Dendritic cells, Natural killer cells, Eosinophils, Neutrophils, Mast cells.

UNIT II : Organs Of The Immune System: Primary and Secondary lymphoid organs (Thymus, Spleen, Lymph nodes, MALT, GALT, SALT).

UNIT III: Humoral ImmUNITY: B-lymphocytes, their lineage, Immunoglobulins, their structure function, classes, sub classes, generation of antibody diversity. Activation of B cells, their differentiation and effector functions., Activation of B cells, their differentiation and effector functions. Complement and its activation.

UNIT IV: Antigen-antibody interactions and Hypersensitivity Reactions: Types of antigen-antibody reactions with suitable examples. Hybridoma Technology - Monoclonal antibodies their application. Immunotoxins, chimeric antibodies and abzymes. Types of hypersensitivity, Principle, mechanisms their relevance & significance in diseases.

UNIT VI: Cell-mediated ImmUNITY: T-cells subclasses their lineage, maturation TCR diversity, MHC, Ag processing and presentation, T-cell activation, effector functions.

UNIT VI: Transplantation: Graft rejection evidence and mechanisms of graft rejection ,prevention of graft rejection, immuno suppressive drugs, **AutoimmUNITY** – experimental models of autoimmune disease treatment of autoimmune disorders and **Tumor immunology**.

TEXT BOOKS:

1. E. Roitt Essential Immunology, Vaccines conventional, subUNIT and recombinant, antidiotypic vaccine, Blackwell Scientific publications, Oxford, 1991.
2. Kuby Immunology, 5th Edition . Richard A Goldsby, Thomas J Kindt Barbara A Osborne .
W H eeman and Company.

REFERENCES:

1. Benjamin E and Leskowitz S, immunology A short Course. Wiley LISS NY, 1991.
2. ELISA Immunological Techniques. DNA vaccines Immunotechnology
3. Cellular Molecular Immunology. Abul Abbas and Litchman, 2003

III year II Semester**(101BT20) COMPUTATIONAL MOLECULAR BIOLOGY**

L	T	P/D	C
3	1	-	3

UNIT I: Introduction To Computational Molecular Biology: Introduction to active areas of research in Computational Molecular Biology, Functional Genomics, Comparative Genomics.

UNIT II: Sequence-Based Database Searches: BLAST and FASTA algorithms, various versions of basic BLAST and FASTA, Use of these methods for sequence analysis including the on-line use of the tools and interpretation of results.

UNIT III: Gene Prediction: Prediction of Genes, Promoters, splice sites, regulatory regions, prokaryotic and eukaryotic genomes, Homology based gene prediction. SNPs and applications. EST approach.

UNIT IV Micro Arrays: Basics of Micro array, DNA micro array, understanding of micro array data and correlation of gene expression data to biological processes and computational analysis tools.

UNIT V: Protein Structure Prediction: Secondary structure prediction methods, Algorithms of Chou Fasman, GOR methods; concepts in measuring the accuracy of predictions (Q3). Protein homology modeling, Protein threading. Protein ab initio structure prediction.

UNIT-Vi: Drug Design: Drug discovery cycle, Role of Bioinformatics in Drug discovery. Introduction to QSAR.

TEXT BOOKS:

1. David W Mount. Bioinformatics- Sequence and genome analysis. CSHL Press.
2. Jonathan Pevsner . Bioinformatics and Functional Genomics. A Jhon Wiely & Sons, Inc., Publication

REFERENCES:

1. Moody P C E and A J Wilkinson. Protein Engineering, IRL Press.
2. Creighton T E, Proteins. Freeman W H. Second Edition 1993.
3. Brandon and Tooze – Proteomics

III Year II Semester**(101BT21) CANCER BIOLOGY (Professional Elective-I)**

L	T	P/D	C
3	1	-	3

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 I: Chemical Carcinogenesis, Metabolism of Carcinogenesis, Natural History of Carcinogenesis, Targets of Chemical Carcinogenesis

UNIT III : Principles Of Carcinogenesis II: Principles of Physical Carcinogenesis, X - Ray radiation - mechanism of radiation Carcinogenesis.

UNIT IV: Oncogenes: Identification of Oncogenes, Retroviruses and Oncogenes, detection of Oncogenes, Growth Factor and Growth Factor receptors that are Oncogenes. Oncogenes / Proto Oncogene activity. Growth factors related to transformations.

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

UNIT VI : Cancer Detection And Therapy: Detection Of Cancer- Detection of Cancers, Prediction of aggressiveness of Cancer, Advances in Cancer detection., New Molecules For Cancer Therapy- 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. L.M.Franks, N.M.Teich. An Introduction to Cellular and Molecular Biology of Cancer, Oxford Medical publications, 1991.

REFERENCE:

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

III Year II Semester**(101BT22) CLINICAL RESEARCH AND REGULATORY AFFAIRS****(Professional Elective-I)**

L	T	P/D	C
3	1	-	3

UNIT I: Introduction To Clinical Research: History, Importance and Scope, stake holders in clinical research, Framework of clinical research, History and purpose of ICH GCP, medical and clinical research terminology, Principles of GCP, Roles and responsibilities in clinical research according to ICH GCP, Sponsor, Investigator, IRB/IEC, Essential documentation, Confidentiality issues

UNIT II: Ethics in Clinical Research: History structure regulation impact of ICH GCP, Ethics in all aspects of health care, historical cases, negligence, informed consent, mental competence, up-to-date cases: cloning, human embryos and IVF, shared responsibilities for decisions and the understanding of the risk

UNIT III: Clinical Study Management: Documentation, Auditing, monitoring and inspection, GCP auditing requirements from regulatory perspective, GCP compliance and audit certificates, GCP auditor training, audit team structure and SOPs, audit planning, audit conduct,

UNIT IV: Regulations in Clinical Research: Declaration of Helenski 2000 amendment, ICH GCP, Indian, FDA, EU, and other regulations, Clinical Trial directive, Data protection Act and Regulations relating to electronic signatures, and financial disclosure, Law, guidelines and codes of practice.

UNIT V: Introduction to Drugs and Cosmetic Act: Aims, objectives, import of drugs, manufacturing of drugs, sale of drugs, labeling and packing of drugs. Patents, Investigational New Drug (IND), New Drug Application (NDA), Abbreviated new Drug Application (ANDA) Submissions,

UNIT VI: Regulatory Authorities and Their Approval: Introduction to FDA, WHO, Code of federal Regulations, Schedule Y and its amendments, Clinical trial approval by Drug Controller General Of India (DCGI), European Medicines Agency and its responsibility, EU clinical trial directive.

TEXT BOOKS:

1. Good Clinical Practices, Central Drugs Standard Control Organization, Govt of India
2. Drugs and Cosmetics Act, 1940

REFERENCES:

1. International Clinical Trial, Volume 1&2, Dominique P.Brunier and Gerhardt Nahler, Interpharm Press, Colorado
2. Code of Federal Regulations by USFDA-Download
3. ICH-GCP Guidelines-Download

III Year II Semester**(101BT23) BIOPHARMACEUTICAL TECHNOLOGY
(Professional Elective-I)**

L	T	P/D	C
3	1	-	3

UNIT I: Introduction to Pharmaceuticals: History & Definition of Drugs. Sources of Drugs- Plant, Animals Microbes and Minerals different dosage forms. Routes of drug administration.

UNIT II: Pharmacodynamics: Definition, Physico-Chemical Principles, Pharmacodynamics- Mechanism of drug action, drug receptors, and Physiological receptors: structural and functional families.

UNIT III: Pharmacokinetics: Drug absorption, factors that affect the absorption of drugs, Distribution of drugs, Biotransformation of drugs, Bioavailability of drugs.

UNIT IV: Drug manufacturing processes : Good manufacturing practices, manufacturing facilities, sources of Biopharmaceuticals, Analytical for biopharmaceuticals -Physicochemical and bioanalytical considerations. Quality assurance and control- storage and stability of biotech products

UNIT V: Applications of Biopharmaceuticals: Controlled and sustained delivery of drugs. Biomaterial for the sustained drug delivery. Liposome mediated drug delivery. Drug delivery methods for therapeutic proteins.

UNIT VI: Pharmacogenomics: Historical perspectives and current status, Genetic Polymorphism of Metabolic Reactions, SNPs, Pharmacogenomics in Antibiotics

TEXTBOOK:

1. Biopharmaceuticals: Biochemistry & Biotechnology, Gary Walsh (1998), John Wiley & Sons Ltd.
2. Industrial Pharmaceutical Biotechnology, Heinrich Klefenz, Wiley-VCH (2002)

REFERENCE

1. Remington's Pharmaceutical sciences, Mark Publications & Co.
2. Theory & Practice of Industrial Pharmacy, (3rd ed.) Leon Lachman, Lea & Febiger (1986)

III year II Semester**(101MA72) Quantitative Aptitude**

L	T	P/D	C
-	-	2	2

UNIT I: Number System: Test for Divisibility, Test of prime number, Division and Remainder – HCF and LCM of Numbers - Fractions.

UNIT II: Average: Average of different groups, Replacement of some of the items - Percentage - Profit and Loss.

UNIT III: Ratio and Proportion: Properties of Ratio, Comparison of Ratios, Useful Simple Results on Proportion – Partnership and Share – Mixtures.

UNIT IV: Simple Interest: Effect of change of P, R and T on Simple Interest - Compound Interest: Conversion Period, Difference between Compound Interest and Simple Interest – Time and Work – Time and Distance.

UNIT V: Mensuration : Area of Plane Figures, Volume and Surface Area of Solid Figures .

UNIT VI: Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs.

TEXT BOOKS:

1. Quantitative Aptitude by R.S.Agarwal
2. Quantitative Aptitude by Abhijit Guha

III year II Semester

(101BT24) Comprehensive Viva

L	T	P/D	C
-	-	-	1

III year II Semester**(101BT78) PLANT BIOTECHNOLOGY LAB**

L	T	P/D	C
-	-	3	2

1. Introduction to equipments used in plant tissue culture & Preparation of stock solutions
2. Preparation of media (MS / B5)
3. Surface sterilization of different explants
4. Inoculation of explants for callus induction
5. Inoculation of explants for direct regeneration
6. Inoculation of callus for indirect regeneration
7. Organ culture
8. Protoplast isolation from leaf and callus
9. Purification & cytological examination of protoplasts
10. Preparation of *Agrobacterium* culture for transformation
11. *Agrobacterium* mediated gene transfer
12. Selection of transformants, reporter gene (GUS/GFP) assays

REFERENCES:

1. Plant Biotechnology: Practical Manual, C. C. Giri & Archana Giri, IK International, 2007.
2. Plant Biotechnology: laboratory manual for plant biotechnology, H. S. Chawla, Oxford IBH publishers
3. A Laboratory Manual of Plant Biotechnology (2nd Ed), S. S.Purohit, Agrobios publishers

EQUIPMENTS:

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

III year II Semester**(101BT79) Immunology Lab**

L	T	P/D	C
-	-	3	2

1. Ouchterlony immunodiffusion.
2. Haemagglutination: Blood grouping / typing
3. Enzyme-linked Immunosorbent Assay (ELISA)
4. Immunoglobulin purification
5. WBC counting / total leukocyte count of blood.
6. Differential leukocyte count.
7. RBC counting.
8. Isolation and viability determination of lymphocyte from peripheral blood.
9. Immunofluorescence
10. Rising of antibodies in animals – polyclonal antibodies.
11. Flow cytometer
12. Immuno precipitation
13. Serum Protein Electrophoresis. Immunoelectrophoretic analysis of human serum.
14. Quantification of immunoglobulin in human serum by radial immunodiffusion

IV year I Semester**(101MB02) MANAGEMENT SCIENCE**

L	T	P/D	C
3	1	-	3

UNIT I: Introduction To Management: Management- Definitions, Levels of Management, functions of management- Planning: types of planning, planning process; Organizing: Organizational Design and structure, staffing; Directing; Maslow's Motivational theory, Leadership styles, Controlling: Basic control process.

UNIT II: Introduction To Operations Management: Plant Location, plant layout, types of production, Work Study, Method study and Work Measurement, Basic Procedures, Project Management: Network Analysis - Programme Evaluation and Review Techniques, Critical Path Method, Crashing of Simple Networks.

UNIT III: Materials Management: Objectives of Materials Management Need for Inventory Control, Economic Order Quantity, ABC Analysis, Inventory Control Systems, Just In Time, Introduction to LSCM, Quality Control Techniques – Inspection, ISO standards, Six Sigma.

UNIT IV: Human Resources Management: Objectives of HRM, Challenges of HRM, HR Planning process, HR functions and policies – Recruitment, Selection, Training and Development, Performance Appraisal, Assessment of HR requirements.

UNIT V: Marketing Management: Concept of Marketing, Functions, Marketing Mix, Product Life Cycle, Marketing Strategies, Channels of Distribution, Differences between products and services.

UNIT VI: Strategic Management: Concepts in Strategic Management, Vision, Mission, Objectives, SWOT Analysis, Concept of Strategic Planning, Competitive Advantage, Concept of Core Competence.

REFERENCES:

1. LM Prasad: Principles and Practices of Management, Sultan Chand & Sons
2. Aswathappa: Production & Operations Management
3. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2005
4. Memoria & S.V. Gadker, Personnel Management, Himalaya, 25/e, 2005
5. Kotler Philip & Keller Kevin Lane: Market Management 12/e, PHI, 2005
6. Strategic Management, Text and Cases, VSP Rao, V Hari Krishna
7. L.S. Srinath: PERT/CPM, Affiliated East-West Press, 2005.
8. Schermerhom, Capling, Poole & Wiesner. Management, Wiley, 2002
9. Pamell: Strategic Management, Biztantra, 2003
10. Thomas N Duening & John M. Ivancevich Management – Principles and Guidelines, Biztantra, 2003.

IV year I Semester**(101MB55) ENTREPRENEURSHIP
(Open Elective – II)**

L	T	P/D	C
3	1	-	3

The objective of the course is to make students understand the nature of entrepreneurship, and its importance to business.

UNIT I

NATURE OF ENTREPRENEURSHIP: Definition of entrepreneurship, Evolution of entrepreneurship Concept Categories of Entrepreneurship, Entrepreneurial Propensity, Entrepreneurial potential, Entrepreneurial Orientation, Schools of thought on Entrepreneurship, Essential features of Entrepreneurship, attitude and leadership of Entrepreneur, Characteristics of entrepreneur, Qualities and skills, functions of entrepreneur

UNIT II

FORMS OF ENTREPRENEURSHIP: Small Business, Importance in Indian Economy, Types of ownership, sole trading, partnership, Joint Stock Company, Important features of Various types of businesses, corporate entrepreneurship, entrepreneurship, Role of Government in the promotion of Entrepreneur, State Enterprises in India.

UNIT III

ASPECTS OF PROMOTION: OpportUNITY Analysis, SWOT Analysis, Internal and External Environment Analysis, Technological Competitiveness, Entrepreneurs and legal regulatory systems.

UNIT IV

PROJECT PLANNING AND FEASIBILITY STUDIES: The Concept of Project, Project Life Cycle, Project Planning, Feasibility, SWOT Analysis, Product and Process Development, Major steps in product development.

UNIT V

FINANCIAL ASPECTS OF THE ENTREPRENEURSHIP: Source of Capital, Debt-Equity Financing Commercial Banks, Bank Loans, Assessment of Benefits and Costs, Informal Agencies In financing entrepreneurs, Government Grants and Subsidies, Types of Investors and Private Offerings. Entrepreneurial Strategy: Generation of new entry opportUNITY, Decisions under Uncertainty, entry strategy, new entry exploitation, environmental instability and First-Mover disadvantages, Risk Reduction strategies, Market scope strategy, Imitation strategies and Managing Newness, Marketing strategies for start-ups, Operational complexities in start-ups

UNIT VI

WOMEN ENTREPRENEURSHIP: Introduction, Problems faced by Women Entrepreneurs in India, Strategies to overcome obstacles faced by women entrepreneurs. The dynamic need, entrepreneurship in a Developing economy, the scope of entrepreneurship among women, promotional efforts supporting women entrepreneurs in India, Issues of employment generation.

References:

- H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.
- Robert D Hisrich, Michael P Peters, Dean A Shepherd, Entrepreneurship, Sixth Edition, New Delhi, 2006.
- Alfred E. Osborne, Entrepreneur's Toolkit, Harvard Business Essentials, HBS Press, USA, 2005.
- Madhurima Lall, Shikha Sahai, Entrepreneurship, Excel Books, First Edition, New Delhi, 2006.
- S.S. Khanka, Entrepreneurial Development, S. Chand and Company Limited, New Delhi, 2007.
- Thomas W. Zimmerer, Norman M. Scarborough, Essentials of Entrepreneurship And Small Business Management, Fourth Edition, Pearson, New Delhi, 2006
- S.R. Bhowmik, M. Bhowmik, Entrepreneurship-A tool for Economic Growth And A key to Business Success, New Age International Publishers, First Edition, (formerly Wiley Eastern Limited), New Delhi, 2007

IV year I Semester**(101MB56) BANKING OPERATIONS, INSURANCE AND RISK MANAGEMENT
(Open Elective – II)**

L	T	P/D	C
3	1	-	3

UNIT I:**INTRODUCTION TO BANKING BUSINESS:**

Banking Sectors- Retail, Corporate, Rural, and International; Non-banking financial intermediaries; Types of advances and deposits in a bank, New Dimensions and Products. - Credit, Debit and Smart Cards, and e-Banking Structure of the Indian Banking System's. Commercial Banks – Public and Private Sector and Foreign Banks. Cooperative Banks.

UNIT II:**BANKING REFORMS AND REGULATION:**

Banking Regulation Act, 1949, Reserve Bank of India Act 1934, and Reserve Bank's Instruments of Credit Control. Deficiencies in Indian Banking including Problems Accounts and Non-Performing Assets, Banking Sector Reforms.

UNIT III:**INSURANCE:**

Need for and importance of insurance, branches of insurance (life and general insurance) policy and procedure.

UNIT IV:**INSURANCE BUSINESS ENVIRONMENT:**

Mathematical basis of life insurance, reinsurance coverage, regulatory and legal frame work governing the insurance, business and economics of insurance, need for changing mindset; Latest trends.

UNIT V:**INTRODUCTION TO RISK**

Types of Risks facing Business and Individuals, Risk Management Process, Risk Management Methods, Risk Identification and Measurement, Risk Management Techniques: Non Insurance Methods.

UNIT VI:**INSURANCE AS A RISK MANAGEMENT**

Techniques Principles: Principle of Indemnity, Principle of Insurable Interest, Principle of Subrogation, Principle of utmost good Faith, Requisites of Insurable Risks, Requirements of an Insurance Contract, Distinguishes Characteristics of Insurance Contracts, Role of Agents and Brokers.

TEXT BOOKS

1. Varshney, P.N., Banking Law and Practice, Sultan Chand & Sons, New Delhi.
2. General principles of Insurance - Harding and Evanly
3. Mark S.Dorfman: Risk Management and Insurance, Pearson, 2009.

REFERENCES:

- Scott E. Harringam Gregory R. Nichaus: Risk Management & Insurance, , TMH, 2009.
- George E. Rejda: Principles of risk Management & Insurance, , 9/e, Pearson Education, 2009.
- G.Koteshwar: Risk Management Insurance and Derivatives, Himalaya, 2008
- Gulati: Principles of Insurance Management, Excel, 2009
- James S Trieschmann, Robert E. Hoyt & David N. Sommer: Risk Management & Insurance, Cengage, 2009.
- Dorfman: Introduction to Risk Management and Insurance, 8/e, Pearson, 2009.
- P.K.Gupta: Insurance and Risk Management, Himalaya ,2009.
- Vivek & P.N. Asthana: Financial Risk Management, Himalaya,2009

IV year I Semester**(101CS03) OOP THROUGH JAVA**

L	T	P/D	C
3	1	-	3

UNIT I: History of Java, Java buzzwords, datatypes, variables, simple java program, scope and life time of variables, operators, expressions, control statements, type conversion and casting, arrays, classes and objects – concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, recursion, string handling.

UNIT II: Inheritance – Definition, single inheritance, benefits of inheritance, Member access rules, super class, polymorphism- method overriding, using final with inheritance, abstract classes, Base class object.

UNIT III: Interfaces :definition, variables and methods in interfaces, differences between classes and interfaces, usage implements and extends keyword, an application using interfaces, uses of interfaces. Packages: Definition, types of packages, Creating and importing a user defined package

UNIT IV: Exception handling -exception definition, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. Multi-Threading:-Thread definition, types of multitasking, uses of multitasking, creating threads using Thread class and Runnable interface, synchronizing threads, thread life cycle.

UNIT V: Advantages of GUI over CUI, The AWT class hierarchy, Component, Frame, Event handling:

Delegation event model, closing a Frame, mouse and keyboard events, Adapter classes. user interface components- labels, button, scrollbars, text components, check box, check box groups, choices, lists panels – scrollpane, menubar, graphics, layout manager – layout manager types – boarder, grid, flow, card and grid bag. Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

UNIT VI: Networking – Basics of network programming, addresses, ports, sockets, simple client server program, multiple clients, sending file from server to client, parallel search server.

TEXT BOOKS

- Java; the complete reference, 6th editon, Herbert schildt, TMH.
- Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education.

REFERENCES

1. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, seventh Edition, Pearson Education.
2. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education

IV year I Semester**(101BT25) DOWNSTREAM PROCESSING**

L	T	P/D	C
3	1	-	3

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

UNIT-II: Bio-Separation Physico-chemical basis of bio-separation processes. Recent development in product Isolation (for ex. one step purification, reverse micelle extraction)

UNIT III: Solid-Liquid Separation: Cell disruption methods for intracellular products, removal of insoluble, biomass (and particulate debris) separation techniques, flocculation and sedimentation, centrifugation and filtration (types and equipments) methods.

UNIT IV: Concentration Of Products I: Membrane-based separations (micro, ultra filtration, hyper filtration, electrodialysis and dialysis), theory, design and configuration of membrane separation equipment applications, Precipitation methods (with salts, organic solvents, and polymers), Extractive separations, aqueous two-phase extraction, supercritical extraction, in situ product removal, integrated bioprocessing.

UNIT V: Concentration Of Products II: Chromatographic techniques- Paper, TLC, Adsorption, Ion exchange, Gel filtration, affinity chromatographic separation processes, GC, HPLC, FPLC, Chromatofocusing electrophoretic separations.

UNIT VI: Alternative Separations Methods: Crystallization, Pervaporation, super critical extraction and foam based separation case study with examples for processing of Two Industrial Products (Gluconic acid / Streptomycin)

TEXT BOOKS:

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

REFERENCES:

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

IV year I Semester**(101BT26) ANIMAL BIOTECHNOLOGY**

L	T	P/D	C
3	1	-	3

UNIT I: Animal cell culture and Media: Introduction, Media-balanced salt solutions and simple growth medium, Role of serum, Serum and protein free media, cell growth factors, Equipment and materials for animal cell culture technology, Chemical, physical and metabolic functions of different constituents of culture medium – Over View

UNIT II: Establishing Cell lines: Basic techniques , disaggregation of tissue- trypsinization, Primary and established cell lines, maintenance of cell culture, cell separation, Cryopreservation, Stem cells –Types and applications

UNIT III: Cell Viability and Toxicity: Biology and characterization of the cultured cells, measuring parameters of growth, Measurement of viability and cytotoxicity, apoptosis and necrosis.

UNIT IV: Cell synchronization: :Cell synchronization, cell transformation, applications of animal cell culture- vaccines, scaling up of animal cell culture

UNIT V: Induced animal Breeding: Introduction, artificial insemination, cloning, invitro fertilization and embryo transfer, nuclear transplantation, selective animal breeding.

UNIT VI: Transgenics: Concept of Transgenics, Gene Pharming, Production of transgenic animals - mouse, fish, sheep, androgenesis, gynogenesis, Ploidy induction

TEXT BOOKS:

1. Culture of Animal Cells, (3rd Edition), F1. Ian Freshney, Wiley-Liss
2. Animal Cell Culture-Practical approach, Ed. John R.W.Masters, Oxford

REFERENCES:

1. Cell Culture Lab Fax. Eds.M.Butler & M.Dawson, Bios Scientific Publications Ltd, Oxford
2. Animal Cell Culture Techniques, Ed. Martin Clynes, Springer
3. Methods in Cell Biology, vol 57, Animal Cell Culture Methods, Ed. Jenni P, Mather and David Barnes, Academic press
4. Cell Growth and Division: A Practical Approach. Ed R.Basega, IRL Press

IV Year I-SEM**(101BT27) MOLECULAR PATHOGENESIS
(Professional Elective – II)**

L	T	P/D	C
3	1	-	3

UNIT I: Introduction to Pathogenesis : Components of microbial pathogenicity, Population genetics of microbial pathogenesis, methods to detect genetic diversity and structure in natural population, epidemiology.

UNIT II: Host Defenses : Host defence against pathogens, clinical importance of understanding host defense, components of the host surface defense systems like skin, mucosa, eye, mouth, respiratory tract, components of the systemic defence like tissues and blood

UNIT III: Host-Pathogen interactions: Virulence and virulence factors, colonizing virulence factors, Diphtheria disease by colonization, disease without colonization, virulence factors damaging the host tissues, virulence genes and regulation of virulence genes. Immune evasion.

UNIT IV: Experimental methods to Study Host-Pathogen Interaction: Selecting the pathogen model, measurement of virulence, identification of potential virulence factors

UNIT V: Modulation of Immune Responses: Vaccines, properties of vaccines. Other immunomodulators – Interleukins (IL-2, IL-4, IL-6, IL-10 and IL-12), Chemokines (IL-8, Rantes, MCP-2 and MIP-1), Interferons (alpha, beta ad gamma interferons).

UNIT VI: Paradigms of Pathogenesis: Clostridium botulinum and Staphylococcus aureus, Intestinal infections, Shigella and E.coli infections. Vibrio cholera infections, gastric and duodenal ulcers-are they due to infection? Tuberculosis and other mycobacterial infections reemerging with vengeance. Viral infections – hepatitis and AIDS. Malaria. Helminthic infection due to round worm.

TEXT BOOKS

1. Iglewski BH and Clark VL. Molecular basis of Bacterial Pathogenesis, Academic Press, 1993
2. Janeway CA and Travers PT. Immunobiology, Blackwell Scientific Publishers, 1994

REFERENCE BOOKS:

1. Talaro K and Talaro A Foundations in Microbiology, WC Brown Publishers, 1993
2. Roitt I. Essentials of Immunology, 8th Edition, Blackwell Scientific Publishers, 1994
3. Austyn JM and Wood KJ. Principles of Cellular and Molecular Immunology, Oxford University Press, 1993

IV Year I Semester**(101BT28) BIOTECHNOLOGY FOR CROP IMPROVEMENT
(Professional Elective – II)**

L	T	P/D	C
3	1	-	3

UNIT I: Plant Biotechnology For Crop Improvement: Techniques for plant transformation, Conventional plant breeding strategies – Seed development, Hybridization, Inbred lines, Pure lines, Heterosis, Genetic Engineering of crops for useful agronomic traits for male sterility, food quality, improved crop productivity and molecular farming.

UNIT II: Molecular Markers: Random amplified polymorphic DNA (RAPD), Restriction fragment length polymorphism (RFLP), Amplified fragment length polymorphism (AFLP), Simple sequence repeats (SSR), Inter Simple sequence repeats (ISSR), Single strand conformation polymorphism (SSCP) and Quantitative trait loci (QTLs)

UNIT III: Molecular Markers For Crop Improvement: Marker assisted selection (MAS), Construction of molecular maps in plants, Map based Cloning, Molecular maps and their utility in plant genomics, Advantages and limitations of molecular markers.

UNIT IV: Transgenic Crops I: Transgenics for stress tolerance, secondary metabolites, increase in productivity by manipulation of photosynthesis, nitrogen fixation, nutrient uptake efficiency, biotic and abiotic stress tolerance-insects, fungi, bacteria, viruses, weeds, drought, salt, flooding and temperature.

UNIT V: Transgenic Crops II: Plants as bioreactors, transgenic plants for quality improvement of protein, lipid & carbohydrate content, Plantibodies, Plant derived vaccines, phytoremediation of contaminated soils, Risks and benefits of release of GM crops. Regulation of research and development of transgenic plants.

UNIT VI: Molecular Biology Of Plant Processes : Tissue specific gene expression, Discovery / Cloning of Plant Genes: Probe based screening, Genomic and proteomic approaches

TEXT BOOKS:

1. Biochemistry and Molecular Biology of Plants (Buchanan, B.B., Gruissem, W. and Jones, R.L eds.) 2000
2. Molecular Plant Breeding, Yunbi Xu, CABI Publishers, I edition, 2010 (ISBN-13: **978-1845933920**)

REFERENCES

1. Principles of Plant Genetics and Breeding, George Acquaah, Blackwell-Wiley Publishers, I Edition, 2006 (ISBN-13: **978-1405136464**)
2. Plant Molecular Breeding- Sheffield Biological Series, H. John Newbury, Blackwell Publishers, 2003 (ISBN-13: **978-0849328138**)

IV Year I Semester**(101BT29) BIOSENSORS AND BIOELECTRONICS
(Professional Elective –II)**

L	T	P/D	C
3	1	-	3

UNIT I: Introduction: Definition of Biosensors Advantages and limitations, various components of biosensors

UNIT II: Types Of Biosensors: Biocatalysis based biosensors, bioaffinity based biosensors, biologically active material and analyte, Types of membranes used in biosensor constructions

UNIT III: Transducer : types, principles and applications-calorimetric, optical, potentiometric/amperometric conductrometric/resistometric, piezoelectric, bioluminescence and Chemiluminescence-based biosensors

UNIT IV: Application Of Biosensors: in clinical chemistry, medicine and health care, biosensors for veterinary, agriculture and food, low cost biosensor for industrial processes on-line monitoring, biosensors for environmental monitoring

UNIT V: Nano Biosensors: Nano optics for biosensors, DNA as tool for Nano bio sensing, Nanowire bio sensing. Implantable biosensors

UNIT VI: Molecular Electronics: Introduction to molecular electronics, Development of molecular arrays, molecular wires and switches, mechanisms of UNIT assembly

TEXT BOOKS:

1. Biosensors: An Introduction by Brian R. Eggins Biosensors edited by AEG CASS OIRL press Oxford University John Wiley & Sons (1997). 2.
2. Roger, K.R. and Gerlach, C.L. 1~99. Update on environmental for biosensors. Env. Sci. Techno! 33 500A - 506A.
3. Billitewski, U. Turner, A.P.F. 2000 Biosensors for environmental monitoring Harwood, Amsterdam.

REFERENCE:

1. Biosensors, Elizabeth A. H. Hall, open University Press Biotechnology Series

IV Year I Semester

(101BT30) PHYTOCHEMICALS AND HERBAL MEDICINE
(Professional Elective-III)

L	T	P/D	C
3	1	-	3

UNIT I: Phytochemicals :Scope & Importance, Classification (Taxonomical, Morphological Chemical, Pharmacological and molecular); Cultivation, Collection & processing of Crude Drugs.

UNIT II: Medicinal & Aromatic Plants: Cultivation Utilization and geographical distribution of Medicinal & Aromatic Plants in India.

UNIT III: Tissue Culture Of Medicinal Plants: Plant Tissue Culture as source of medicines, Plant Tissue Culture for enhancing secondary metabolite production (*Withania somnifera*, *Rauwolfia serpentina*, *Catheranthus roseus*, *Andrographis paniculata*, *Dioscorea* sp.); Anticancer drugs (Taxol, Vicristin, Vinblastin, Camptothesis)

UNIT IV: Methods Of Drug Evaluation: (Morphological, Microscopic, Physical & Chemical). Preliminary screening, Assay of Drugs – Biological evaluation / assays, Microbiological methods.

UNIT V: Chemical Methods Of Analysis And Detection Of Adulterants: Chemical estimations, Spectrophotometry & Fluorescence analysis. Drug adulteration – Types of adulterants.

UNIT VI: Types Of Phytochemicals- Carbohydrates & Derived Products; Glycosides - extraction methods (Digitalis, Aloe, Dioscorea,); Tannins (Hydrolysable & Condensed types); Volatile Oils - extraction methods, (Clove, Mentha), Alkaloids - extraction methods (Taxus, Papaver, Cinchona); Flavonoids- extraction methods, Resins- extraction methods, Applications of Phytochemicals- Application of phytochemicals in industry and healthcare; Biocides, Biofungicides, Biopesticides.

TEXT BOOKS:

1. Pharmacognosy, C. K. Kokate, A. P. Purohit & S. B. Gokhale (1996), Nirali Prakashan, 4th Ed.
2. Natural Products in medicine: A Biosynthetic approach (1997), Wiley.

REFERENCES:

1. Hornok, L. (ed.) (1992). Cultivation & Processing of Medicinal Plants, Chichister, U. K: J. Wiley & Sons.
2. Trease & Evans, Pharmacognosy – William Charles Evans, 14th ed. (1989), Harcourt Brace & Company.

IV Year I Semester**(101BT31) FOOD SCIENCE AND TECHNOLOGY
(Professional Elective-III)**

L	T	P/D	C
3	1	-	3

UNIT I: Introduction: Objectives of Food science and Technology, Chemical, nutritional, and functional properties of carbohydrates (starch, cellulose, sugars, pectin, fibres (changes during processing) manufacture of maltodextrins and corn syrups, Cyclodextrins, lipids (omega-3 and omega-6 fatty acids, Phytosterols and their nutraceutical significance) Rancidity. Proteins(Protein efficiency ratio PER), enzymes, Endogenous enzymes in foods, Enzymes as food processing aids.

UNIT II: Food Preservation: Principles of food preservation: Physical (Blanching, Pasteurization, Freezing), Thermal death time, D-value, Z-value , Irradiated foods – Radappertization, Radicidation, and radurization of foods. Chemical : Benzoic acid and parabens, nitrites and nitrates, phenolics, antioxidants: BHA, BHT and biological methods: Bacteriocin, Nisin)

UNIT III: Food Microbiology and Fermentations: Probiotics, types of microorganisms associated with food –meats, seafood, vegetables, Dairy products. Factors affecting growth and survival of Microorganisms in foods. Fermented meat -sausages, Fisheries - Fish Sauses, vegetables-Sauerkaraut, Olives, Dairy products -cheese, beverages- wine, beer. Spoilage in Meats, Fish, Food -borne infections – Salmonellosis, shigellosis, *E.coli*, gastroenteritis), Food intoxications – Botulism , aflatoxins, patulin, ochratoxins .

UNIT IV: Food Additives and Analysis: Pigments in food, Food Flavours and colours, Water activity measurements and its significance in food quality, Enzymatic methods of food analysis, Analysis of pesticides in foods, Analysis of heavy metals in food, analysis of phytosterols, *trans*-fatty acids and omega fatty acids, Chromatographic methods in food analysis.

UNIT V: Food Processing: Basic principles, UNIT operations-size reduction-hammer mill, ball mill, mixing –pan mixers ,masticators, blender. emulsification, centrifugation-tubular bowl centrifuge, disc bowl centrifuge ,Extraction, crystallization-vacuum crystalizer.

UNIT VI: Quality Control : Concept of quality: Quality attributes- physical, chemical, nutritional, microbial, and sensory; their measurement and evaluation. International quality systems and standards like BS 5750 and ISO 9000 series. Food Safety and Standards Act, 2006; HACCP. certification and quality assurance AGMARK, BIS).

TEXT BOOKS

1. Roger A., Gordan B., and John T., " Food Biotechnology ", 1989. 3.
2. George J.B., and John T., " Food Microbiology ", CBS Publishers & Distributors, 1987. 4th edition.
3. Frazier and D. C. Westhoff , Food Microbiology, 4th ed., 1988.

REFERENCES

1. George, J. B., "Basic Food Microbiology", CBS Publishers Distributors, 1987. 4th edition.
2. Lindsay, Willis Biotechnology, Challenges for the flavor and food Industries, Elsevier Applied Science, 1988. 4

IV Year I Semester**(101BT32) NANOBIO TECHNOLOGY
(Professional Elective-III)**

L	T	P/D	C
3	1	-	3

UNIT I: Introduction to Nanotechnology: Nanotechnology-historical perspective, Definition of nano scale with reference to biosystems; Nanobiotechnology Vs Bionanotechnology; Scope and future prospects; Challenges of nanotechnology.

UNIT II: Nanostructures: Nanomaterial synthesis-overview, Properties, Self assembly and Polymerization; Smart materials- nano-biostructures- carbon nanotubes, bucky balls, nano wire; Heterogenous nano structures- nano shells, Quantum Dots, Micelles and liposomes.

UNIT III: Nanocharacterization Tools: Spectroscopy-NMR, Raman, Plasma Resonance and imaging techniques; Electron microscopy-SEM, TEM, STEM; Scanning probe instruments; Nanolithography; XRD.

UNIT IV: Nanomolecular biology: Microarrays (DNA and Protein); Role of genetically engineered polymer proteins; Protein-hybrid computers.

UNIT V: Nanobiotechnology Applications-I: Drug delivery, Photodynamic therapy, molecular motors, neuro electronic interfaces, development of nanoluminescent tags, Designer biopolymers-Procollagen, RNA topoisomerase, Proteins as magnetic materials, Tissue engineering.

UNIT VI: Nanobiotechnology Applications-II: Applications in Agriculture - Smart Delivery Systems, Food industry - Food Processing, Environment - remediation of soil and water.

TEXTBOOKS

1. M. Ratner and D.Ratner, Nanotechnology—a gentle introduction to the next big idea, Pearson Education, 2007.
2. R. R. Birge, Protein based computers, Scientific American, 1995.
3. Bionanotechnology by Good Sell-Wiley Liss.
4. Biomedical applications of nanotechnology by-Labhasetwar-Wiley Interscience.

REFERENCES

1. L.E.Foster, Nanotechnology-Science, Innovation and opportunity, Person education inc, 2007.
2. Nanoelectronics and nanosystems-Karl Goser-Springer Engineering Series.

IV year I Semester**(101MA73) LOGICAL REASONING – II**

L	T	P/D	C
-	-	2	2

UNIT I: Data Sufficiency: Problems in which a question on any topic such as Coding – Decoding, Blood Relations, Directions, Arithmetical Reasoning etc.

UNIT II: Puzzle Test: Classification Type Questions, Seating Arrangements Comparison Type Questions, Sequential Order of Things, Selection Based on given conditions, Family – Based Puzzles, Jumbled Problems.

UNIT III: Assertions and Reason – Logical Venn Diagrams – Alpha Numeric Sequence Puzzle.

UNIT IV: Cubes and Dice – Analytical Reasoning

UNIT V: Logical Deduction: Logic, Statement – Arguments, Statement – Assumptions, Statement – Conclusions, Deriving Conclusions from Passages.

UNIT VI: Clocks & Calendar.

Text Book: Verbal and Non Verbal Reasoning by R.S. Agarwal.

IV year I Semester

(101BT33) Pre Project Seminar

L	T	P/D	C
-	-	-	2

IV year I Semester

(101BT34) Industry Oriented Mini Project

L	T	P/D	C
1	-	-	2

IV Year I Semester

(101BT80) DOWNSTREAM PROCESSING LABORATORY

L	T	P/D	C
1	-	3	2

Experiments:

1. Downstream processing of ethanol using distillation technique
2. Two phase aqueous extraction
3. Isolation and partial purification of egg white lysozyme
4. Isolation and estimation of casein from milk
5. Cell disruption using Homogenizer
6. Gel filtration chromatography
7. Adsorption isotherms
8. Isolation of Chloroplasts and estimation of chlorophyll content
9. Precipitation of proteins using Ammonium sulphate
10. Agarose gel Electrophoresis
11. Sedimentation studies
12. Drying technique

Equipments:

1. Tangential flow filtration UNIT
2. Ultra filtration membrane
3. Centrifuge.
4. Chromatographic matrix.
5. Chromatographic columns.
6. UV – Vis spectrophotometer.
7. Separating funnel
8. Lyophilizer
9. Magnetic stirrer.

IV Year I Semester**(101BT81)ANIMAL BIOTECHNOLOGY LABORATORY**

L	T	P/D	C
	-	3	2

1. Inverted Microscopy - Demonstration
2. Aseptic culture of cells
3. Warm Trypsinization
4. Cold Trypsinization
5. Passage of Monolayer
6. Primary culture technique for chicken embryo fibroblast
7. Establishment of suspension culture
8. Maintenance of cell lines
9. Cell viability Assay by Trypan blue
10. DNA damage by Comet Assay
11. Study of effect of toxic chemicals on cultured mammalian cells
12. Cryopreservation technique

IV year II Semester**(101BT35) BIOETHICS, BIO SAFETY & IPR**

L	T	P/D	C
4	1	-	4

UNIT I: Bioethics: Principles of Bioethics. Bioethics in Microbial (Bioterrorism-Anthrax, Botulism), Plant (GMO) & Animal (Stem Cells & Cloning) Biotechnology

UNIT II: Biosafety Concepts And Issues: Definition of Biosafety, Biosafety for human health and environment, Assessment of Biological hazard, Levels of biosafety for microbes, plants & animals, Cartagena protocol

UNIT III: Biosafety Regulations: Use of genetically modified organisms and their release in to the environment. Special procedures for r-DNA based products. International dimensions in Biosafety. Biotechnology and food safety. Case study – Bt Cotton, Bt Brinjal

UNIT IV: Intellectual Property Rights I: Discovery & Innovation, Types of IPR, Patents and methods of application of patents, Case study on Patents (Basmati rice, Turmeric, Neem). Trade Secrets, Copyrights, Trade Marks, Industrial designs,

UNIT V: Intellectual Property Rights II: Patent search – databases, Patent drafting, Patent Cooperation Treaty (PCT) for filing patents, Plant breeder's rights, Integrated circuits,

UNIT VI: Overview of International And National Conventions: Overview of WTO, GATT, TRIPS, WIPO and Indian Patent Act

TEXT BOOKS:

1. Bioethics – Shaleesha A Stanley, Wisdom Educational Service, Chennai, 2008
2. V Sree Krishna. Bioethics & Biosafety in Biotechnology. New age International Publications, 2007

REFERENCE:

1. Borem, A., Santos, F., & Bowen, D. (2003). *Understanding Biotechnology*. Prentice Hall. Upper Saddle River, NJ.
2. Singer, Peter A.; Viens, A.M. (2008), *Cambridge Textbook of Bioethics*, Cambridge: Cambridge University Press, ISBN 978-0-521-69443-8
3. Anitha Rao R & Bhanoji Rao “Intellectual Property Rights – A Primer”, Eastern Book Company, 2008.
4. Thomas, J.A., Fuch, R.L. (2002). *Biotechnology and Safety Assessment* (3rd Ed). Academic Press.

IV Year II Semester**(101BT36) BIOREACTOR AND PLANT DESIGN**

L	T	P/D	C
4	1	-	4

UNIT-I: Fundamentals Bioreactor Design: Introduction, Production requirement, Biological system identification, Stoichiometry and medium design.

UNIT-II: Stirred Tank Bioreactor Design: Introduction, Important Transport Phenomena: Power consumption, structured model of stirred tank bioreactor.

UNIT-III: Immobilized microorganisms: Bioreactor Design, membrane bioreactor Design.

UNIT-IV: Bioreactor operation modes: Introduction, classification of operation modes, basic equation of operation of stirred tank bioreactors, Fed batch operation, utility of fed batch culture, basic equation of fed batch operation, classification of fed batch operation, basic equation of Chemostat.

UNIT V: Plant Design-I Technical feasibility survey, process development, flow diagrams, equipment design and specifications, Marketability of the product, availability of technology, raw materials, equipments, human resources, land and utilities, site characteristics, plant location, plant layout, plant operation and control

UNIT VI: Plant Design-II Waste disposal, govt. regulations and other legal restrictions, community factors and other factors affecting investment and production costs, Administration, safety and other auxiliary services, payroll overheads, warehouse and storage facilities etc.

TEXT BOOKS:

1. Bioreactor System Design by Juen A.Asenjo, Jose C.Merchuk, Published by CRC Press 1995.
- 2.. Peters and Timmerhaus, Plant design and Economics for Chemical Engineers, McGraw Hill 4th Edition, 1989.

IV Year II Semester

(101BT36) Project

L	T	P/D	C
-	-	-	10

IV Year II Semester

(101BT39) Comprehensive viva

L T P/D C

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IV Year II Semester

(101BT39) Technical Seminar

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