

**COURSE STRUCTURE
AND
DETAILED SYLLABUS
for
B.Tech Four Year Degree Course – I and IV year
in
BIOTECHNOLOGY
(BT)
(Applicable for the batches admitted from 2012-2013)**



SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY
(An Autonomous Institution approved by UGC and affiliated to JNTUH)
Yamnapet, Ghatkesar, R.R.District-501 301.

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY
(Autonomous)
B.Tech BIOTECHNOLOGY

B. Tech I YEAR I SEMESTER COURSE STRUCTURE 2012-13

S. No	Subject Code	Subject	L	T	P/D	C	Int (Max. Marks)	Ext (Max. Marks)
1	121EN01	English I	3	-	-	3	30	70
2	121MA02	Mathematics for Biotechnology - I (For Bi.P.C students) (OR) Fundamentals of Biology (For MPC Students)	3	2	-	3	30	70
	121BT01							
3	121PH01	Engineering Physics - I	3	1	-	3	30	70
4	121CH01	Engineering Chemistry	2	1	-	2	30	70
5	121 IT 01	Computer Programming	3	1	-	3	30	70
6	121ME01	Engineering Drawing - I	2	-	4	4	30	70
7	121EN71	English Language Lab - I	-	-	2	1	25	50
8	121PH71	Engineering Physics Lab - I	-	-	3/2	1	25	50
9	121CH71	Engineering Chemistry Lab	-	-	3/2	1	25	50
10	121 IT 71	Computer Programming Lab	-	-	3	2	25	50
11	121ME71	Engineering Workshop – I	-	-	3/2	1	25	50
12	121 IT 72	IT Workshop -I	-	-	3/2	1	25	50
Total			16	5	15	25	330	720

B. Tech Biotechnology
I Year II Semester Course Structure

S. No	Subject Code	Subject	L	T	P/D	C	Int (Max. Marks)	Ext (Max. Marks)
1	121EN02	English - II	2	1	-	2	30	70
2	121MA04	Mathematics for Biotechnology II	3	2	-	3	30	70
3	121CS01	Data Structures and C ++	4	1	-	4	30	70
4	121ME02	Engineering Drawing - II	1	-	3	2	30	70
5	121EE41	Basic Electrical Engineering	3	1	-	3	30	70
6	121BT02	Process Engineering Calculations	4	1	-	4	30	70
7	121CH03	Chemistry for Biotechnologists	2	1	-	2	30	70
8	121EN72	English Language Lab-II	-	-	2	1	25	50
9	121CS71	Data Structures and C ++ Lab	-	-	3	2	25	50
10	121ME72	Engineering Workshop-II	-	-	3/2	1	25	50
11	121IT73	IT Workshop-II	-	-	3/2	1	25	50
Total			19	7	11	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	121EC02	Basic Electronics	3	1	-	3	30	70
2	121MA06	Mathematics for Biotechnology - III	3	2	-	3	30	70
3	121BT03	Biochemistry	4	1	-	4	30	70
4	121BT04	Microbiology	3	1	-	3	30	70
5	121BT05	Cell Biology	3	1	-	3	30	70
6	121ME04	Basic Mechanical Engineering	3	2	-	3	30	70
7	121EN73	Functional and Communicative Written English	-	-	3	2	25	50
8	121BT71	Biochemistry Lab	-	-	3	2	25	50
9	121BT72	Microbiology and Cell Biology Lab	-	-	3	2	25	50
Total			19	8	9	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	121BT06	Environmental Studies	3	1	-	3	30	70
2	121MA07	Probability and Statistics	3	1	-	3	30	70
3	121BT07	Thermodynamics for Biotechnologists	3	1	-	3	30	70
4	121BT08	Genetics and Molecular Biology	3	1	-	3	30	70
5	121BT09	Instrumental Methods of Analysis	3	1	-	3	30	70
6	121BT10	Bioprocess Engineering	3	1	-	3	30	70
7	121EN74	Effective English Communication and Soft Skills	-	-	2	2	25	50
8	121BT11	Comprehensive Viva	-	-	-	1	-	50
9	121BT73	Bioprocess Engineering Lab	-	-	3	2	25	50
10	121BT74	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	3ZC01	Managerial Economics & Financial Analysis and control	3	1	-	3	30	70
2	3G512	Biochemical Reaction Engineering	3	1	-	3	30	70
3	3G513	Genetic Engineering	3	1	-	3	30	70
4	3G514	Bioinformatics	3	1	-	3	30	70
5	3G515	Momentum and Heat Transfer	3	1	-	3	30	70
6		Open Elective-I	3	-	-	3	30	70
7	3HC76	Quantitative Aptitude	-	-	2	1	25	50
8	3G575	Group Project	-	-	3	1	25	50
9	3G576	Genetics, Molecular Biology and Genetic Engineering Lab	-	-	3	2	25	50
10.	3G577	Bioinformatics Lab	-	-	3	2	25	50
11	3G578	Technical paper Writing & Seminar - I	-	-	2	1	25	-
		Total	18	5	13	25	305	620

Subject code	Open Elective – I
3HC51	Basic Spanish Language
3HC41	Basic French Language
3HC46	Basic German Language
3ZC09	Total Quality Management
3ZC11	Logistics and Supply Chain Management

B. Tech Biotechnology
III Year II Semester Course Structure

S. No	Subject code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	3G616	Instrumentation and Bioprocess Control	3	1	-	3	30	70
2		Open Elective-II	3	-	-	3	30	70
3	3G617	Plant Biotechnology	3	1	-	3	30	70
4	3G618	Immunology	3	1	-	3	30	70
5	3G619	Mass Transfer and Separations	3	1	-	3	30	70
6		Professional Elective-I	3	1	-	3	30	70
7	3H677	Logical Reasoning	-	-	2	1	25	50
8	3G677	Comprehensive Viva Voce	-	-	-	1	-	50
9	3G678	Plant Biotechnology Lab	-	-	3	2	25	50
10	3G679	Immunology Lab	-	-	3	2	25	50
11.	3G680	Technical paper Writing & Seminar -II	-	-	2	1	25	-
Total			18	5	10	25	280	620

Subject code	Open Elective – II	Subject code	Professional Elective – I
3ZC03	Banking Operations, Insurance and Risk Assessment	3G620	Computational Molecular Biology
3ZC04	Entrepreneurship	3G621	Cancer Biology
3ZC07	Fundamentals of Disaster Management	3G622	Biopharmaceutical Technology
3ZC12	Project Management and Finance		

IV Year I Semester Course Structure

S. No	Subject code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	3ZC02	Management Science	3	1	-	3	30	70
2	3G723	Downstream Processing	3	1	-	3	30	70
3	3G724	Animal Biotechnology	3	1	-	3	30	70
4	3G725	Industrial and Environmental Biotechnology	4	1	-	4	30	70
5		Professional Elective-II	4	1	-	4	30	70
6		Professional Elective-III	1	1	-	4	30	70
7	3G732	Project Phase I	-	-	-	1	50	-
8	3G733	Industry oriented Mini-project	-	-	-	2	25	50
9	3G780	Downstream Processing Lab	-	-	3	2	25	50
10	3G781	Animal Biotechnology Lab	-	-	3	2	25	50
11.	3G782	Technical paper Writing & Seminar -III	-	-	2	1	25	-
Total			18	6	8	29	330	570

Subject code	Professional Elective - II	Subject code	Professional Elective - III
3G726	Food Science and Technology	3G729	Molecular Pathogenesis
3G727	Biotechnology for Crop Improvement	3G730	Nano Biotechnology
3G728	Biosensors and Bioelectronics	3G731	Clinical Research and Regulatory Affairs

IV Year II Semester Course Structure

S. No	New Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	3G832	Bioethics, Biosafety & IPR	3	1	-	4	30	70
2	3G833	Bioreactor and Plant Design	3	1	-	4	30	70
3	3G834	Project Phase – II	-	-	15	10	50	150
4	3G835	Comprehensive Viva III	-	-	-	2	-	50
5	3G836	Technical paper Writing & Seminar - IV	-	-	2	1	25	-
6								
		Total	6	2	17	21	135	340

I Year I Semester

(121EN01)

ENGLISH – I

(ENGLISH LANGUAGE TEACHING THROUGH LITERATURE)

(Common to all branches)

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

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. **Listening** : Listening for words
3. **Speaking** : Making requests
4. **Grammar** : Naming words specific (Part I)
5. **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

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

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:

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

Reference Books:

1. **Business Vocabulary In Use -Bill Mascull, Cambridge University Press.**
2. **How to build a better vocabulary –Nurnberg Maxwell & Morris Rosenblum: Grand Central Publishers**

How to read better and faster: Norman Lewis, W.R.Goyal Publishers, New Delhi

I Year I Semester

**(121MA02) MATHEMATICS FOR BIOTECHNOLOGY -I
(FOR BiPC STUDENTS ONLY)**

L	T	P/D	C
3	2	-	3

UNIT I**Trigonometry**

Fundamentals of Algebra, Introduction to Sets, Relations, Functions, Trigonometric ratios of Compound angles, multiple and sub-multiple angles, Transformation, hyperbolic functions and complex numbers.

UNIT II**Co-Ordinate Geometry**

Distance between two points, slope of straight line, and equation of straight line in different forms. Equation to parallel and perpendicular lines. Introduction and standard forms of circle, parabola, ellipse and hyperbola.

UNIT III**Limits and Continuity**

Limit of a function, standard limits, and indeterminate forms. Continuity of function and discontinuity of a function

UNIT IV**Differentiation**

Differentiation, product rule, quotient rule, differentiation of trigonometric, logarithmic, exponential functions and composite functions. Second order derivatives of functions. Length of tangent, sub-tangent, normal and sub-normal.

UNIT V**Partial Differentiation**

Functions of several variables, Partial differentiation, Total differentiation, Euler's theorem, Maxima and Minima for functions of one variable and two variables.

UNIT VI**Integration**

Integration, methods of integration- method of transformation (trigonometric functions), method of substitution, Integration by parts. Integration of rational and irrational functions. Define integrals.

TEXT BOOKS:

1. CBSE Mathematics for Class XI & XII, Dinesh Khattar and Anita Khattar, P H I Publications.

REFERENCE BOOKS:

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

**(121BT01) FUNDAMENTALS OF BIOLOGY
(FOR MPC STUDENTS)**

L	T	P/D	C
3	1	--	3

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 I: Introduction to human body, Structure and function of Digestive, Respiratory, And Circulatory systems.

Unit V: Human Biology II: Structure and function of Nervous, Endocrine, Excretory and Reproductive systems

Unit VI: Applied Biology: Basic concepts of 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

(121PH01) Engineering Physics – 1

(Common to all branches)

L	T	P/D	C
3	1	--	3

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, and hcp Structures.

UNIT-II

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

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

UNIT- III

Elements of Statistical Mechanics: Phase space, Ensemble, Difference between micro, canonical & grand canonical ensemble, Qualitative explanation of Maxwell - Boltzman Statistics, Bose – Einstein Statistics, and Fermi – Dirac Statistics, Density of states quantitative treatment.

UNIT-IV

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-V

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-VI

Band Theory of Solids: Bloch Theorem, Kronig-Penny Model (Qualitative Treatment), E-K curve \bar{e} , velocity of, point of inflection, effective mass of an electron and its significance, Origin of Energy Band Formation in Solids, Classification of Materials into Conductors, Semi Conductors & Insulators.

Text Books:

1. Engineering Physics, P K Palanisamy, Sitech Publications

Reference Books:

1. Introduction to Solid State Physics, Charles Kittel, John Wiley Publisher
2. Solid State Physics, Neil W. Ashcroft, N. David Mermin,, Thomson Publisher,
3. Statistical Mechanics, Donald Allan McQuarrie, University Science Books Publisher, California
4. Statistical Mechanics, Sathya Prakash, Pragathi Prakashan Publisher
5. Quantum Mechanics by G. Aruldas
6. Applied Physics, M Chandrashekar and P Applu Naidu, VGS Book Links

B.Tech I Year I Sem

(121CH01) ENGINEERING CHEMISTRY
(Common to all Branches)

L	T	P/D	C
2	1	0	2

UNIT-I: WATER TECHNOLOGY-I

Introduction ,Effect of water on Rocks and Minerals, Types of impurities in Water, Hardness of Water-Temporary and permanent hardness. Units and Inter conversion of Units. Estimation of Hardness by EDTA Method. Problems on Temporary and permanent Hardness.Disadvantages of Hard Water. Portable water, Methods of Treatment of Water for Domestic purpose-Sedimentation, Coagulation, Filtration, Diinfection-Chlorination, Ozonization. Reverse osmosis

UNIT-II: WATER TECHNOLOGY-II

Water for Industrial purpose –water for steam making-Boiler Troubles-Carry over-Priming and foaming, Boiler Corrosion, Scales and Sludges, Caustic Embrittlement. Water Treatment:-Internal Treatment – colloidal, phosphate Calgon, Carbonate, Sodium aluminate conditioning of Water.External Treatment-Lime soda Process,Zeolite Process,Ion –Exchange Process,-Numerical Problems.

UNIT III: ELECTROCHEMISTRY

Conductance-types, Electrolytic conductance-specific, equivalent and molar conductance, ionic conductance, ionic mobilities, Kolrausch'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.

UNIT IV: BATTERIES

Cell and Battery, 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 V: SCIENCE OF CORROSION

Definition, Examples – Types of Corrosion: Theories of Corrosion and Mechanism – Dry Corrosion, (Direct Chemical attack), Wet Corrosion, (Electro Chemical Theory) Principles of Corrosion, Galvanic Series, Galvanic Corrosion, Concentration Cell Corrosion. Factors influencing Corrosion Control of Corrosion – Proper Design. Use of pure metal and metal alloys, Passivity, Cathodic Protection – Sacrificial anode and Impressed Current Modifying the Environment, use of Inhibitors.

UNIT VI: PROTECTIVE COATING AND METHODS THEIR APPLICATIONS ON METALS

Surface Preparation: (1) Solvent Cleaning (2) Alkali Cleaning (3) Pickling and Etching (4) Sand Blasting (5) Mechanical Cleaning. Types of protective Coating: Metallic Coatings – Anodic Coatings, Galvanization, Cathodic Coatings – Tinning, Metal Cladding, Electroplating Ex: Chromium Plating, Metal Spraying, Cementation Sharadizing, Colourizing, Chromizing, Chemical Conversion Coating: (1) Phosphate (2) Chromate (3) Anodized Coatings.

Organic Coatings: Paints – Constituents and their functions

Text Books:

1. Engineering Chemistry: Dr.M.Tirumala Chary and Dr.E.Laxminarayana, Scitech publications.
2. Engineering Chemistry: P.K. Jain and M.K. Jain, Dhanpathrai Publications – 14th Edition

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. Chemistry of Engineering Materials by CV Agarwal,C.P Murthy, A.Naidu, BS Publications.
4. Engineering Chemistry by R. P. Mani, K. N. Krishna B. Rama Devi Cengage Learning New Delhi (2010).
5. Engineering Chemistry by Shiva Shnakar Tata McGraw Hill (2010).

I Year I Semester

**(121 IT01) COMPUTER PROGRAMMING
(Common to all Branches)**

L	T	P	C
3	1	-	3

UNIT – I- Syllabus

Computer fundamentals – Computer Systems, Computer Hardware, Computer Software, Computer Environments – Personal Computing Environment, Time-sharing Environment, Client/Server Environment, Distributed Computing, Computer Languages – Machine Languages, Symbolic Languages, High-Level Languages, Creating and running programs – Writing and Editing, compiling, linking, and executing programs, System Development – SDLC. (As in chapter 1 of Text Book 1)

Problem solving Techniques – Algorithms, pseudo code, flowcharts – Simple illustrations and domain problems like: Sum of digits of a number, Nature of quadratic equations, Income Tax Problem, Standard Deviation, Fibonacci sequence and golden ratio, Towers of Hanoi.

Objective:

By undergoing this unit, the student will be able to:

1. Define Computer Systems. Distinguish between Computer Hardware and Software. understand different kinds of Computer Languages. Acquaint with Problem solving Techniques through Algorithms, pseudo code, flowcharts.

UNIT – II- Syllabus

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

Simple data types – void, integral, floating-point – memory allocation for these types. Type qualifier const.

Operators – Unary, binary and ternary, precedence and association rules among operators.

Expressions – Primary expressions, post-fix expressions, pre-fix expressions, unary expressions, binary expressions, evaluating expressions, type conversions, statements.

Decision control structures – if..else, dangling else, switch statement.

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

Objective:

By undergoing this unit, the student will be able to:

1. Define Simple data types, operators and expressions.
2. Understand and apply Decision control structures: if ... else, dangling else, switch statement. and apply Repetitive control structures: while, do ... while, for, break and continue statements, Nested structures.

UNIT – III- Syllabus

Arrays – Definition, initialization, strings as character arrays, two dimensional and multidimensional arrays, and variable length arrays.

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.

Objective:

By undergoing this unit, the student will be able to:

1. Define, understand, and apply arrays and pointers. Explain the relationship between arrays and pointers. pointers with functions. Understand the concept of dynamic memory allocation and apply it to solve problems. Handle the strings: Input output functions, string handling functions.

UNIT – IV- Syllabus

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

Parameter passing – Call by value and call by reference, passing arrays as arguments to functions.

Recursive functions – Definition, examples, advantages and disadvantages.

Macros – Definition, examples, comparison with functions.

Objective:

By undergoing this unit, the student will be able to:

1. Define and understand modularity. Differentiate between Call by value and call by reference. Able to pass arrays as arguments to functions. Understand the use of recursion.

UNIT – V- Syllabus

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.

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, text files and binary files, direct reading from and writing structures to files, command line arguments, error handling functions in files random access files.

Objective:

By undergoing this unit, the student will be able to:

1. Define and use structures, unions Understand data organization, file operations, Accessing file data.

UNIT – VI- Syllabus

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

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

Linked Lists & Dynamic memory allocation – Constructing a linked list, adding nodes to, inserting nodes into, deleting nodes from, modifying data in nodes of a linked list.

Objective:

By undergoing this unit, the student will be able to:

1. Undertake case study of simple bank transactions Understand Preprocessor directives: Construct a linked list, and its operations.

Text Books:

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

References:

1. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education.
2. Let us C by Yashwanth P. Kanetkar 8th edition BPB publications.
3. Computer programming for teens by Mary Farrell.

I Year I Semester

**(121ME01)ENGINEERING DRAWING – I
(Common to all branches)**

L T P/D C
2 - 4 4

UNIT – I

Introduction to Engineering Drawing: Drawing Instruments and their uses, types of lines, use of pencils, Lettering, Rules of dimensioning.

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

Introduction To Scales (Theory Only): Scales Used In Engineering Practice and Concept Of Representative Fraction

Curves used in Engineering Practice and their Constructions:

Conic Sections including Rectangular Hyperbola - General method only.

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.

UNIT –V

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

UNIT –VI

Intersection of Similar and Dis-similar Solids: Line method, Cutting plane method, Intersection of Prism Vs Prism, Cylinders Vs Cylinder (Under Similar category) and Cylinder Vs Prism (Under Dis-similar category)

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhatt / Charotar publishers
2. Engineering Drawing, K.L.Narayana and Kannaiah / Sciotech publishers.

REFERENCES:

1. Engineering Drawing, K.Venugopal/G.Sreekanjana, New Age International Publishers.
2. Engineering Drawing, B.V.R.Gupta, M.Raja Roy/I.K.International Publishing House,

I Year I Semester**(121EN71) ENGLISH LANGUAGE LAB – I
(COMMON TO ALL BRANCHES)**

L	T	P/D	C
-	-	2	1

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 listening and learning the sounds of English language i.e. phonetics from the computer monitor, thus preparing them for the correct pronunciation and language fluency.
3. To train them to converse effectively in different situations of life.
4. To help the students in producing effective oral presentations, and to enable them for extempore.

Syllabus:

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

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

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-vusyak 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

Suggested 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
- A text book of English Phonetics for Indian Students by T. Balasubramanian Mac Millan

I Year I Semester**(121PH71) ENGINEERING PHYSICS LABORATORY
(COMMON TO ALL BRANCHES)**

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

1. Calculation of error – Error estimation
2. Determination of wavelength of a given laser Source of light by using diffraction grating
3. To find frequency of tuning fork – Melde’s experiment
4. To find the frequency of ac signal generator – A c Sonometer
5. R C Network
6. L C R series and parallel resonance
7. Determination of rigidity modulus of a given wire – Torsional pendulum
8. Plank’s constant
9. Determination of the acceleration due to gravity by compound pendulum.

Note: Any six of the above nine Experiments are to be conducted.

I Year I Semester

(121CH71) ENGINEERING CHEMISTRY LABORATORY

(COMMON TO ALL BRANCHES)

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

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 n penetration Test.

I Year I Semester

(121IT71) COMPUTER PROGRAMMING LABORATORY

L	T	P/D	C
-	-	3	2

1. Unit I (Cycle 1)

1. Write an algorithm for converting a given Celsius temperature to its equivalent Fahrenheit temperature and draw a flowchart.
2. Write an algorithm to find the largest of three given numbers and draw a flowchart.
3. Write an algorithm and draw a flowchart for finding the roots and nature of roots of a quadratic equation, given its coefficients.
4. Write an algorithm and flowchart for finding the first n Fibonacci numbers, give n.

2. Unit II (Cycle 2)

1. Write an algorithm, flowchart, and C program for:
 1. Finding the area and circumference of a circle of given radius.
 2. Finding the volume of a sphere of given radius.
 3. Finding the lateral surface area of a right circular cone of given base radius and height.
 4. Finding selling price of an item, given its cost price and profit percent.
 5. Finding the interest on a given principal for a given period of time at a given rate of per year.
2. Write a C program to display all the sizes of data types in C.
3. Write a C program to display a given decimal integer into an equivalent octal number and hexadecimal number using %o and %x in printf function.

3. Unit II (Cycle 3)

1. Write a C program to find the roots and nature of the roots of a quadratic equation, given its coefficients.
2. Write a C program for finding the largest of three given numbers.
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.

4. Unit III (Cycle 4)

1. Write three C programs to print a multiplication table for a given number using while, do-while, and for loops.
2. Write a C program to compute the sum of:
 1. $1+x+x^2+x^3+\dots+x^n$, given x and n.
 2. $1! + 2! + 3! + \dots + n!$, given n.
 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.

5. Unit III (Cycle 5)

1. Write a C program in the menu driven style to perform the operations +, -, *, /, % between two given integers.
2. Write a C program to find the largest and the least of some numbers given by the user.
3. Write a C program to find the sum of the digits of a positive integer.

6. Unit III (Cycle 6)

1. Write C functions for the following:
 1. A function that takes an integer n as argument and returns 1 if it is a prime number and 0 otherwise.
 2. A function that takes a real number x and a positive integer n as arguments and returns x^n .
 3. A function that takes a positive integer n as an argument and returns the n^{th} Fibonacci number.
2. Using recursion write C functions for the following:
 1. Factorial of a non-negative integer n.
 2. Number of combinations of n things taken r at a time.
 3. Greatest Common Divisor of two integers.
 4. Least Common Multiple of two integers.

7. **Unit III (Cycle 7)**
 1. Write a menu driven style program to compute the above functions (cycle 6) on the choice of the function given by the user.
 2. Define macros for the following and use them to find sum of the squares of the minimum and maximum of two given numbers.
 1. Larger of two numbers.
 2. Smaller of two numbers.
 3. Sum of the squares of two numbers.
 3. Write a program to generate Pascal's triangle.
 4. Write a program to count the number of letters, words, and lines in a given text.
8. **Unit IV (Cycle 8)**
 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.
 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.
 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. **Unit IV (Cycle 9)**
 1. Write a C program to implement the operations of matrices – addition, subtraction, multiplication.
 2. Write a program to find whether a given matrix is symmetric, lower triangular, upper triangular, diagonal, scalar, or unit matrix.
10. **Unit V (Cycle 10)**
 1. Write a function to swap two numbers.
 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.
11. **Unit VI (Cycle 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.
 2. Define a structure point. Write a program to find the distance between two points.
 3. 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. **Unit VI (Cycle 12)**
 1. Write a program to:
 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.
 2. Open the file created above and display the contents of the file.
 3. Copy a file into some other file, file names given by the user or by command line arguments.
 4. Append a user mentioned file to another file.
 5. Reverse the first n characters of a file.

I Year I Semester

(121ME71) Engineering Workshop –I
(COMMON TO ALL BRANCHES)

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

1. House Wiring

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

2. Home Appliances

Practice of disassembly and assembly of various home appliances (such as Fans, Mixers, Washing machines etc.,

3. Welding

Preparation and welding of Lap Joint
Preparation and welding of Butt Joint

I Year I Semester

(121IT72) IT WORKSHOP-I**(COMMON TO ALL BRANCHES)**

<i>L</i>	<i>T</i>	<i>P/D</i>	<i>C</i>
-	-	3/2	1

Week1:

Introduction to Computer: Identify the peripherals of a computer, components/peripherals in a CPU & its functions. Introduction to the types of Operating System, Install computer with dual boot operating system (windows, Linux with PowerPoint presentation). Comparison of types of OS in different platform.

Week 2: Assembling and Deassembling Praticals

Week 3:

Introduction to Microsoft Windows XP: Software and data, Components of Desktop, Working with windows

Week 4:

Getting Started with Microsoft Windows XP: Using the Start Menu, Obainting Help on Windows
Changing Setting, Using Applications in Windows, Shutting Down Windows

Week 5:

Introduction to Linux Operating system, Linux Commands, DOS commands

Week 6:

Install computer applications in Linux and windows.

Software and hardware trouble shoot, personal computer security settings and application software of the system.

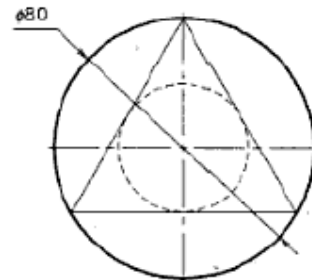
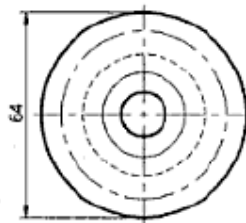
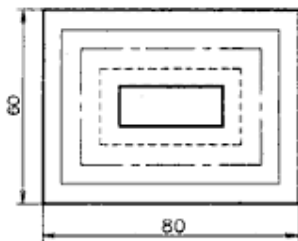
Cyber Ethics: Access websites and email, effectively and securely browse (banksites, https webpages) and share the data, categories of websites (.com, .in, .edu, .org).

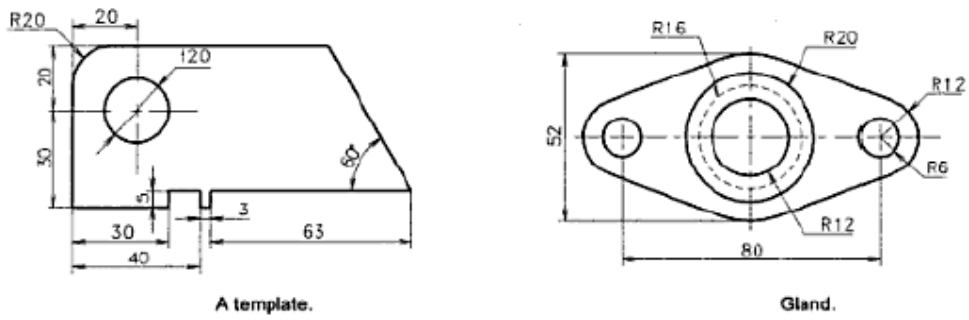
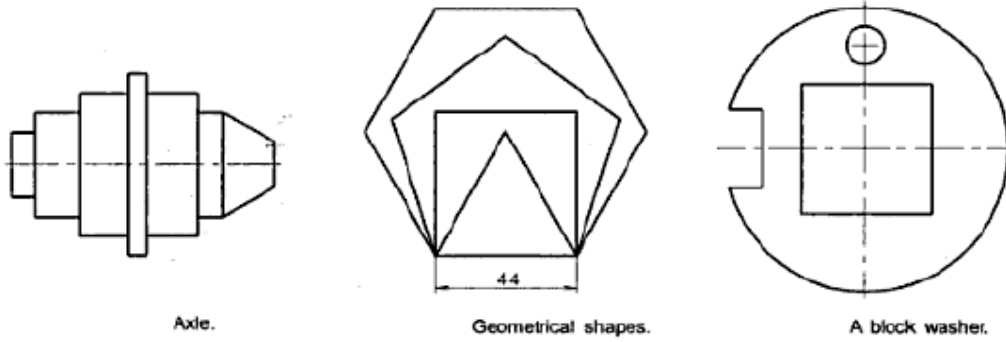
Week 7: Drafting of 2D Figures:

Draw commands – Line, Rectangle, Circle, Arc, Polygon, Ellipse, Hatch, text – Various methods of using these commands.

Modify commands – Erase, Move, Rotate, Copy object, Offset, Array, Mirror, Break, Trim, Extend, Stretch, Chamfer, Fllet, Scale etc.,

Dimensioning commands –Dimensioning of lines, arcs

Simple Exercises on drawing using AUTOCAD:



TEXT BOOK:

1. "Comdex Information Technology Course Kit" by Vikas Gupta, Dreamtech Press
2. Engineering Drawing with AutoCAD by R.B.Choudary/ Anuradha Publishers.

I Year II Semester

(121EN02) ENGLISH – II**(ENGLISH LANGUAGE TEACHING THROUGH LITERATURE)****(Common to all Branches)**

		L	T	P/D	C
		2	1	-	2
UNIT – I					
1. Speech	: Swami Vivekananda				
2. Grammar	: Phrasal Verbs				
UNIT – II					
1. Short Story	: Ha' Penny – Alan Paton				
2. Grammar	: Concord-Subject-Verb Agreement				
UNIT – III					
1. Letter	: Abraham Lincoln's Letter to His Son's Teacher				
2. Grammar	: Sentence Construction-I (Kinds of Sentences-Assertive, Imperative, Interrogative, Exclamatory)				
UNIT – IV					
1. Short Story	: The Only American From Our Village by Arun Joshi				
2. Grammar	: Sentence Construction-II (Simple, Compound, Complex sentences)				
UNIT – V					
1. Essay	: 'Of Studies' -Francis Bacon				
2. Grammar	: Idioms				
UNIT – VI					
1. Speech	: Polonious Speech –An extract from Shakespeare's <i>Hamlet</i>				
2. Short Story	: Luck – Mark Twain				

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.

Reference Books:

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 B.Tech. II Semester

(121MA04) MATHEMATICS FOR BIOTECHNOLOGY-II

L	T	P/D	C
3	2	-	3

UNIT – I: First order Ordinary Different equations, Differential equations of first order and first degree –exact, linear and Bernoulli's Equation, applications to Newton's law of cooling, law of natural growth and decay, orthogonal trajectories

UNIT – II: Higher Order Differential Equations Non-homogeneous linear differential equations of second and higher order with constant coefficients. Methods of variation of parameters. Solving of simultaneous Differential Equations.

UNIT – III: Introduction to Partial differential Equations, Formation of partial differential equations, solutions to first order linear and non-linear equations, Four standard types.

UNIT- IV: Fourier series Fourier series of functions, Fourier series of even and odd functions. Half- Range series,

UNIT – V: Laplace transforms Laplace transform of standard functions — First shifting theorem,— Second shifting theorem,change of scale property, - Transforms of derivatives and integrals – Unit step function Dirac's delta function, Laplace transform of Periodic functions.

UNIT – VI: Inverse laplace transforms

Inverse laplace transforms- Shifting Theorems,— Differentiation and integration of transforms, Partial fractions, convolution theorem – Application of Laplace transforms to ordinary differential equations.

TEXT BOOKS:

1. Advanced Engineering Mathematics, S. R. K. Iyengar and R.K. Jain, Narosa Publishing House, London, 2002.
2. Higher Engineering Mathematics, B.S. Grewal, Khanna Publications, New Delhi.
3. Engineering Mathematics, B. V. Ramana, Tata McGraw Hill Publishing Company Ltd.

REFERENCE BOOKS:

1. A text Book of KREYSZIG's Engineering Mathematics, Dr. A. Ramakrishna Prasad, Wiley Publications.
2. A text book of Engineering Mathematics, Dr.M. Venkata Krishna, G.Shankar Rao,Galgotia Publications,New Delhi

I Year II Semester**(121CS01) DATA STRUCTURES AND C++
(Common to all Branches)**

L	T	P/D	C
4	1	--	4

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
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, Constructors-default constructor, parameterized constructor, constructor initialization list, copy constructor. Destructors.

UNIT – VI

Static class members, this pointer, friend functions, Dynamic memory management with operators new and delete.Overloading-function overloading, Operator overloading, restrictions on operator overloading, overloading unary and binary operators,templates, inheritance.

TEXT BOOKS

- 1.Data Structure Through C by Yashavant Kanetkar.
- 2.The complete reference C++ By Herb Schildt.
3. Data Structures, A pseudocode Approach with C by Richard F. Gilberg & Behrouz A. Forouzan.

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

(121ME02) ENGINEERING DRAWING - II
(Common to all Branches)

L	T	P/D	C
1	-	3	2

UNIT – I

Scales: Construction of Plain, Diagonal, Comparative, Vernier Scales and Scale of chords.

UNIT – II

Development of Surfaces: Development of Surfaces of Right Regular Solids – Prisms, Cylinders, Pyramids, Cones and their parts.

UNIT – III

Isometric Projections/views: 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.

Conversion of Orthographic Views to Isometric Views of simple objects.

UNIT –IV

Transformation of Projections: Conversion of isometric views to orthographic views of simple objects.

UNIT –V

Perspective Projections: 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. Bhatt / Charotar publishers
2. Engineering Drawing, K.L.Narayana and Kannaiah / Sciotech publishers.

REFERENCES:

1. Engineering graphics with Auto CAD- R.B Choudary / Anuradha Publishes
2. Engineering Drawing, K.Venugopal/G.Sreekanjana, New Age International Publishers.
3. Engineering Drawing, B.V.R.Gupta, M.Raja Roy/I.K.International Publishing House.

I Year II Semester

L	T	C
3	2	3

Code: 121EE41

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

Unit – I: Introduction to Electrical Engineering:

Review of Ohm's Law, Basic circuit components, Kirchoff's Laws. Types of sources, Source transformation, V- I relationship for passive elements. Series parallel circuits, Star - delta and delta - star transformation. Simple problems.

Unit – II: Fundamentals of Single phase and three phase AC circuits:

Sinusoidal representation of voltage & current, basic definitions, R.M.S. and Average values of Sinusoidal 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: D.C Machines:

Principle of operation of D.C generators, Types of D.C generators, E.M.F equation, Principle of operation of D.C motors, Types of D.C motors, Torque equation, Losses and efficiency calculation in D.C Generators and D.C motors.

Unit – IV: Transformers:

Principle of operation, Constructional Details, Ideal Transformer and Practical Transformer, equivalent circuit, Losses, OC and SC Test, Efficiency and Regulation Calculations, Elementary treatment & Simple problems. Three phase transformers, star – delta, delta – star connections.

Unit – V: Three phase Circuits and three phase induction motors:

Three phase circuits – phase sequence, Star and delta connection, Relation between line and phase voltages and currents in a balanced system. Three phase induction motor: Principle of operation, Construction, Types, Problems on slip, rotor frequency, rotor emf and torque.

Unit – VI: Basic Instruments:

Introduction, classification of instruments, Operating principles, Essential features of measuring instruments, Permanent Magnet Moving coil (PMMC) instruments, Moving Iron (MI) instruments, Extension of Ammeter and voltmeter ranges.

Text Books:

1. Basic electrical Engineering – M.S.Naidu and S.Kamakshiah – TataMcGraw-Hill,2005 edition
2. Basic Electrical Engineering –T.K.Nagesarkar and M.S.Sukhja Oxford University Press.2nd edition

References:

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

I Year II Semester

(121BT02) PROCESS ENGINEERING CALCULATIONS

L	T	P/D	C
4	1	--	4

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: Gas, Liquid and Solids 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

UNIT-IV: Energy balances Intensive and extensive properties, enthalpy, calculation of enthalpy changes, general energy balance equations, 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

UNIT-V: Combined material and energy balances simultaneous material and energy balances of steady state, some examples

UNIT-VI: Unsteady state material and energy balances Unsteady state material and energy equations, material balance in batch distillation, 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**(121CH03) CHEMISTRY FOR BIOTECHNOLOGISTS**

L	T	P/D	C
2	1	-	2

UNIT-I: Chemical bonding

Types of Bonds, Ionic bond; Covalent bond, characteristics covalent bond- Bond length, Bond Energy, Polar & Non Polar covalent bond. Dipole Moment. Co-ordinate bond - Hydrogen bonding, Vander Waal's forces. Covalent and Non covalent interactions

UNIT II: Thermochemistry:

Hess's Law, heat of a reaction, effect of temperature on heat of reaction, at constant pressure (Kirchoff's Equation) heat of dilution, heat of hydration, heat of neutralization and heat of combustion.

Unit III: Reaction Kinetics

Significance of rate law and rate equations, order and molecularity. First order reaction, second order reaction and zero order reaction. Units of rate constant. Influence of temperature on reaction rates. Equilibrium constant and reaction rates. Catalyst, catalyst in industry

UNIT-IV: Solutions

Properties of water, pH & Buffer, Henderson Hassel Balch equation, Determination of pKa values, physiological buffers , True solution, colloidal solution, suspension, emulsions, concentration of solution- Normality, Molarity, Molality, and mole fraction. Colligative properties

UNIT – V: Surface Chemistry

Solid surfaces, types of adsorption, Langmuir adsorption isotherm, BET adsorption isotherm, Calculation of surface area of solid & applications of adsorption, classification of colloids, Electrical & optical properties of colloids, applications of colloids in industry.

UNIT-VI: STRUCTURAL AND MECHANISTIC CONCEPTS OF ORGANICS

Classes of organic compounds & functional groups. Intermolecular Forces and physical properties. Inductive, electromeric, mesomeric effect. Stability of reaction intermediates e.g. carbocation and free radicals. Mechanism of nucleophilic substitutions. optical isomerism, chirality and its implications

Text Books:

1. "Organic Chemistry," 6/e, Morrison & Boyd, Prentice-Hall India.
2. Essentials of Physical chemistry; Bahl & Tuli; S. Chand Publications.

I Year II Semester

**(121EN72) ENGLISH LANGUAGE LAB-II
(Common to all branches)**

L	T	P/D	C
-	-	2	1

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 enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
2. To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English and respond appropriately in different professional contexts.
3. 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.
4. To enable the students in equipping themselves in being assertive and convincing, while debating.

Syllabus

1. Introduction to Stress and Intonation.
2. Functional English –Starting a conversation-responding appropriately and relevantly-using the right body language-role plays based on different situations
3. Vocabulary building – Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, etymology, analogy, idioms and phrases
4. Reading Comprehension – Reading for facts, guessing meanings from the context, scanning, skimming, inferring meaning and critical reading
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.

Suggested Software:

- ❖ Hi Class system Monitoring Software

- ❖ Globerena 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

(121CS71) DATA STRUCTURES AND C++ LABORATORY
(Common to all branches)

L T P/D C
- - 3 2

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) Selection Sort
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 discriminant 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 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C++ program to generate the first n terms of the sequence.
12. Write a C++ program that checks whether a given string is palindrome or not.

TEXT BOOKS:

1. Data Structure through C by Yashavant Kanetkar.
2. The complete reference C++ by Herb Schildt.
3. Data Structures, A pseudocode Approach with C by Richard F. Gilberg & Behrouz A. Forouzan.

I Year II Semester

(121ME72) ENGINEERING WORKSHOP –II

(Common to all Branches Except CSE & IT)

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

1. Fitting

To make a Step Fitting as per the dimensions

To make a Half Round Fitting as per the dimensions

2. Tin Smithy

Preparation of Funnel

Preparation of Square box

3. Smithy

- Fabrication of S - Shape
- Fabrication of Hook shape

I Year II Semester**(121IT73) IT WORK SHOP-II**
(Common to CSE, IT & BT)

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

Week 1:

Introduction to S/W's difference b/w hardware and software. Introduction to MS-Office and its importance. Using word – Accessing, overview of toolbars saving files, rulers, format painter.

Features: Formatting fonts, Drop cap, Applying text effects, character spacing, Borders, colors, insert 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.

Week 3:

Creating News letters

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

Week 4:

Basics of Power Point Presentation

Features : PPT Orientation, Slide layouts, Inserting Text, Word Art, Formatting Text, Bullets & Numbering, Auto shapes, 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.

Week5:

Introduction to Excel

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

Week 6:

Formula in excel – Average, Standard Deviation, Charts, Roaming & Inserting worksheets, Hyper linking, count function, lookup / Vlookup, sorting, Conditional formatting.

Week 7:

Introduction to HTML,

Features: Formatting Tags, Linking of pages using Anchor Tags, Table tags

Websites and Textbooks:

1. Complete Reference Microsoft Office 2003
2. <https://office.microsoft.com/en-us/support/> (office help and how-to)
3. W3schools.com

II Year I Semester

**(121EC02) BASIC ELECTRONICS
(Common to CSE, IT and BT)**

L	T	P/D	C
3	1	-	3

UNIT-I

SEMICONDUCTOR DIODES AND APPLICATIONS: Review of p-n junction diode, Characteristics, Parameters and AC equivalent circuit.. Half-wave diode rectifier, Ripple factor, Full-wave diode rectifier, Other full-wave circuits, Break diodes and their applications in power supply circuits.

UNIT-II

TRANSISTORS: Bipolar Junction transistor, Transistor Voltages and currents, amplification, Common Base, Common Emitter and Common Collector Characteristics, DC Load line and Bias Point.
BIASING METHODS: Base Bias, Collector to Base Bias, Voltage divider Bias, Comparison of basic bias circuits, 08 periods

UNIT-III

OTHER SEMI CONDUCTOR DEVICES: Silicon Controlled Rectifier (S.C.R), and its applications Unijunction transistor, and its applications, Junction Field effect Transistors JFET Characteristics, JFET Amplification. (Common source)

UNIT-IV

AMPLIFIERS & OSCILLATORS: Concepts of Decibel and Half power points, Single Stage CE Amplifier and Capacitor coupled two stage CE amplifier (Qualitative discussions only), Negative feedback and its effects. The Barkhausen Criterion for Oscillations, RC phase shift, Hartley, Colpitts and crystal oscillator (Qualitative discussions only). -08 periods

UNIT-V

VOLTAGE REGULATORS: IC 723 voltage regulators and three terminal IC regulators, Introduction to voltage multipliers, uninterrupted power supplies and switching regulators.

UNIT-VI

NUMBER SYSTEMS: Introduction, decimal system, Binary, Octal and Hexadecimal number systems, addition and subtraction, fractional number, Binary Coded Decimal numbers. -06periods

TEXTBOOKS:

1. Electronic Devices and Circuits: David. A. Bell; PHI, New Delhi, 2004
2. Electrical and Electronics & Computer Engineering for Scientists and Engineers Second Edition -K.A. Krishnamurthy & M.R.

REFERENCEBOOKS:

1. Electronics Devices and Circuits by Sanjeev Gupta, Dhanpat Rai Publications
2. Electronics Devices and Circuits Theory by Baystad and Nashelsky, PHI

II Year I Semester

(121MA06) MATHEMATICS FOR BIOTECHNOLOGY-III

L	T	P/D	C
3	2	-	3

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

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

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 . Predictor-Corrector Method

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

(121BT03) BIOCHEMISTRY

L	T	P/D	C
4	1	-	4

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, overview of 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

(121BT04) MICROBIOLOGY

L	T	P/D	C
3	1	-	3

UNIT I: Introduction To Microbiology: Pioneers and their discoveries in Microbiology: Antony von Leuwenhoek, 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, Fungi Classification systems-Phylogenetic, Phenetic, Taxonomic ranks, Major characteristics used in Taxonomy- Morphological, Physiological, Ecological, Biochemical, Immunological, Genetical and Molecular

UNIT III: Nutrition and Cultivation:

Nutritional Types in microbes, Growth curve ,Growth factors, Aerobic and anaerobic metabolism. Medium and its types, Pure culture techniques, special techniques for cultivation of anaerobes, Influence of environmental factors on growth- solutes, water activity, pH, temperature, oxygen, osmotic pressure, radiation etc, bacterial growth curve, methods for determining bacterial numbers, mass and cell constituents.

UNIT IV: Control and Preservation of Microbes:

Control of microorganisms- sterilization and disinfection: physical (moist and dry heat, radiation and filtration), chemical (disinfectants, antiseptics, antibiotics and other chemotherapeutic agent), Preservation of Microorganisms: cryopreservation, Lyophilization, Application and limitation of various methods

UNIT V: Introduction to Viruses: Virus properties, Structure of viruses, Classification of viruses-Bacteria, plants and animals, Applications of Viruses in Biotech Industry

UNIT VI: Viral replication

Viral replication, Bacterial, plant and animal replication in cytoplasm and nucleus with 1 example each (DNA and RNA viral replication), Cultivation of viruses-overview.

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

(121BT05) CELL BIOLOGY

L	T	P/D	C
3	1	-	3

UNIT I: Introduction to Cell

Basic properties of cells; Cell theory; Cell complexity – Cell size & shape; Chemistry of the cell, Plasma membrane- structure and function; Cytoplasm; Cytoskeleton - Microtubules, Microfilaments & Intermediate filaments, cell motility – cilia & flagella

UNIT II: Cell Organelles

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

UNIT III: 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,

UNIT IV: Trafficking

Protein Glycosylation, Intracellular Protein traffic & targeting, 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

(121ME04) BASIC MECHANICAL ENGINEERING

L	T	P/D	C
3	2	-	3

UNIT – I Thermodynamics: Basic concepts of Thermodynamics, Property of gases, Zeroth Law, First Law of Thermodynamics and its applications, Second Law of Thermodynamics, Carnot cycle, Air standard cycles - Otto, Diesel, Cycles and simple problems.

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, Need for 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 Hydraulic pumps and Turbines: Reciprocating and centrifugal pumps and their applications. Layout of Hydro-electric power plant, Classification of hydraulic turbines, Description and principle of operation of Pelton wheel and Francis turbine (without velocity triangles), Axial flow reaction turbine.

UNIT- V Metal casting: Casting methods-Sand casting, shell mold casting, Investment casting, Diecasting, - characteristics, advantages, limitations and applications.

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

UNIT – VI Mechanical working of metals:

Rolling, Extrusion, Forging, Press working operations, principle, 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.

II Year I Semester

**(121EN73)Functional and Communicative Written English
(Common to All Branches)**

L T P/D C
- - 3 2

Course Description

This course provides a platform for the learners to practice written communication to excel and sustain in the industry. It emphasizes on the techniques of collecting, organizing, and presenting 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 the course, the students will be able to:

1. Develop effective communication skills (spoken and written). Good oral and written communication skills
2. Perform all written tasks with clarity and coherence
3. Participate efficiently in group discussions
4. Take part effectively in various selection procedures adopted by the recruiters.
5. Develop Effective Presentation skills
6. Develop all-round personalities with a mature outlook to function effectively in different circumstances.

UNIT-I : TECHNICAL WRITING

- Introduction
- Techniques-pre-writing, writing, re-writing
- Objectives in technical writing: clarity, conciseness, accuracy, organisation, ethics.
- Exercises

UNIT – II GROUP DISCUSSION

- Introduction
- Personality Traits for GD
- Areas tested in GD – Content, Communication Skills, Group Dynamics and Leadership
- Tips on Group Discussion
- Group Discussion Etiquette – Dos and Don'ts

UNIT-III : CORRESPONDENCE

- Memos
- Letter writing in detail
- Resume'
- Exercises

UNIT – IV BODY LANGUAGE

- Introduction
- Importance of body language
- Body Language at work place
- Assessing the body language of others
- Understanding body language
- Improving one's body language

UNIT-V REPORT STRATEGIES

- The Summary
- Reports
- Proposals

Textbooks:

1. Technical Writing: Process and Product by Sharon J Gerson; Fifth edition. Pearson publishers.
2. 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. Body Language – Your success Mantra by Shalini Verma, S Chand, 2006
5. Strategies for Engineering Communication: Stevenson Susan and Steve Whitmore: Wiley, India.
6. How to build a better vocabulary – Nurnberg Maxwell & Morris Rosenblum: Grand Central Publishing
7. Six weeks to words of power –Funk Wilfred: W.R.Goyal Publishers & Distributors
8. Word power made easy – Norman Lewis
9. How to read better and faster: Norman Lewis, W.R.Goyal Publishers, New Delhi
10. Effective Technical Communication –Ashraf Rizvi.

II Year I Semester**(121BT71) BIOCHEMISTRY LAB**

L	T	P/D	C
-	-	3	2

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. Qualitative analysis of proteins
6. Quantitative estimation of Amino Acids by Ninhydrin method
7. Quantitative estimation of Proteins by Biuret /Lowry method
8. Quantitative estimation of cholesterol
9. Saponification value of oils
10. Determination of Acid value and Iodine values of oils
11. Quantitative Estimation of DNA/RNA
12. Isolation of urease / alkaline phosphatase

II Year I Semester**(121BT72) MICROBIOLOGY AND CELL BIOLOGY LAB**

L	T	P/D	C
-	-	3	2

1. Introduction to microscope and Sterilization techniques (lecture/demonstrations)
2. Identification of Animal, Plant and Bacterial cells by simple staining
3. Micrometry
4. Examination of different stages of mitosis in onion root tips
5. Examination of different stages of meiosis in flower buds
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.
3. Practical Manual in microbiology, Plant tissue culture and pathology – K.R. Aneja , New age Publication, 2001

II Year II Semester

**(121BT06) ENVIRONMENTAL STUDIES
(Common to all branches)**

L	T	P/D	C
3	1	-	3

UNIT I: ECOSYSTEMS

Ecosystem definition, concept, Structure and Function, food chain and food web, Ecological pyramids, Biogeochemical cycles, Ecological niche and succession, Classification (Forest, Grassland, Desert, Pond, River, Marine, Estuarine, Wetlands), ecosystem value, services and carrying capacity.

UNIT II: NATURAL RESOURCES

Definition, classification, Forest resources-use and over-exploitation, deforestation, Energy resources-energy demand, renewable and non-renewable energy resources, alternate energy resources, Case studies. Food Resources-World Food problems, effects of modern agriculture, fertilizer-pesticide problems, Mineral resources : Use and exploitation environmental effects of extracting and using mineral resources, case studies.

UNIT III: ENVIRONMENTAL COMPONENTS

Atmosphere- Definition, layers, state (weather and climate) acid rain, green house effect, ozone layer depletion, Global warming, Kyoto protocol, Montreal protocol, Carbon trading, Hydrosphere-Definition, Types (surface and groundwater), distribution, Water conservation, use and over-exploitation, floods, drought, dams-benefits and problems, conflicts over water, Lithosphere- Chemical composition of the earth (core, mantle, crust), mineral 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,

UNIT V: ENVIRONMENTAL POLLUTION AND CONTROL

Air pollution: Definition, causes, effects and Control measures, Environment Protection Act, Air (Prevention and Control of Pollution) Act, 1981, Case study: Bhopal Gas Tragedy, Water Pollution- Definition, types, characteristics of domestic and industrial effluents – Water quality parameters, Drinking water treatment and standards, Waste water treatment, Case studies: Mercury pollution-Minamata Bay diseases; Definition, causes, effects and Control measures: Soil Pollution, Noise Pollution and Marine Pollution, Waste Management- Solid Waste, Hazardous waste and E-waste management.

UNIT VI: SUSTAINABLE DEVELOPMENT

Concept of Sustainable development, Threats to sustainability-population explosion, urbanization, over-exploitation of resources, Strategies for Sustainable development- Wasteland reclamation, Role of IT (Remote sensing and GIS) in environmental management, green technologies, Environmental Impact Assessment-overview

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.
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

(121MA07) PROBABILITY AND STATISTICS
(Common to All Branches)

L T P/D C

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 function, Expectation and Probability distributions - Binomial, Poisson and normal distributions – related properties.

UNIT III

Sampling Distributions:

Populations and samples, Sampling distribution of the Mean (known) and Sampling distribution of the mean (unknown), proportions, sums and differences . Applications of central Limit Theorem. Estimation, Point estimation, Interval estimation and Bayesian estimation

UNIT IV

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, test for goodness of fit, independence of attributes.

UNIT VI

Linear Programming:

Introduction, Formulation of LPP, Graphical method, Simplex method.

Text Books :

1. Advanced Engineering Mathematics, S. R. K. Iyengar and R.K. Jain, Narosa Publishing House, London, 2002.
2. Higher Engineering Mathematics, B.S. Grewal, Khanna Publications, New Delhi.
3. Engineering Mathematics, B. V. Ramana, Tata McGraw Hill Publishing Company Ltd.
4. Probability and Statistics for Engineers: Miller and John E. Freund, PHI Publishers, 6th Edition.

REFERENCE BOOKS:

1. Fundamentals of Mathematical Statistics: Gupta and Kapoor – S. Chand and Co.
2. Probability and Statistics for Engineers- Walpole and Meyer.
- 3, Probability and Statistics ,Dr.M. Venkata Krishna, B.S Publications

II Year II Semester

(121BT07) THERMODYNAMICS FOR BIOTECHNOLOGISTS

L	T	P/D	C
3	1	-	3

Unit I: CONCEPTS AND DEFINITIONS

System, Surroundings, Intensive and extensive properties, Thermodynamic equilibrium: Thermal, mechanical and chemical equilibrium, Process, work, pure substance, concept of phase, Equations of state: Ideal gas, Vander waals equation of state, critical constants

Unit II: FIRST LAW OF THERMODYNAMICS

First law of thermodynamics, consequences of first law of thermodynamics, constant volume, constant pressure, constant temperature process. Adiabatic processes, Calculation of heat , work, internal energy and enthalpy

Unit III : FIRST LAW ANALYSIS

First law of thermodynamics for a continuous system and a control volume, Steady state flow processes, Fuels and Combustion: Standard Heat of Reaction, Standard enthalpy of formation, standard enthalpy of Combustion, Effect of Temperature on standard heat of reaction,

Unit IV : SECOND LAW OF THERMODYNAMICS

First law of thermodynamics limitation, Statements of Second Law, Equivalence of Kelvin-Planck and Clausius statements, Entropy concept, Carnot cycle, Carnot power cycle, Rankine cycle, practical Rankine cycle, Refrigeration cycles, calculation of COP, Calculations of Entropy change, Second law analysis of control volume.

Unit V: THERMODYNAMIC RELATIONS

Maxwells relations, Thermodynamic potentials: Internal Energy, Helmholtz Potential, Enthalpy, Gibb free Energy . entropy as function of temperature and pressure , entropy as function of temperature and specific volume, Specific heat relations, Clasius-Clapeyron equation

Unit VI: SOLUTION THERMODYNAMICS

Concepts of chemical potential and fugacity, Ideal and non ideal solutions, Activity Coefficient, Criteria for phase equilibrium; Vapor-liquid equilibrium calculations for binary mixtures from Raoult's law and Henry's law

TEXT BOOKS:

- 1.Y.V.C.Rao An introduction to 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 II Semester**(121BT08) GENETICS AND MOLECULAR BIOLOGY**

L	T	P/D	C
3	1	-	3

UNIT – I: MENDELIAN GENETICS

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

UNIT – II: MOLECULAR GENETICS - I

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

UNIT – III: MOLECULAR GENETICS - II

Linkage & crossing over, Recombination, Twopoint and three point crosses and gene mapping, Karyotyping, Allele frequencies and genotype frequencies, Random mating and Hardy-Weinberg principle, Quantitative inheritance

UNIT – IV: DNA REPLICATION

Mechanism of DNA replication, Meselson and Stahl experiment, Replication Process in detail, Telomere replication, DNA damage and repair mechanisms

UNIT – V: TRANSCRIPTION

m-RNA, r-RNA, t-RNA structures, Transcription in prokaryotes and eukaryotes, Post transcriptional processing of RNA's, Control of Transcription

UNIT – VI: TRANSLATION

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

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**(121BT09) INSTRUMENTAL METHODS OF ANALYSIS**

L	T	P/D	C
3	1	-	3

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**(121BT10) BIOPROCESS ENGINEERING**

L	T	P/D	C
3	1	-	3

UNIT I: INTRODUCTION TO BIOPROCESS

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

UNIT II: FERMENTATION -I

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

UNIT III: MEDIA FORMULATION

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

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: GROWTH KINETICS

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: BIOREACTORS

Differences and similarities between chemical and bioreactors, classifications of bioreactors, fluidized bed reactor, packed bed reactor, bubble column reactors air lift reactors. Bioreactor for plant and animals cells.

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**(121EN74) EFFECTIVE ENGLISH COMMUNICATION AND SOFT SKILLS**

L	T	P/D	C
-	-	2	2

Course Description

This course empowers the students for career opportunities, 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. Training in soft skills 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 one 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.
- Become adept using electronic communication
- Conduct effective business correspondence and prepare good business reports.
- 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.

UNIT-I ELECTRONIC COMMUNICATION

- E-correspondence
- E-mail etiquette
- E-resume'; online job applications
- Letter of application
- Exercises

UNIT – II SOFT SKILLS

- Introduction
- Building attitude – personality traits
- Five aspects of soft skills – communication skills, problem solving skills, leadership skills, work ethics and team work
- Learning soft skills
- Impression management
- Goal setting Time management

UNIT – III: DEVELOPING POSITIVE ATTITUDE

- Introduction
- What is positive attitude?
- The power of positive attitude
- Positive thinking- the key to success
- Negative thinking
- Types of negative thinking
- The causes of negative attitude

- Consequences of negative attitude
- How to change negative attitude

UNIT – IV ETIQUETTE AND MANNERS

ETIQUETTE

- Introduction
- Modern etiquette
- Benefits of etiquette
- Classification of etiquette
- Telephone Etiquette
- Email Etiquette.

MANNERS

- Introduction
- Poor manners noticed in youth – why should good manners be practiced?
- Practicing good manners
- Professional manners
- Social skills (manners)

UNIT – V INTERVIEW SKILLS

- Introduction
 - On the day of interview
 - Dress code at interview
 - Job interview
- Why an interview?
- Types of interview
- Dress code for an interview
- Interview etiquette
- Types of questions asked
- Telephonic interview
- Possible reasons for rejecting a candidate
- Preparation before interview – basic tips.

Textbooks:

1. Technical Writing: Process and Product by Sharon J Gerson; Fifth edition. Pearson Publishers.
2. 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.Body Language – Your success Mantra by Shalini Verma, S Chand, 2006
- 5.Strategies for Engineering Communication: Stevenson Susan and Steve Whitmore: Wiley, India.
- 6.How to build a better vocabulary – Nurnberg Maxwell & Morris Rosenblum: Grand Central Publishing
- 7.Six weeks to words of power –Funk Wilfred: W.R.Goyal Publishers & Distributors
- 8.Word power made easy – Norman Lewis
- 9.How to read better and faster: Norman Lewis, W.R.Goyal Publishers, New Delhi
- 10.Effective Technical Communication –Ashraf Rizvi Wiley, India.
- 6.How to build a better vocabulary – Nurnberg Maxwell & Morris Rosenblum: Grand Central Publishing
- 7.Six weeks to words of power –Funk Wilfred: W.R.Goyal Publishers & Distributors
- 8.Word power made easy – Norman Lewis
- 9.How to read better and faster: Norman Lewis, W.R.Goyal Publishers, New Delhi
- 10.Effective Technical Communication –Ashraf Rizvi

II Year II Semester

(121BT11) COMPREHENSIVE VIVA

L	T	P/D	C
-	-	-	1

II Year II Semester

(121BT73) BIOPROCESS ENGINEERING LAB

L	T	P/D	C
-	-	3	2

1. Extraction of commercially important enzymes from natural source
2. Quantification of enzyme activity and specific activity
3. Effect of pH, temperature, enzyme and concentration of substrate on enzyme activity
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. Demonstration of Batch, Fed-batch reactors.
8. Production and estimation of ethanol from Glucose using *Sacharomyces cerevisiae* in batch reactor
9. Production of wine
10. Production and estimation of citric acid by *Aspergillus niger*
11. Determination of BOD
12. Production and assay of antibiotic

II Year II Semester**(121BT74) INSTRUMENTAL METHODS OF ANALYSIS LAB**

L	T	P/D	C
-	-	3	2

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 protein by Thin layer Chromatography of fruit juice
10. Agarose gel Electrophoresis of DNA
11. 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.

III year I Semester**(3ZC01) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (OPEN ELECTIVE – I)**

a	b	c	d	e	f	g	h	i	j	k	l

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 I Semester**(3G512) BIOCHEMICAL REACTION ENGINEERING**

a	b	c	d	e	f	G	h	i	j	k	l
X		X							X	X	

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 energetic 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 , Types of Inhibition- kinetic models; Substrate and Product Inhibition; Allosteric regulation of enzymes;

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,

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 P.M.Doran

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**(3G513) GENETIC ENGINEERING**

a	b	c	d	e	f	g	h	i	j	k	l
	X	X	X	X		X		X	X	X	

L T P/D C
3 1 - 3

Unit I: GENE REGULATION: Prokaryotic system: The operon model, Lactose, Arabinose & Tryptophan operons, Eukaryotic system: Repetitive DNA, Gene rearrangement, Promoters, Repressors, Activators and Enhancer elements, gene amplification

Unit II: PLASMIDS AND TRANSPOSONS: Definition, Types, Classification, Identification and Transfer of Plasmids. Host restriction and 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, SV40 and baculoviruses, Expression vector-pGem, Yeast cloning vectors-2 μ m Plasmid, YE_p, YAC.

Unit IV: DNA MANIPULATIONS: Nucleases, Types of Nucleases, Endonuclease, Types of Endonucleases. DNA modifying enzymes, Restriction digestion & mapping of DNA. DNA Ligases, Linkers, Adaptors, Homo polymer tailing, Introduction of DNA into living cells- Transformation. Gene transfer-Methods

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, Applications of PCR technology, Loop-mediated isothermal amplification (LAMP). Molecular markers: RFLP, RAPD & AFLP; 16s r-RNA typing, Gene Therapy (Case Study ADA) Gene Silencing.

TEXT BOOKS:

1. Principles of Gene Manipulation, an Introduction to Genetic Engineering Old R.W.Primrose SB, - Blackwell Scientific Publications
2. Gene Cloning and DNA Analysis: An Introduction, T A Brown, *6th edition*. Wiley-Blackwell publications

Reference Books:

1. DNA cloning 1 and 2. Glover, D.M. and Hames, B.D. 1995. IRL Press Oxford University Press.
2. Benjamin Lewin: Gene VII, Oxford University Press, Oxford,
3. An Introduction to Genetic Engineering by Desmond S.T. Nicholl, Cambridge University Press
4. Recombinant DNA. By James D Watson and Michael Gilman. 2nd Edition, (2001). W. H Freeman and Company NY.
5. Molecular Biotechnology: Principles Application of Recombinant DNA by Bernard R Glick and Jack J. Pasternak, 2nd Edition. ASM press Washington DC.

III Year I Semester**(3G514) BIOINFORMATICS**

a	b	c	d	e	f	g	h	i	j	k	l
X		X	X			X			X	X	

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 (NCBI, DDBJ,EMBL), Protein Databases (SWISS PROT, PDB, SCOP, CATH),pathway databases (KEGG), Drug Database (Zinc database)

Unit III: 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 IV: 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 V: 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.

UNIT-VI: DRUG DESIGN

Drug discovery cycle, Role of Bioinformatics in Drug discovery. Molecular Docking by argus lab, autodock softwares) Protein-ligand interactions, Protein-protein interactions

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**(3G515) MOMENTUM AND HEAT TRANSFER**

a	b	c	d	e	f	g	h	i	j	k	l
X		X	X			X			X	X	

L T P/D C
3 1 - 3

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 venture meters 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: 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

III year I Semester**(3HC51) BASIC SPANISH (OPEN ELECTIVE – I)**

a	b	c	d	e	f	g	h	i	j	k	l

L T P/D C
3 1 - 2

Unit-I

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.

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 qué', and 'quién'; causal phrase with 'porque'; 'ser' and 'estar'; negative sentences; adjectives of nationality.

Unit-II

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.

Grammatical Aspects

Gender and number of nouns and adjectives; the verb 'tener'; interrogative sentences; demonstrative and qualitative adjectives

Unit-III

To express opinions on something, contradict someone in a modest ways, suggest something, to value things aesthetically and intellectually; expression of likes and dislikes; expression and reaction to certain things, (agreement or disagreement).

Grammatical Aspects

Qualitative adjectives, forms and usage, gradations, superlative adjectives, exclamatory sentences; the verb 'gustar', forms and syntax; personal pronouns; definite and indefinite pronouns, direct object pronouns; prepositions; verbs like 'parecer' and 'encontrar', their form and syntax, interrogative pronouns.

Unit IV

Invitations; accepting and rejecting invitations; how to fix an appointment;

Grammatical Aspects

Present indicative of irregular verbs, expressions with 'tener' estar prepositional pronouns; interrogative sentences.

Unit V

Expression of time; Spanish and Latin American time tables and comparison with Indian time tables.

Grammatical Aspects

Time with 'ser'

Unit VI

Expressions relating climate, weather of the day, Seasons, Vacations

Grammatical Aspects

Expressions with the verbs 'ser' and 'hacer'

TEXT BOOKS:

1. ELE INICIAL 1
2. Espanol sin Fronteras, A. Sánchez, M. Ríos, J.A. Metalla. SGEL, Madrid, 1997.
3. Entre Nosotros A. Sánchez, M. Ríos, J.A. Metalla. SGEL, Madrid, 1997.

III year I Semester**(3HC41) BASIC FRENCH (OPEN ELECTIVE – I)**

a	b	c	d	e	f	g	h	i	j	k	l

L T P/D C
3 1 - 2

UNITE – 1**UN PRINTEMPS A PARIS**

VOCABULAIRE: Professions et nationalités, vie quotidienne et loisirs,
Descriptions physiques et psychologiques, nombres cardinaux.

UNITE – 2

GRAMMAIRE : Articles définis et indéfinis, genre et nombre des noms et des
Adjectifs, interrogation et négation, conjugaison du présent.
PHONETIQUE : Intonation, liaison, voyelles orales et nasales.

UNITE – 3

COMMUNICATION : Faire connaissance, inviter et répondre à une invitation, décrire
les personnes.
CIVILISATION : Paris, monuments et lieux publics. La vie de quatre parisiens
De professions différentes.

UNITE- 4**AVENTURE EN BOURGOGNE**

VOCABULAIRE: Logement et nourriture, vêtements et couleurs, fêtes et
Faits divers, nombres ordinaux.
GRAMMAIRE : Articles partitifs, adjectifs démonstratifs et possessifs,
Prépositions et adverbes de quantité et de lieu, pronoms
Toniques, l'impératif, verbes pronominaux

UNITE – 5

PHONETIQUE : Intonation, semi-voyelles, liaison, consonnes sonores et
sourdes
COMMUNICATION : Exprimer l'ordre et l'obligation, demander et
commander, évaluer et apprécier, féliciter et remercier.

UNITE – 6

CIVILISATION : Une région de France : la Bourgogne, vie quotidienne à la
campagne.

In addition Passé Composé will be introduced in the Unite 2

TEXT BOOKS:

: LE NOUVEAU SANS FRONTIERES – 1 (Text Book and
(Unit 1 & Unit 2) Exercise Book published by CLE INTERNATINAL – Phillippe
Dominique et al.

III year I Semester**(3HC46) DEUTSCH FUR ANFANGER (German for beginners) (OPEN ELECTIVE – I)**

a	b	c	d	e	f	g	h	i	j	k	l

L T P/D C
3 1 - 2

Unit 1 Definite and indefinite articles (including negation)

1. Noun: Gender and plural forms, cases (nominative, accusative, dative and genitive)

Unit 2 Verb: strong & 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 3

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

Unit 4

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

Unit 5

6. Pretaritim of sein and haben
7. Perfect tense

Unit 6

8. Negatin: of a sentence and of words therein.
9. Sentence structure: general principles observed in German language.

READING LIST: One of the following books shall be used (depending upon the availability of the book)

TEXT BOOKS:

1. Braun, K., Nieder, L., Schmue, F.1977. Deutsch als Fremdsprache I. A. Ernst Klett Verlag, Stuttgart.
2. Schulz, D., Griesbach, H., 1968. Deutsche Sprachlehre fur Auslander. Max Hueber Verlag. Munchen.
3. Hieber, W. 1987. Lemziel Deutsch (Special Indian Edition).Max Hueber Verlag. Munchen
4. Neuneer, G., et al. 1979. Deutsch Aktiv. Langenscheidt. Berlin
5. Schapers, R., et al. 1980. Grundkkurs Deutsch. I. Verlag fur Deutsch. Munchen
6. Schapers, R., et al. 1981 Deutsch 2000 I. Max Hueber Verlag. Munchen
7. Haussermann, U. et al. 1995 Sprachkurs Deutsch. Verlag Moritz Diesterweg. Frankfurt/Main.
8. Muller, M., et al. 2001 Moment mal ! Langenscheidt. Berlin.
9. Jutta Muller, Thomas Storz, 2006. Laguna. Heuber Veerlag, Ismaning. Deutschland.
10. Hermann Funk, Christina Kuhn, Oliver Bayerlein., Studio d A 1. 2005 Comelsen Verlag, Berlin.
11. Rosa-Marie Dallapiazza, Eduard von Jan, Till Schonherr, unter Mitarbeit von Jutta Orth-Chambah. Tangram aktuell 1 – Lektion 1 – 4, Lektion 5 – 8 2009. Max Hueber Verlag. Munchen.

III year I Semester

(3ZC09) TOTAL QUALITY MANAGEMENT (OPEN ELECTIVE – I)

a	b	c	d	e	f	g	h	i	j	k	l
							L				

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 Reengineering.

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: IS09000: Universal Standards of Quality: ISO around the world, The IS09000 ANSI/ASQCQ-90. Series Standards, benefits of IS09000 certification, the third party audit, Documentation IS09000 and services, the cost of certification implementing the system.

TEXT BOOKS:

III year I Semester**(3ZC11) LOGISTICS AND SUPPLY CHAIN MANAGEMENT (OPEN ELECTIVE – I)**

a	b	c	d	e	f	g	h	i	j	k	l

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.

TEXT BOOKS:

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

References:

1. Martin Christopher, *Logistics and Supply Chain Management*, Pitman, London.
2. B.S.Sahay, *Supply Chain Management for Global Competitiveness*, Macmillan, New Delhi.2003.
3. Philip B.Schary, Tage Skjott-Larsen: *Managing the Global Supply Chain*, Viva, Mumbai, 2006.
4. Monczka: *Purchasing and Supply Chain Management* Thomson, 2006.
5. Ballou, *Business Logistics/Supply chain Management*5/e Pearson Education.
6. 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 I Semester**(3HC76) Quantitative Aptitude**

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- - 3 1

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

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III year I Semester

(3G575) Group Project

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III Year I Semester

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(3G576) 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.

EQUIPMENTS:

1. Autoclave.
2. Laminar air flow chamber.
3. Water bath present to the optimum temperature for restriction Endo nuclease digestion.
4. Balance
5. Deepfreeze (-20)
6. pH Meter
7. Micro centrifuge
8. Micropipettes
9. Submarine Gel Electrophoresis unit with power pack.
10. U.V. Trans illuminator
11. Vertical slab gel electrophoresis equipment.

REFERENCES:

1. Current protocols in Molecular Biology by Maniatis.

III Year I Semester

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(3G77) BIOINFORMATICS LABORATORY

L T P/D C
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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

3G578 Technical paper Writing & Seminar - I

III year II Semester

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(3G616) INSTRUMENTATION AND BIOPROCESS CONTROL

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UNIT I: ELEMENTS OF INSTRUMENTS :Basic concepts of response of first order type instruments, mercury in glass thermometer, bimetallic thermometer, pressure spring thermometer, static accuracy and response of thermometer. Thermo electricity, industrial thermocouples, measurement of temperature using thermocouples.

UNIT II: MEASURING INSTRUMENTS: Measurements of liquid level, pressure measurement in open vessels, level measurements in pressure vessels, Liquid column manometers, measuring elements for gauge pressure and vacuum,, indicating elements for pressure gauges, measurement of absolute pressure.

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. Transportation lag control systems, Servo and Regulatory control problems.

UNIT V: CONTROLLERS AND STABILITY: Development of block diagram, controllers and final control elements, 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 - first order system, First order system in series, second order system, Controllers.

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, stephanoupoulis G., Prentice Hall, N.Delhi, 1990.

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**BANKING OPERATIONS, INSURANCE AND RISK MANAGEMENT
(OPEN ELECTIVE - II)**

Code: 3ZC03

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Course Objective: The objective of the course is to provide to students an understanding of Banking Operations, Insurance Market, and Risk Management Principles and techniques to control the risk, & the major Institutions involved and the Services offered within this framework.

UNIT I

INTRODUCTION TO BANKING BUSINESS: Introduction to Banking sectors-History of banking business in India, Structure of Indian banking system: Types of accounts, advances and deposits in a bank New Dimensions and products- E-Banking, Mobile-Banking, Net Banking, CRM, cheque system and KYC system.

UNIT II

BANKING REFORMS AND REGULATIONS: Banking regulation Act-1949, Reserve Bank of India Act-1934, Establishment of RBI, Functions and credit control system; Role of commercial banks and its functions. Banking sector reforms in India and deficiencies in Indian banking including problems accounts and Non-Performing Assets.

UNIT III

INTRODUCTION TO INSURANCE: Introduction to insurance, Need and importance of Insurance, principles of Insurance, characteristics of insurance contract, branches of insurance and types of insurance; life insurance and its products: Role of Agents and brokers.

UNIT IV

INSURANCE BUSINESS ENVIRONMENT: Regulatory and legal frame work governing the insurance sector, history of IRDA and its functions: Business and economics of insurance, need for changing mindset and latest trends.

UNIT V

INTRODUCTION TO RISK MANAGEMENT: Introduction to Risk, meaning and types of risk in business and individual, Risk management process, methods: Risk identification and measurement, Risk management techniques; Non insurance methods.

UNIT VI

FINANCIAL RISK MANAGEMENT: Introduction to Financial markets. Financial risk management techniques –Derivatives, Hedging and Portfolio management techniques: Derivatives and types of Derivatives-Futures, options and swaps: Shares, Commodity and Currency trading in India.

BOOKS RECOMMENDED:

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

REFERENCES:

- Scott E. Harringam Gregory R. Nichanus: Risk Management & Insurance, TMH, 2009.
- Geroge E. Rejda: Principles of risk Management & Insurance, 9/e, pearson Education. 2009.
- G. Koteswar: Risk Management Insurance and Derivatives, Himalaya, 2008.
- Gulati: Principles of Insurance Management, Excel, 2009.
- James S Trieschmann, Robert E. Hoyt & David N. Sommer: Risk Mgt. & 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.
- Jyotsna Sethi & Nishwan Bhatia: Elements of Banking and Insurance, 2/e, PHI, 2012.

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4ZC04 ENTREPRENEURSHIP

Course Objective: The objective of the course is to make students understand the nature of Entrepreneurship, and its importance to business to the engineering students, which will allow them to get the required intuition and interest in starting their own start-up's

UNIT I

INTRODUCTION TO ENTREPRENEURSHIP: Definition of entrepreneurship, Evolution of entrepreneurship, Classification of Entrepreneurs, Entrepreneurship as a Process, Entrepreneurial Propensity, Benefits and Drawbacks of Entrepreneurship. Characteristics of entrepreneur, Qualities and skills, functions of entrepreneur. Women Entrepreneurs, Problems and opportunities.

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

EXPLORING OPPORTUNITIES AND STRATEGIES: Opportunity Analysis, SWOT Analysis, Internal and External Environment. First-Mover disadvantages, Risk Reduction strategies, Market scope strategy, Imitation strategies and Managing Newness, Marketing strategies for start-ups, Pitfalls in start-up analysis. Taxes as bottlenecks for the growth of new start-up's, subsidies and incentives given to save taxes .

UNIT IV

BUSINESS PLAN AND FEASIBILITY STUDIES: Preparation of an Effective Business Plan, Contents of a Business Plan, Detailed discussion of the business plan. Model Business, Feasibility study, Environmental scanning, Economic Analysis, Industry Analysis, Competitive Analysis. Write Up for an effective feasible and bankable report.

UNIT V

INNOVATIONS AND PROTECTION OF IDEAS: Creativity process in developing Innovation, breakthrough innovations and its consequences on the society. Inspiring innovations. New product ideas, Idea generation methods, quality gates, prototype building, Test marketing. Protecting the ideas, Applying for Intellectual Property rights, Patents, Copyrights, Trademarks, Geographical Indicators. Introduction to World Intellectual Property Organization (WIPO).

UNIT VI

FINANCIAL ASPECTS OF THE ENTREPRENEURSHIP: Sources of Capital ,Debt and Equity, Commercial Banks, Angel Investors, Venture capitalist, IDBI,ICICI,IFCI,SFC'c.

Government Grants and Subsidies. Registration Process and the documentation required. Government Agencies helping in Registration Process. DIC, NSIC and other Central and State Institutions.

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

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4ZC07 FUNDAMENTALS OF DISASTER MANAGEMENT

Course Objectives:

1. To provide students an exposure to disasters, their significance and types.
2. To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
3. To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
4. To enhance awareness of institutional processes in the country
5. To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I

INTRODUCTION TO DISASTERS: Concepts and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks) Disasters – Classification, Causes, Impacts (including social, economic, political, environmental, health, psychosocial, etc.). Differential impacts – in terms of caste, class, gender, age, location, disability.

UNIT II

GLOBAL TRENDS IN DISASTERS:

Urban disasters, pandemics, complex emergencies, Climate change Case Study on Climate Change.

UNIT III

APPROACHES TO DISASTER RISK REDUCTION: Disaster cycle – its Analysis, Phases. Culture of safety, prevention, mitigation and preparedness; Community-based DRR: Structural and nonstructural measures, roles and responsibilities of community, Panchayati Raj Institutions / Urban Local Bodies (PRIs / ULBs), district administration, states, centre, and other stakeholders; Case studies.

UNIT IV

INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT: Factors affecting Vulnerabilities, differential impacts; Impact of Development projects such as dams, embankments, changes in land-use etc; Climate change adaptation; Relevance of indigenous knowledge, appropriate technology and local resources; Case studies.

UNIT V

DISASTER MANAGEMENT IN INDIA: Hazard and vulnerability profile of India. Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management; Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programs and legislation); Case studies.

UNIT VI

APPLICATION OF TECHNOLOGY IN DISASTER MANAGEMENT: IT in Disaster Management – Databases – RDBMS – Management information systems – Decision support systems – GIS – Intranets and Extranets – Video Teleconferencing, Trigger Mechanism – Remote Sensing – Contribution of remote sensing and GIS. Case Studies and Global Initiatives.

Books Recommended:

- B. K. Khanna: **“Disasters: All you wanted to know about”**, New India Publishing Agency, New Delhi
- Pradeep sanhi, Madhavi malalgoda and arya bandhu, “Disaster risk reduction in south asia “PHI
- Amita sinvhal ,”Understanding earthquake disasters”TMH,2010

References:

- Natural Hazards and Disaster Management: R.B. Singh, Rawat Publications
- Remote Sensing and GIS by A.M. Chandra and S.K. Ghosh, Narosa Publishing house
- GIS – Fundamentals, Applications and Implementations: Dr. K. Elangovan, New India publishing agency

Suggested Reading List:

- Alexander David, Introduction in ‘Confronting Catastrophe’, Oxford University Press
- Andharia J., Vulnerability in Disaster Discourse, JTCDM, Tata Institute of Social Sciences Working Paper no. 8, 2008
- Blaikie, P, Cannon T, Davis I, Wisner B 1997. At Risk Natural Hazards, Peoples’ Vulnerability and Disasters, Routledge.
- Coppola P Damon, 2007. Introduction to International Disaster Management
- Carter, Nick 1991. Disaster Management: A Disaster Manager’s Handbook. Asian Development Bank, Manila Philippines.
- Cuny, F. 1983. Development and Disasters, Oxford University Press. Document on World Summit on Sustainable Development 2002.
- Govt. of India: Disaster Management Act 2005, Government of India, New Delhi.
- Government of India, 2009. National Disaster Management Policy
- Gupta Anil K, Sreeja S. Nair. 2011 Environmental Knowledge for Disaster Risk Management, N 1DM, New Delhi
- Indian Journal of Social Work 2002. Special Issue on Psychosocial Aspects of Disasters, Volume 63, Issue 2, April.
- Kapur, Mu & others, 2005: Disasters in India Studies of grim reality, Rawat Publishers
- Kapur Anu 2010: Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi.
- Pelling Mark, 2003 The Vulnerability of Cities: Natural Disaster and Social Resilience Earthsean publishers, London
- Reducing risk of disasters in our communities, Disaster theory, Tearfund, 2006.

- UNISDR, Natural Disasters and Sustainable Development: Understanding the links between Development, Environment and Natural Disasters, Background Paper No. 5. 2002.
- IFRC. 2005. World Disaster Report: Focus on Information in Disaster, pp. 182-225.

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4ZC12 PROJECT MANAGEMENT & FINANCE

Course Objective: The course has been designed to create an awareness of the need for systematic management of projects. This application-oriented course provides the skills in project planning, financing, implementing and controlling, starting from project identification, till project termination.

UNIT I

PROJECT MANAGEMENT CONCEPTS: Concept and characteristics of a project, objectives of project management, types of projects, project organizational structure, project life cycle, qualities & functions of a project manager, challenges and problems of project management.

UNIT II

PROJECT FORMULATION: Generation and Screening of Project Ideas, Project Identification, Project Rating Preliminary, Analysis, Market, Technical, Financial, Economic and Ecological Pre-Feasibility Report, Project Estimates and Techno- Economic Feasibility Report, Detailed Project Report, Different Project Clearance procedure.

UNIT III

PROJECT IMPLEMENTATION AND CONTROL: Monitor and assess project performance, performance measurement, Methods to monitor, evaluate and control planned cost and schedule performance, quality management tools and techniques at different stages of project.

UNIT IV

PROJECT FINANCING: Source of capital, Debt-Equity Financing, Formal & Informal Agencies in Financing, Government grants and Subsidies, Seed, Angel & Venture Capital, DCF Techniques: NPV, IRR, PI and Non DCF Methods: BP, ARR for Project evaluation.

UNIT V

PROJECT RISK ASSESSMENT: Probabilistic cash flow approaches, sources, measures and perspectives of standalone risk analysis, Sensitivity Analysis, Scenario Analysis, Break-Even-Analysis, Simulation managing risk, Project selection Analysis.

UNIT VI

PROJECT CLOSEOUT AND TERMINATION: Introduction, Types of Project Termination, Natural Termination – The Closeout Process: Finishing the work, Handling over the project, Gaining acceptance for the Project, Harvesting the Benefits, Project Reviewing.

Books Recommended:

- Clifford F Gray, Erik W Larson, “Project Management-The Managerial Process”, Tata McGraw-Hill Publishing Co. Ltd
- Financial Management by I M Pandey, Vikas Publishing House

References:

- Jack Meredith, Samuel J. Mantel Jr, “Project Management-A Managerial Approach”, John Wiley Sons
- John M Nicholas “Project Management for Business and Technology” Prentice Hall of India Pvt. Ltd.
- James P Lewis “Project Planning, Scheduling and Control Tata McGraw-Hill Publishing Co. Ltd
- Financial Management: M Y Khan & P K Jain, Text, Problem and Cases 6/e Tata McGraw-Hill Publishing Co. Ltd
- Project Management: Engineering, Technology and Implementation, Shtub, Bard and Globerson, PH Inc.
- Project Management Handbook, Lock, Gower.
- Project Management Handbook, Cleland and King, VNR
- Project Management: Systems approach to Planning Scheduling and Controlling, H. Kerzner.
- Project Scheduling and Monitoring in Practice, S. Choudhury, SAP.
- Total Project Management: The Indian Context, P. K. Joy, Macmillan India Ltd.

III year II Semester**(3G617) PLANT BIOTECHNOLOGY**

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UNIT I: INTRODUCTION TO CELL AND TISSUE CULTURE:

Concept of Totipotency, Tissue culture media (composition, preparation); Initiation and maintenance of callus, 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:

Cell suspension culture, synchronization, Biotransformation, 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; Vector Mediated gene transfer: *Agrobacterium*, Vector less: Physical Methods - electroporation, microinjection and particle bombardment chemical methods – PEG, Ca_2PO_4

UNIT V: TRANSGENIC PLANTS:

Production of transgenic plants for Abiotic (Drought, temperature, salt) and Biotic (Herbicide resistance, Insect resistance, Disease resistance, Virus resistance)

UNIT VI: MOLECULAR FARMING:

Biotechnology for quality Oil, Transgenic plants as bioreactors, 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, Science 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**(3G618) IMMUNOLOGY**

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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 Freeman 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**(3G619) MASS TRANSFER AND SEPARATIONS**

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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. Numerical 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. Numerical 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), Numerical 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 II Semester

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(3G620) COMPUTATIONAL MOLECULAR BIOLOGY (Professional Elective-I)

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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: MOLECULAR DOCKING**TEXT BOOKS:**

1. David W Mount. Bioinformatics- Sequence and genome analysis. CSHL Press.
2. Jonathan Pevsner. Bioinformatics and Functional Genomics. A Jhon Wiley & 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

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(3G621) CANCER BIOLOGY (Professional Elective-I)

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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, tumor 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. L.M.Franks, N.M.Teich. An Introduction to Cellular and Molecular Biology of Cancer, Oxford Medical publications, 1991.
2. Robert A Weinberg, The Biology of Cancer, Garland Science, 2010
3. Robin Hesketh, Introduction to Cancer Biology, Cambridge University Press, 2013

REFERENCE:

1. Dunmock N.J and Primrose. S.B., Introduction to modern Virology, Blackwell publications.
2. Cancer: Principles and Practice of Oncology, 9th Edition, Vincent T. DeVita, Jr., Theodore S. Lawrence, Steven A. Rosenberg, Lippincott Williams and Wilkins, 2011

III Year II Semester

a	b	c	d	e	f	g	h	i	j	k	l
X	X		X						X	X	

(3G622) 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)

a	b	c	d	e	f	g	h	i	j	k	l	m
x												

Syllabus for B. Tech. III Year II semester

LOGICAL REASONING

(Common to All Branches)

Code: 3HC77

L T P/D C
- - 2 1

Unit – I

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

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

Unit – II

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

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

Unit – III

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

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

Unit – IV

Directions, Arithmetical Reasoning.

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 – V

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

Cubes and Dice – Analytical Reasoning .Logical Deduction: Logic, Statement – Arguments

Unit – VI

Clocks & Calendar .Data Sufficiency and Syllogism.

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

a	b	c	d	e	f	g	h	i	j	k	l	m
x		x				x	x	x	x			

**Syllabus for B. Tech. III Year II semester
COMPREHENSIVE VIVA II**

Code: 3E677

L	T	P/D	C
-	-	-	1

Pre-Requisites: None

Course Outcomes:

- Students are assessed in the courses they have undergone till the completion of that academic year.
- They are asked to comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills.

There shall be a Comprehensive Viva-Voce in III year II Semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of an external examiner, Head of the Department and two Senior Faculty members of the Department.

The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects he/she studied during the B.Tech course of study up to III Year. The Comprehensive Viva-Voce is valued for 50 marks by the Committee.

There are no internal marks for the Comprehensive Viva-Voce.

III year II Semester

a	b	c	d	e	f	g	h	i	j	k	l

(3G678) 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. Organogenesis
6. Cell suspension culture
7. Anther Culture
8. Protoplast isolation from leaf and callus
9. Extraction of Phytochemicals from medicinal plant
10. Qualitative analysis of phytochemicals
11. Preparation of *Agrobacterium* culture for transformation
12. *Agrobacterium* mediated gene transfer

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

a	b	c	d	e	f	g	h	i	j	k	l

(3G679) 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. Immuno electrophoretic analysis of human serum.
14. Quantification of immunoglobulin in human serum by radial immunodiffusion

a	b	c	d	e	f	g	h	i	j	k	l	m
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**Syllabus for B. Tech. III Year II semester
TECHNICAL PAPER WRITING AND SEMINAR- II**

Code: 3G680

L	T	P/D	C
-	-	2	1

Pre-Requisites: All Courses till this semester

Course Outcomes:

- Students identify a topic from the current technical topics of their choice in the computer science domain and the allied fields, after surveying in the internet resources, journals and technical magazines in the library.
- Student learnt to arrange the contents of the presentation and scope of the topic, in an effective manner.
- Each student then presents the technical topic they chose in front of the panel and the fellow students, using the oratory skills.
- Students also face the questions posed by the panel and the students and answer them.

There shall be a Technical Paper writing and seminar evaluated for 25 marks in Third Year Second Semester. The evaluation is purely internal and will be conducted as follows:

Paper writing	: 05 marks
Final report	: 05 marks
Presentation before a departmental committee consisting of Head, a Senior Faculty and Supervisor	: 15 marks

IV year I Semester

a	b	c	d	e	f	g	h	i	j	k	l

(3ZC02) 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

a	b	c	d	e	f	g	h	i	j	k	l
X			X			X				X	

(3G725) DOWNSTREAM PROCESSING

L T P/D C
4 1 - 4

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: 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 Dekkera Inc
3. M.R.Ladisich, Bioseparation engineering: Principles, Practice and Economics, Wiley Interscience 2001

IV year I Semester

a	b	c	d	e	f	g	h	i	j	k	l
	X	X		X	X			X		X	

(3G726) ANIMAL BIOTECHNOLOGY

L T P/D C
4 1 - 4

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, Equipments and materials for animal cell culture technology, Chemical, physical and metabolic functions of different constituents of culture medium – Over View

UNIT II: ESTABLISHED CELL LINES: Basic techniques, disaggregation of tissue-trypsinization, Primary and established cell lines, cell separation, Cryopreservation, Cell synchronization, cell transformation

UNIT III: CELL VIABILITY AND TOXICITY: Measurement of viability and cytotoxicity, Biology and characterization of the cultured cells, measuring parameters of growth, apoptosis and necrosis.

UNIT IV: APPLICATIONS OF ANIMAL CELL CULTURE: Applications of Animal cell culture- vaccines, Bio-therapeutics, Monoclonal antibodies, Stem cells –Types and applications, scaling up of animal cell culture.

UNIT V: INDUCED ANIMAL BREEDING: Introduction, artificial insemination, cloning, in-vitro fertilization and embryo transfer, nuclear transplantation, selective animal breeding.

Unit VI: EXPERIMENTAL & TRANSGENIC ANIMALS: Concept of Transgenics, Production of transgenic animals - mouse, fish, Poultry, Generation of animal models for biomedical and pharmaceutical studies and limitations of animal models.

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 Semester

a	b	c	d	e	f	g	h	i	j	k	l
	X		X	X		X		X	X	X	

(3G727) INDUSTRIAL AND ENVIRONMENTAL BIOTECHNOLOGY

L T P/D C
4 1 3

UNIT I: PRODUCTION OF PRIMARY METABOLITES: Bioprocess-overview, Organic acids -Citric acid, Lactic acid, Amino acids -Glutamic acid, Phenyl alanine, Alcohols –Ethanol, Strain improvement , Dual or multiple fermentation

UNIT II: PRODUCTION OF SECONDARY METABOLITES: Antibiotics-Penicillin, Streptomycin, Erythromycin, Vitamin B₁₂

UNIT III: ENZYMES AND RECOMBINANT PROTEINS: Production and applications of Industrial Enzymes - Proteases, Amylases, Lipases, Cellulases. Enzymes in food and pharmaceutical industries; Production of recombinant proteins - Insulin, IL2, recombinant vaccines- Hepatitis

UNIT IV: WASTEWATER TREATMENT: Characteristics of wastewater, Primary treatment, Secondary and tertiary treatment, Aerobic treatment -Activated sludge process, Tricking 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: Bioplastics –PHB, Polylactide (PLA) , Biofertilizers – *Rhizobium*, *Azotobacter*, *Azospirillum*, Phosphate solubilizing microorganisms, 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.

IV Year I Semester

a	b	c	d	e	f	g	h	i	j	k	l
		X	X		X				X	X	

(3G728) FOOD SCIENCE AND TECHNOLOGY (Professional Elective-II)**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 and their nutraceutical significance) Rancidity. Proteins(Protein efficiency ratio PER).

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, Dairy products. Factors affecting growth and survival of Microorganisms in foods. Fermented meat -sausages, Fisheries - Fish Sauces, vegetables-Sauerkaraut, Olives, Dairy products -cheese, beverages- wine, beer. Spoilage in Meats, Fish, Food -borne infections – Salmonellosis, shigellosis), Food intoxications – Botulism , aflatoxins.

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.

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 crystallizer.

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 HACCP.

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.

IV Year I Semester

a	b	c	d	e	f	g	h	i	j	k	l
	X	X	X			X		X	X	X	

**(3G729) 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

a	b	c	d	e	f	g	h	i	j	k	l
X		X	X	X	X				X	X	

**(3G728) 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. Bilitewski, U. Turner, A.P.F. 2000 Biosensors for environmental monitoring Harwood, Amsterdam.

REFERENCE:

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

IV year I Semester

a	b	c	d	e	f	g	h	i	j	k	l
	X		X			X			X	X	

(3G733) MOLECULAR PATHOGENESIS (PROFESSIONAL ELECTIVE – III)

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. Bacterial biofilms.

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 and 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

Iglewski BH and Clark VL. Molecular basis of Bacterial Pathogenesis, Academic Press, 1993
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**(3G731) NANOBIO TECHNOLOGY (PROFESSIONAL ELECTIVE-III)**

a	b	c	d	e	f	g	h	i	j	k	l
		x	x	x							

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: NANOBIO TECHNOLOGY 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: NANOBIO TECHNOLOGY 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**(3G732) CLINICAL RESEARCH AND REGULATORY AFFAIRS (Professional Elective-III)**

a	b	c	d	e	f	g	h	i	j	k	l
	X		X			X			X	X	

L T P/D C
3 1 - 3

UNIT I: INTRODUCTION TO CLINICAL RESEARCH: Introduction to Drug Discovery and drug Development, Historical Perspectives of clinical Research: Nuremberg Code, Thalidomide study , Nazis Trials, Tuskegee Syphilis Study, The Belmont Report, The declaration of Helsinki, Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines

UNIT II: ETHICS IN CLINICAL RESEARCH: Ethics in all aspects of health care, historical cases, negligence, Declaration of Helsinki and informed consent, Ethics committees, constitution and practices up-to-date cases: cloning, human embryos and IVF

UNIT III: CLINICAL STUDY MANAGEMENT: Documentation, Types of Auditing, Audit criteria, Audit process, Responsibilities of stake holders in audit process, Audit follow-up, Audit monitoring and inspection, SOPs

UNIT IV: REGULATIONS IN CLINICAL RESEARCH : ICH GCP guidelines , Clinical Research regulations in India – CDSCO guidelines, USFDA regulations to conduct drug studies, Clinical Research regulations in UK – Medicines and Healthcare Products Regulatory Agency (MHRA) Clinical Research regulations in Europe (EMA), Data protection Act and Regulations relating to electronic signatures

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, Schedule Y and its amendments, Hierarchy and working flow of FDA in India, Roles of DCGA and CDSCO in drug control, Clinical trial approval by Drug Controller General of India (DCGI)

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

IV year I Semester

a	b	c	d	e	f	g	h	i	j	k	l	m
					x	x						

Syllabus for B. Tech. IV Year I semester
PROJECT PHASE – I

Code: 3G732

L	T	P/D	C
-	-	2	1

Pre-Requisites: All Courses till this semester**Course Outcomes:**

- Students identify a topic from the current technical topics of their choice in the computer science domain and the allied fields, after surveying in the internet resources, journals and technical magazines in the library.
- Student learnt to arrange the contents of the presentation and scope of the topic, in an effective manner.
- Each student then presents the technical topic they chose in front of the panel and the fellow students, using the oratory skills.
- Students also face the questions posed by the panel and the students and answer them.

A pre-project seminar in fourth year first semester will be evaluated for 50 marks as follows. This is aimed at the students to identify a project on which they are likely to continue for their project in final year second semester.

Preliminary Report on progress of the work	: 10 marks
Mid Semester presentation	: 10 marks
Final report	: 10 marks
Final Presentation and Defense before a departmental Committee consisting of head, a senior faculty and supervisor	: 20 marks

There shall be no external evaluation in pre-project seminar.

a	b	c	d	e	f	g	h	i	j	k	l	m
x	x	x	x	x	x	x	x	x	x		x	

**Syllabus for B. Tech. IV Year I semester
INDUSTRY ORIENTED MINI PROJECT**

Code: 3G733

L T P/D C
- - - 2

Pre-Requisites: All Courses till this semester

Course Outcomes:

- Students used the concepts learned in the courses, so far, in executing the modules of the projects.
- They also exhibited the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
- They also inculcated an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.
- Through this course, communicative skills and team skills are largely improved.
- The students learnt the ability to work as an individual and in a team.

There shall be an industry-oriented mini-Project in their specialization that may be carried out in collaboration with an industry / R & B organization / Academic Institution, to be taken up during the vacation after III year II Semester examination. However, the mini project and its report shall be evaluated during IV year I Semester. The industry oriented mini project shall be evaluated for a total of 150 marks with 50 marks for internal assessment and 100 marks for end examination. The mini project must be submitted in report form and should be presented before a committee, consisting of an external examiner, head of the department, a senior faculty member of the department and supervisor of the mini project.

The pattern of internal evaluation is as follows:

Work in progress as evaluated by internal guide	:	10 marks
Work in progress as evaluated by External guide	:	20 marks
Report	:	10 marks
Seminar presentation and defense of project	:	10 marks

If the mini project is conducted within the college, the work in progress is evaluated by the supervisor for 30 marks.

IV Year I Semester

a	b	c	d	e	f	g	h	i	j	k	l

(3G780) DOWNSTREAM PROCESSING LABORATORY

L	T	P/D	C
-	-	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

a	b	c	d	e	f	g	h	i	j	k	l

(3G781) ANIMAL BIOTECHNOLOGY LABORATORY

L T P/D C
- 3 2

1. Inverted Microscopy - Demonstration
2. Media preparation and Sterilization – RPMI, DMEM, Eagles.
3. Warm Trypsinization
4. Cold Trypsinization
5. Passage of Monolayer
6. Primary culture technique for chicken embryo fibroblast
7. Cell viability Assay by FDA and Tryphan blue, Cell Duplication time.
8. DNA damage by Comet Assay
9. Study of effect of toxic chemicals on cultured mammalian cells
10. Cryopreservation technique and thawing
11. Cell suspension cultures

a	b	c	d	e	f	g	h	i	j	k	l	m
					x	x	x		x			

Syllabus for B. Tech. IV Year I semester
TECHNICAL PAPER WRITING AND SEMINAR- III

Code: 3G782

L	T	P/D	C
-	-	2	1

Pre-Requisites: All Courses till this semester

Course Outcomes:

- Students identify a topic from the current technical topics of their choice in the computer science domain and the allied fields, after surveying in the internet resources, journals and technical magazines in the library.
- Student learnt to arrange the contents of the presentation and scope of the topic, in an effective manner.
- Each student then presents the technical topic they chose in front of the panel and the fellow students, using the oratory skills.
- Students also face the questions posed by the panel and the students and answer them.

There shall be a Technical Paper writing and seminar evaluated for 25 marks in Fourth Year First Semester. The evaluation is purely internal and will be conducted as follows:

Paper writing	: 05 marks
Final report	: 05 marks
Presentation before a departmental committee consisting of Head, a Senior Faculty and Supervisor	: 15 marks

a	b	c	d	e	f	g	h	i	j	k	l
			X	X					X	X	

IV year II Semester

(3G836) BIOETHICS, BIO SAFETY & IPR

L	T	P/D	C
3	1	-	3

UNIT I: BIOETHICS: Principles of Bioethics. Bioethics in Microbial (Biosecurity), Plant (GMO) & Animal Biotechnology (Stem Cells & Cloning)

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, Integrated circuits, Trade Marks, Industrial designs,

UNIT V: INTELLECTUAL PROPERTY RIGHTS II: Copyrights, Plant breeder's rights, Overview of WTO, GATT, TRIPS, Patent search – databases, Patent drafting, WIPO & Patent Cooperation Treaty (PCT)

UNIT VI: ETHICS IN PRECLINICAL AND CLINICAL TRIALS: Institutional Animal Ethics Committee, good practices in animal experimentation as per committee for the purpose of control and supervision on experiments on animals (CPCSEA), Good Clinical Practice (GCP)

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

a	b	c	d	e	f	g	h	i	j	k	l
X		X							X	X	

(3G388) BIOPROCESS OPTIMIZATION AND PLANT DESIGN

L T P/D C
3 1 - 3

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 microorganism 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: 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: 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.

a	b	c	d	e	f	g	h	i	j	k	l	m
x	x	x	x	x	x	x	x	x	x		x	

**Syllabus for B. Tech. IV Year II semester
PROJECT PHASE - II**

Code: 3E884

L T P/D C
- - 15 10

Pre-Requisites: All Courses till this semester

Course Outcomes:

- Students identify vast application areas for mobile / wireless communication / computing.
- They also understand the working principle of GSM technology.
- Students understand various media access control methods that are meant for wireless communication, each methods' pros and cons
- Understand the issues in the Network layer in the wireless communication and identifying suitable solutions for the same
- Understand the issues in the Transport layer in the wireless communication and identifying suitable solutions for the same
- Understand MANETs with an example like Bluetooth technology.
- Understand Security Issues related to mobile computing and various solutions to mitigate the security problems.

Out of total 200 marks for project work (in the final year second semester), 50 marks shall be for Internal Evaluation and 150 marks for the External Evaluation at the end of the Semester.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The committee consists of an external examiner, HOD, a Senior Faculty Member and Internal Guide.

The pattern of Internal Evaluation is as follows:

Division of marks for internal assessment – 50 marks

- Progress of Project work and the corresponding interim report as evaluated by internal guides at the end of 5 weeks : 05 Marks
- Seminar at the end of 5 weeks : 05 Marks
- Progress of Project work as evaluated by guides at the end of 10 weeks : 05 Marks
- Seminar at the end of 10 weeks : 05 Marks
- Evaluation by the Guides (at the end of 15 weeks) : 10 Marks
- Project Report : 05 Marks
- Final presentation and defense of the project : 15 Marks

If the project is conducted internally the marks will be given by Internal Guide himself.

Division of Marks for External Evaluation – 150 Marks

Pattern of External Evaluation for Project

1. Final Project Report : 30 Marks
 2. Presentation : 20 Marks
- Demonstration / Defense of Project : 100 Marks

a	b	c	d	e	f	g	h	i	j	k	l	m
x		x				x	x	x	x			

**Syllabus for B. Tech. IV Year II semester
COMPREHENSIVE VIVA - III**

Code: 3G835

L	T	P/D	C
-	-	-	2

Pre-Requisites: All Courses till this semester

Course Outcomes:

- Students are assessed in the courses they have undergone till the completion of that academic year.
- They are asked to comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills.

There shall be a Comprehensive Viva-Voce in IV year II Semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of an External Examiner, Head of the Department and two Senior Faculty members of the Department.

The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects he/she studied during the B.Tech course of study till IV Year. The Comprehensive Viva-Voce is valued for 50 marks by the Committee.

There are no internal marks for the Comprehensive Viva-Voce.

a	b	c	d	e	f	g	h	i	j	k	l	m
					x	x	x		x			

**Syllabus for B. Tech. IV Year II semester
Computer Science and Engineering
TECHNICAL PAPER WRITING AND SEMINAR- IV**

Code: 3E893

L	T	P/D	C
-	-	2	1

Pre-Requisites: All Courses till this semester**Course Outcomes:**

- Students identify a topic from the current technical topics of their choice in the computer science domain and the allied fields, after surveying in the internet resources, journals and technical magazines in the library.
- Student learnt to arrange the contents of the presentation and scope of the topic, in an effective manner.
- Each student then presents the technical topic they chose in front of the panel and the fellow students, using the oratory skills.
- Students also face the questions posed by the panel and the students and answer them.

There shall be a Technical Paper writing and seminar evaluated for 25 marks in Fourth Year Second Semester. The evaluation is purely internal and will be conducted as follows:

Paper writing	: 05 marks
Final report	: 05 marks
Presentation before a departmental committee consisting of Head, a Senior Faculty and Supervisor	: 15 marks