

**COURSE STRUCTURE
AND
DETAILED SYLLABUS
for
B.Tech Four Year Degree Course
in
BIOTECHNOLOGY
(BT)**

(Applicable for the batches admitted from 2014-2015)



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

B. Tech I YEAR I SEMESTER COURSE STRUCTURE 2014-15

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	4H101	English – I	2	1	-	2	30	70
2	4H112	Mathematics for Biotechnology - I (For Bi.P.C students) (OR)	3	2	-	3	30	70
	4G101	Fundamentals of Biology (For MPC Students)						
3	4H121	Engineering Physics – I	3	1	-	3	30	70
4	4H131	Engineering Chemistry - I	3	1	-	3	30	70
5	4F101	Computer Programming	4	1	-	4	30	70
6	4B101	Engineering Drawing - I	2	-	4	4	30	70
7	4H171	English Language Lab – I	-	-	2	1	25	50
8	4H181	Engineering Physics Lab-I	-	-	3/2	1	25	50
9	4H186	Engineering Chemistry Lab	-	-	4/2	2	25	50
10	4F171	Computer Programming Lab	-	-	3	2	25	50
11	4B171	Engineering workshop-I	-	-	3/2	1	25	50
12	4F172	IT Workshop - I	-	-	3/2	1	25	50
13	4G173	Technical paper Writing & Seminar - 1	-	-	2	1	25	-
Total			17	6	17.5	28	355	720

I Year II Semester Course Structure

S. No	Subject Codes	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	4H202	English – II	2	1	-	2	30	70
2	4H214	Mathematics for Biotechnology -II	3	2	-	3	30	70
3	4E201	Data Structures and C ++	4	1	-	4	30	70
4	4B202	Engineering Drawing – II	2	-	3	3	30	70
5	4AC41	Basic Electrical Engineering	3	1	-	3	30	70
6	4C232	Basic Electronics	3	2	-	3	30	70
7	4H233	Chemistry for Biotechnologists	2	2	-	2	30	70
8	4H272	English Language Lab-II	-	-	2	1	25	50
9	4E271	Data Structures and C ++ Lab	-	-	3	2	25	50
10	4B273	Engineering Workshop-II	-	-	3/2	1	25	50
11	4F273	IT Workshop-II	-	-	3/2	1	25	50
12.	4G274	Technical paper Writing & Seminar - II	-	-	2	1	25	-
13	4CC80	Basic Electronics Lab			4/2	1	25	50
14	4AC91	Basic Electrical Engineering Lab	-	-	4/2	1	25	50
Total			19	9	17	28	335	690

II Year I Semester Course Structure

S. No	Subject code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	4G302	Process Engineering Calculations	3	1	-	3	30	70
2	4H314	Mathematics for Biotechnology - III	3	1	-	3	30	70
3	4G303	Biochemistry	4	1	-	4	30	70
4	4G304	Microbiology	4	1	-	4	30	70
5	4G305	Cell Biology	4	1	-	4	30	70
6	4BC04	Basic Mechanical Engineering	3	2	-	3	30	70
7	4HC73	Functional and Communicative Written English	-	-	4	2	25	50
8	4G371	Biochemistry Lab	-	-	4	2	25	50
9	4G372	Microbiology and Cell Biology Lab	-	-	4	2	25	50
11.	4G373	Technical paper Writing & Seminar - III	-	-	2	1	25	-
Total			21	7	14	28	280	570

II Year II Semester Course Structure

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	4GC06	Environmental Studies	3	1	-	3	30	70
2	4HC16	Probability and Statistics	3	1	-	3	30	70
3	4G406	Thermodynamics for Biotechnologists	3	1	-	3	30	70
4	4G407	Genetics	4	1	-	4	30	70
5	4G408	Instrumental Methods of Analysis	3	1	-	3	30	70
6	4G409	Bioprocess Engineering	4	1	-	4	30	70
7	4H410	Effective English Communication and Soft Skills	-	-	4	2	25	50
8	4G473	Comprehensive Viva I	-	-	-	1	-	50
9	4G474	Bioprocess Engineering Lab	-	-	4	2	25	50
10	4G475	Instrumental Methods of Analysis Lab	-	-	4	2	25	50
11.	4G476	Technical paper Writing & Seminar – IV	-	-	2	1	25	-
Total			20	6	14	28	280	620

III Year I Semester Course Structure

S. No	Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	4ZC01	Managerial Economics & Financial Analysis and control	3	1	-	3	30	70
2	4G510	Biochemical Reaction Engineering	4	1	-	3	30	70
3	4G511	Molecular Biology	4	1	-	4	30	70
4	4G512	Bioinformatics	3	1	-	3	30	70
5	4G513	Immunology	4	1	-	4	30	70
6		Open Elective-II	3	-	-	3	30	70
7	4HC76	Quantitative Aptitude	-	-	2	2	25	50
8	4G575	Group Project	-	-	3	1	25	50
9	4G576	Immunology lab	-	-	4	2	25	50
10	4G577	Bioinformatics Lab	-	-	4	2	25	50
11.	4G578	Technical paper Writing & Seminar – V	-	-	2	1	25	-
		Total	20	5	15	28	305	620

Subject code	Open Elective – II
4FC21	Database Management Systems
4ZC07	Fundamentals of Disaster Management
4ZC03	Banking Operations, Insurance and Risk Assessment
4ZC04	Entrepreneurship
4EC26	SAP-I
4ZC12	Project Management and Finance

III Year II Semester Course Structure

S. No	Subject code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	4G614	Momentum and Heat Transfer	4	1	-	4	30	70
2	4GC06	Environmental Studies	3	-	-	3	30	70
3	4G615	Plant Biotechnology	3	1	-	3	30	70
4	4G616	Genetic Engineering	4	1	-	4	30	70
5	4G617	Mass Transfer and Separations	4	1	-	3	30	70
6		Professional Elective-I	3	1	-	3	30	70
7	4H677	Logical Reasoning	-	-	2	2	25	50
8	4G677	Comprehensive Viva Voce	-	-	-	1	-	50
9	4G678	Plant Biotechnology Lab	-	-	4	2	25	50
10	4G679	Genetics, Molecular Biology and Genetic engineering lab	-	-	4	2	25	50
11	4G680	Technical Paper Writing & Seminar – VI	-	-	2	1	25	-
		Total	20	5	12	28	280	620

Subject code	Professional Elective – I
4G618	Molecular Toxicology
4G619	Bioprocess Economics and Plant design
4G620	Biopharmaceutical Technology
4FC22	Big Data Analytics
4EC27	SAP-II

IV Year I Semester Course Structure

S. No	Subject code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	4ZCO2	Management Science	4	1	-	4	30	70
2	4G721	Industrial and Environmental Biotechnology	3	1	-	3	30	70
3	4G722	Bioreactor Design and Bioprocess Control	4	1	-	4	30	70
4	4G723	Downstream Processing	4	1	-	4	30	70
5	4G724	Animal Biotechnology	4	1	-	4	30	70
6		Professional Elective-II	4	1	-	4	30	70
7		Professional Elective-III	4	1	-	4	30	70
8	4G731	Project Phase - I	-	-	-	1	50	-
9	4G732	Industry oriented Mini-project	-	-	-	2	25	50
10	4G780	Downstream Processing Lab	-	-	4	2	25	50
11.	4G781	Animal Biotechnology Lab	-	-	4	2	25	50
12	4G782	Technical paper Writing & Seminar - VII	-	-	2	1	25	-
Total			25	7	8	35	360	640

Subject code	Professional Elective – II	Subject code	Professional Elective - III
4G725	Food Science and Technology	4G728	Computational Molecular Biology
4G726	Clinical Research and Regulatory Affairs	4G729	Biotechnology for Crop Improvement
4G727	Molecular Pathogenesis	4G730	Cancer Biology

IV Year II Semester Course Structure

S. No	New Subject Code	Subject	L	T	P/D	C	Max Marks	
							Int	Ext
1	4G833	Bioethics, Biosafety & IPR	4	1	-	4	30	70
2	4G834	Biosensors and Nanobiotechnology	4	1	-	4	30	70
3	4G835	Project Phase – II	-	-	15	10	50	150
4	4G883	Comprehensive Viva III	-	-	-	2	-	50
5	4G884	Technical Paper Writing & Seminar - VIII	-	-	2	1	25	-
		Total	8	2	-	21	135	340

B. Tech: YEAR I - Semester I**ENGLISH**

Subject Code: 4H101

Theory: L – T - C

2 – 1 – 2

*Maximum Marks: 100**Internal – 30 / External - 70*

A	b	c	D	e	f	g	h	i	j	k	l
x											

The proposed syllabus is covered in 5 units: First unit is a refresher course to calibrate the students and test their previous knowledge in English. It is a bridge course to identify their ability in different areas of language learning. A diagnostic test is followed by this course. Exercises based on the test items are provided as a remedial course.

UNIT 1: Refresher Course

Exercises on English Vocabulary and Grammar are practiced and followed up by a Diagnostic Test

- **Grammar - Parts of Speech**
- **Correction of Sentences**
- **Vocabulary**
- **One Word Substitutes**

DIAGNOSTIC TEST 1**REMEDIAL CLASSES**

Exercises on different aspects to improve basic English language learning is provided

WRITING: Guided paragraph

UNIT 2: Short Story

Short Story & Vocabulary (*Devoted Son* by **Anita Desai**)

Vocabulary: Words from the text

- a. Meanings of Words
- b. Usage of Words
- c. Synonyms of Words
- d. Antonyms of Words
- e. Usage of Sentences

Grammar: Types of Sentences – Simple / Compound / Complex

Conversation of one type into the other / Rules of conversation

Exercises based on simple to compound, simple to complex, compound to complex, complex to compound, complex to simple, etc.

Writing: Paragraph Writing

Speaking: Asking questions to gain information (*working in pairs*)

“Wh” Questions; Tag Questions; Command and Requests; Greeting and Leave Taking; Asking for Permission

UNIT 3: Public Address

***Evolution of Indomitable Spirit in Youth* by APJ Abdul Kalam**

Vocabulary: Words from the text

- a. Meanings of Words
- b. Usage of Words
- c. Homonyms, Homophones and Homographs
- d. Words often confused and sentences with such words

Grammar: Verbs, Types of Verbs, Finite / Infinitive, Transitive and Intransitive, Auxiliary, Tenses (Regular and Irregular Verb Tenses)

Exercises based on Verbs and their various usages

Writing: Writing a paragraph on any famous / inspirational person

Speaking: *Greeting and Leave Taking, Apologizing and Inviting (working in pairs)*

DIAGNOSTIC TEST 2

Remedial Activity 2

UNIT 4: Creativity

Lesson: ***A Tea Party*** by Ruth Pravar Jhabwala

Vocabulary: Text based words, meanings and sentences / Affixation, Prefixes, Infixes and Suffixes

Grammar: Sentences Using the Correct Form of given base word

Writing: Informal / Formal Letter Writing (*Salutation, Introduction, Body, Conclusion, Complimentary Close and Signature*)

Speaking: Situational Dialogues

UNIT 5: Inspiring Speech

Moon Shot Speech (1961) by John F. Kennedy

Vocabulary: Text Based Words / Meanings

Collocations: Words that go together

Exercises based on Collocations

Phrasal Verbs

Exercises

Grammar: Scrambled Words and Writing Sentences

Writing: Summarizing

Speaking: Topic related short speeches / Narrating an anecdote

Prescribed Text: Compiled by Faculty - Department of English (SNIST)

Suggested Reading: Essential English Grammar by Raymond Murphy

Intermediate English Grammar by Raymond Murphy

Code: 4H112**1st Year B. Tech, Semester –I****L T P/D C****3 2 - 3**

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

MATHEMATICS FOR BIOTECHNOLOGY-I**UNIT-I****Trigonometry**

Fundamentals of Algebra, Introduction to Sets, Relations, Functions, Trigonometric Ratios of Compound angles, Multiple and Sub-multiple Angles, Transformation, Hyperbolic Functions, 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, Types of discontinuity of a function.

UNIT -IV**Differentiation**

Introduction, Derivatives of Trigonometric, Logarithmic, Exponential and Composite Functions. Second and higher Order Derivatives of a Function. Length of tangent, sub-tangent, Normal and Sub-normal. Applications of Derivatives (Motion in a straight line, Motion under gravity)

UNIT-V**Partial Differentiation**

Functions of several variables, Partial differentiation, Total differentiation, Euler's theorem, Maxima and minima values of a function of several variables- Applications.

UNIT-VI**Integration**

Introduction, Integration of standard functions, Methods of integration- Method of substitution, Integration by parts. Indefinite and Definite Integrals. Applications of integration in finding areas of bounded regions.

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.
4. A Text Book of KREYSZIG's Engineering Mathematics, Dr. A. Ramakrishna Prasad, Wiley Publications.
5. Advanced Engineering Mathematics, S. R. K. Iyengar and R.K. Jain, Narosa Publishing House, London.

I Year I Semester**(4G101) FUNDAMENTALS OF BIOLOGY
(FOR MPC STUDENTS)**

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

L	T	P/D	C
3	2	--	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: Developmental Biology

Gametogenesis, fertilization, gastrulation, Cleavage, organogenesis, sex determination, developmental gene regulation, and teratology.

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 (4H121) Engineering Physics – 1

L	T	P/D	C
3	1	--	3

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

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. Atomic densities along various important directions and planes and comparison of deformability of BCC, FCC and hcp metals.

UNIT-II

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.

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

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. P K Palanisamy, Engineering Physics, Sitech Publications

Reference Books:

1. Charles Kittel, Introduction to Solid State Physics, John Wiley Publisher
2. Neil W. Ashcroft, N. David Mermin,, Solid State Physics, Thomson Publisher,
3. Donald Allan McQuarrie, Statistical Mechanics, University Science Books Publisher, California
4. Sathya Prakash, Statistical Mechanics, Pragathi Prakashan Publisher
5. Quantum Mechanics by G. Aruldas
6. John L Powel, Quantum Mechanics, Narosa Publications
7. Ramamurti Shanker, Principles of quantum Mechanics, Springer Publication
8. M Chandrashekar and P Applu Naidu, Applied Physics, VGS Book Links
K. Vijaya Kumar, S Chandralingam, Modern Engineering Physics, S Chand Publisher

I Year I Semester

(4H131)ENGINEERING CHEMISTRY-I
(Common to all)

L	T	P/D	C
3	1	-	3

A	b	c	D	e	f	g	h	i	j	k	l

UNIT - I WATER TECHNOLOGY

- (a) **Water quality Parameters:**-Hardness of water – types of hardness (temporary and permanent). Estimation of hardness of water by EDTA Method.
- (b) **Water for Industrial purpose:** Water for steam making, Boiler troubles-Carry over (priming & foaming).Boiler Corrosion, Scale and sludge, caustic embrittlement.
- (c) **Treatment of Water:** Internal Conditioning- Phosphate, Carbonate & Calgon conditioning. External Treatment: Lime- Soda, Zeolite, Ion-exchange process, Desalination-Reverse osmosis and electro dialysis. Methods of Treatment of Water for Domestic purpose-Sedimentation, Coagulation, Filtration, Disinfection-Chlorination, Ozonization. (Numerical problems on calculation temporary and permanent hardness).
Engineering applications: Methodology and working of mineral water plant (ISI) for drinking purpose.

UNIT - II ELECTROCHEMISTRY

Electro Ionics:- Conductance – conductors (metallic and electrolytic) – Types of conductance – specific, Equivalent, molar conductance – Effect of dilution on conductance – Kohlrausch's law and its applications i) Determination of equivalent conductance for weak electrolytes ii) Degree of dissociation iii) Solubility of sparingly soluble salts – numerical problems on Kohlrausch's law.

Electrodes :- E M F of electrochemical cells – cell notation and cell reaction – electrode potential (oxidation and reduction) Nernst Equation and its applications. Types of electrodes (a) Gas electrode (H₂ electrode) (b) Metal ion electrode (Zn/Zn⁺²) (c) Redox electrode (Quinhydrone electrode) (d) Metal – Metal insoluble salt electrode(SCE) (e) Ion selective electrode. **Engineering Applications – determination of P^H.**

UNIT - III ELECTROCHEMICAL ENERGY SOURCES – BATTERIES

Cell and batteries – types of batteries

- (a) Primary batteries – Lechalanche cell (dry cell), Lithium cell
- (b) Secondary batteries(Accumulators) – Lead acid battery, Alkaline battery Ni-Cd battery, , Lithium-ion battery
- (c) Fuel cells- H₂ – O₂ fuel cell & Methanol – Oxygen fuel cell
- (d) Photovoltaic Cell- Solar Cell

Engineering applications – future water powered car, solar cells in domestic and automobiles.

UNIT - IV CORROSION AND ITS CONTROL

Corrosion – Basic concepts – Mechanism of chemical, electrochemical Corrosion (absorption of O₂ and evaluation of H₂) – Pilling - Bed worth rule – Types of electrochemical Corrosion – Galvanic Corrosion – Pitting Corrosion – Concentration Cell Corrosion – Factors affecting the rate of Corrosion.

Engineering Applications:

- a) **Corrosion Control Methods-** Cathodic protection – sacrificial anode and impressed current cathode method.
- b) **Protective Coatings --** Surface preparation for metallic coatings like hot dipping (**tinning and galvanizing**) metal cladding (**Al Cladding**) electro plating (**copper plating**) and electroless plating (**Nickel plating**). Methodology and production of gold decorative articles.

UNIT - V PHASE EQUILIBRIA AND ALLOYS

Phase rule:- Introduction, definition of terms with examples, one components system – Water system, reduced phase rule – Two component systems, classification – lead – silver system.

Alloys: - Introduction – Definition – properties of alloys – significance of alloying, functions and effect of alloying elements. **Engineering applications of ferrous alloys – Ni chrome and stainless steel, nonferrous alloys – brass and bronze.**

UNIT - VI NANO CHEMISTRY

Basics – distinction between molecules, nanoparticles and bulk materials, size – dependent properties.

Nano Particles: nano cluster, Nano rod, nano tube (CNT) and nano wire.

Synthesis: Precipitation, thermolysis, hydrothermal, solvothermal, electrode position, laser ablation, wet chemical methods of preparation (micro emulsion – solvent extraction Reduction – chemical oxidation

Reduction. **Applications of Nano materials in Medicine and Energy systems - Carbon nanotubes in efficient solar cell and fuel cells.**

Text Books:

1. 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 & Mukkanti, S. Chand & CO, New Delhi (2014).
3. Chemistry of Engineering Materials by C.V. Agarwal, C.P. Murthy, A. Naidu; BS publications.
4. Text Book of Nano Science and Nano Technology by B.S. Murthy and P. Shankar, University press.

I YEAR I SEMESTER

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

L T P C
3 1 - 3

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

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: Construc 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.

(4B101) ENGINEERING DRAWING – I
(Common to all branches)

L **T** **P/D** **C**
2 -- 4 4

A	b	c	D	e	f	g	h	i	j	k	l
x											

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 2nd Edition [Basant Agrawal](#), [C. M. Agrawal](#), Tata McGraw-Hill Education

REFERENCES:

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

ENGLISH LANGUAGE LAB : -1 **ELCS Lab**

Lab Code: 4H171

P/D – C

2 - 1

Maximum Marks: 75

Internal – 25 / External - 50

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

Phonetics:

1. Vowels: Long Vowels
2. Vowels: Short Vowels
3. Vowels: Diphthongs
4. Consonants: Voiced Consonants
5. Consonants: Voiceless Consonants
6. Stress or Accent
7. Intonation

Communication Skills:

1. Situational Dialogues
Speaking Activity – Introducing Oneself; Introducing Others; Meet and Greet
2. JAM Sessions
3. Describing an object/person/situation/place
4. Telephonic Conversations
5. Giving Directions
6. Review of a story/film/novel.

I Year 1st Semester(4H181) **Engineering Physics Lab – 1**

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

(Common to all branches)

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

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 Circuit
6. L C R series and parallel resonance
7. Determination of rigidity modulus of a given wire – Torsional pendulum
8. Determination of Planck’s constant
9. Determination of the acceleration to gravity and radius of gyration by compound pendulum.

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

Prescribed Practical Book by Dr. Y. Aparna, Professor & HOD of Physics Department, JNTUH

I Year I Semester

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

(4H186) ENGINEERING CHEMISTRY LABORATORY

L	T	P/D	C
-	-	4/2	2

The objective of the Laboratory practicals is to make the student to acquire the basic Knowledge used for engineering applications.

1. Determination of Hardness of a **ground water** sample.
2. Preparation of **Thiokol rubber**.
3. Determination of **Viscosity of a lubricant** by Redwood Viscometer..
4. Estimation of Copper in **Brass alloy** (HYPO)
5. Estimation of Calcium in **Portland cement**.
6. Estimation of Iron content in **Ore sample** using Colorimeter (KSCN)
7. Estimation of **rate of Corrosion of Aluminium** in acidic and alkaline medium.
8. Determination of **Mohr's salt** by **Potentiometric** method.
9. Determination of **Calorific value** of Solid fuel by using Bomb Calorimeter.
10. Experiment on Green chemistry; **Aldol condensation** (not by Classic route)
11. Determination of Flash point and fire point of a **lubricant**
12. Determination of strength of Strong Acid using Strong Base (**HCl vs NaOH**) by **Conductometric titrations**.

I Year I Semester

(121IT71) COMPUTER PROGRAMMING LABORATORY

L T P/D C
- - 3 2

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

1. Unit I (Cycle 1)

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

2. Unit II (Cycle 2)

- Write an algorithm, flowchart, and C program for:
 - Finding the area and circumference of a circle of given radius.
 - Finding the volume of a sphere of given radius.
 - Finding the lateral surface area of a right circular cone of given base radius and height.
 - Finding selling price of an item, given its cost price and profit percent.
 - Finding the interest on a given principal for a given period of time at a given rate of per year.
- Write a C program to display all the sizes of data types in C.
- 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)

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

- Write three C programs to print a multiplication table for a given number using while, do-while, and for loops.
- Write a C program to compute the sum of:
 - $1+x+x^2+x^3+\dots+x^n$, given x and n.
 - $1!+2!+3!+\dots+n!$, given n.
 - $1-x^2/2!+x^4/4!-x^6/6!+x^8/8!-x^{10}/10!+\dots$ to n terms where the n^{th} term becomes less than 0.0001.

5. Unit III (Cycle 5)

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

6. Unit III (Cycle 6)

- Write C functions for the following:
 - A function that takes an integer n as argument and returns 1 if it is a prime number and 0 otherwise.
 - A function that takes a real number x and a positive integer n as arguments and returns x^n .
 - A function that takes a positive integer n as an argument and returns the n^{th} Fibonacci number.
- Using recursion write C functions for the following:
 - 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.
- 5.

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.

Code: 4B171

ENGINEERING WORKSHOP – I

(Common to all branches)

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

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

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

After completing the subject, students will be able:

- To identify the various tools used for basic workshop
- To identify the tools and understand the basic circuit for tube light and calling bell
- To understand the various parts used in home appliances
- To understand the basic welding tools and perform welding of simple joints

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

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

Code: 4F172**IT WORKSHOP-I**

L	T	P/D	C
-	-	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 7: Software and data, Components of Desktop, Working with windows

Week 4:

Getting Started with Microsoft Windows 7: 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).

TEXT BOOK:

1. "Comdex Information Technology Course Kit" by Vikas Gupta, Dreamtech Press

I YEAR – II Semester**English - II**

Subject Code: 4H202

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

Theory: L – T - C

2 – 1 – 2

Maximum Marks: 100

Internal – 30 / External - 70

UNIT 1: Short StoryLesson: ***A Short Story of an Indian Engineer / A Talent, Undone*** by **Bhargav Prasanna**

Grammar: Active and Passive Voice

Vocabulary: Words and Phrases from the text

Writing: Paragraph Writing (*Guided and Free*)Speaking: Narration of Places of Interest (*India and Overseas*)**UNIT 2: Speech**Lesson: ***The Convocation Speech*** by **Narayana Murthy**

Vocabulary: Phrasal Verbs from the text

Grammar: Direct and Indirect Speech

Exercises related to speech

Writing: Précis Writing

Speaking: *Speaking on Current Affairs / Latest Technology***UNIT 3: Analysis of an Essay**Lesson: ***The Secret of Work*** by **Swami Vivekananda**

Vocabulary: One Word Substitutes

Writing: Essay Writing

Speaking: Giving Instructions and Directions

UNIT 4: Life HistoryLesson: ***Three Days to See*** by **Hellen Keller**

Concept and Elements of a Biography; Fiction and Non-Fiction; Ideas; Reminiscing

Writing: Critical Appreciation

Speaking: Speaking on past experiences and life's events

UNIT 5: Advancement of TechnologyLesson: ***The Cyber Age*** (**Polymer Bank Notes**)

Question and Answers regarding a report / Testing on Mood, Tense and Voice

Vocabulary: Text Based Words / Meanings

Writing: Report on the economic status due to Credit/Debit Card

Speaking: Debate on conventional Currency and "plastic money"

*Prescribed Text: Compiled by Faculty - Department of English (SNIST)**Suggested Reading: Essential English Grammar by Raymond Murphy**Intermediate English Grammar by Raymond Murphy*

I Year B.Tech. II Semester**(4H214)MATHEMATICS FOR BIOTECHNOLOGY-II****(For Bio-Technology)**

L	T	P/D	C
4	2	-	4

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

UNIT– I: First order Ordinary Different Equations: Differential equations of first order and first degree – Exact, Linear and Bernoulli’s Equation.

Applications: Newton’s Law of Cooling, Law of Natural Growth and Decay.

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

Application: Bending of beams, Simple harmonic motion and LCR circuit.

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 coefficients, Fourier series to the functions of any period $p=2L$, Fourier series of even and odd functions, Half-range Expansions.

Applications: Fourier series to ordinary differential equations with boundary conditions.

UNIT–V: Laplace Transforms: Laplace transform of standard functions, shifting theorems, change of scale property, multiplication by powers of t , Division by t , Laplace transform of unit step function, Impulse function and periodic functions.

UNIT–VI: Inverse Laplace Transforms

Inverse Laplace transforms: properties, partial fraction method and convolution theorem (without proof).

Applications: Laplace transforms to solve ordinary differential equations with constant coefficients.

TEXT BOOKS:

1. Mathematical Methods of Science and Engineering, Kanti B.Datta, CENGAGE Learning.
2. Higher Engineering Mathematics, B.S. Grewal, Khanna Publications, New Delhi.
3. Engineering Mathematics, B. V. Ramana, Tata McGraw Hill Publishing Company Ltd.
4. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 8th Edition.

REFERENCE BOOKS:

1. A Text Book of KREYSZIG’s Engineering Mathematics, Dr. A. Ramakrishna Prasad, Wiley Publications.
2. Advanced Engineering Mathematics, S. R. K. Iyengar and R.K. Jain, Narosa Publishing House, London, 2002.

I Year II Semester
Code: 4E201

DATA STRUCTURES AND C++
(Common to all Branches)

						L	T	P/D	C		
						4	1	-	4		
a	b	c	d	e	f	g	h	i	j	k	l

UNIT – I

Introduction to data structures: Abstract data type (ADT), Stacks and Queues circular queues and their implementation with arrays.

Applications of Stack: infix to post fix conversion, postfix expression evaluation.

Applications of Queues

Objective:

On completion of the unit/chapter, a student should be able to: (i) Define what is an abstract data type (ii) Differentiate linear and non-linear data structures (iii) Representation and implementation of stack and queue using arrays. (iv) Convert the given infix expression to post fix notation and evaluate the postfix expression using stack. (v) Understand the applications of stack and queue.

UNIT – II

Singly linked lists, Advantages of Linked lists over Arrays, Doubly linked lists, Circular list and their operations, representing stacks and queues with Linked lists.

Objective:

On completion of the unit/chapter a student should be able to:(i) Understand what is a linked list (ii) know how structurally the distinct categories of lists differ from each other (iii) implement various categories of lists such as singly linked lists, doubly linked lists and circular lists (iv) understand how to represent and implement stack and queue using linked list

UNIT – III

Trees- Binary trees, terminology, representation, traversals.

AVL trees, AVL tree operations: Insertion, deletion and searching.

Graphs- terminology, representation, graph traversals (DFS & BFS).

Objective:

On completion of the unit/chapter a student should be able to:(i)understand the terminology and uses of trees and graphs(ii)explain distinct representations of trees as well the graphs(iii)analyze binary search tree(iv)construct binary search tree, given the elements and traverse the tree in pre-order, in-order and post-order(v)differentiate Depth First Search(DFS) and Breadth First Search (BFS) techniques and could traverse through the graph using DFS and/or BFS

UNIT - IV

Searching - Linear and binary search methods. Hash table representation, hash functions, double hashing.

Sorting - Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort.

Objective:

On completion of the unit/chapter a student should be able to:(i)understand what is meant by searching and could differentiate linear search operation performed on an ordered set of elements and an unordered set of elements(ii)differentiate the linear search and binary search techniques (iii)explain the procedure involved in binary search method(iv)understand the necessity of sorting techniques(v)list and implement different types of sorting techniques(vi)know and compare the time complexity of each sorting technique

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.

Objective:

On completion of the unit/chapter a student should be able to:(i)differentiate structured programming approach and the object oriented programming approach(ii)understand the terms class, object and could write simple programs in C++ (iii)understand how to use access specifiers (iv)explain the differences between constructor and normal function

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: single, multiple and multi level inheritance.

Objective:

On completion of the unit/chapter a student should be able to:(i)describe static class members(ii)make use of this pointer, friend function(iii)demonstrate the dynamic memory allocation and deallocation (iv)understand what is overloading and write programs on function overloading, operator overloading(v)understand and differentiate types of templates (vi)learn inheritance and its usage.

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**(4B202) ENGINEERING DRAWING – II****(Common to all branches)**

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

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

After completing the subject, students will be able:

- to draw the various types of scales for different applications and using various types of units.
- to understand the practical applications of development of various solids and draw their developments
- to understand the concept of three dimensional representations of simple and complex objects through isometric projection principle given their orthographic representation
- to convert pictorial (Isometric) views to orthographic views.
- to understand the applications and draw the perspective views of various drawing entities
- to understand the computer aided drafting technique and commands for generation of basic entities of drawing

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 2nd Edition [Basant Agrawal](#), [C. M. Agrawal](#), Tata McGraw-Hill Education

REFERENCES:

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

Code: 3AC41

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

				L		T		C			
				3		2		3			
a	b	c	d	e	f	g	h	i	j	k	l
x	x										

Unit – I: Introduction to Electrical Engineering:

Ohm's Law, Basic circuit components, Kirchhoff's Laws. Types of sources, Source transformation, V- I relationship for passive elements. Series parallel circuits, Star - delta and delta - star transformations, mesh and nodal analysis. Network theorems – superposition, thevenin's theorem & maximum - power transfer theorem, simple problems.

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

Principle of AC voltage, wave forms & basic definitions. R.M.S. and Average values of alternating currents and voltage, Form factor and Peak factor, Phasor representation of alternating quantities, the 'j' operator and phasor algebra, Analysis of ac circuits with single basic network elements, Single phase series circuits.

Faraday's laws of electro-magnetic induction, concept of self and mutual inductances.

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: Single Phase 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.

Unit – V: Three phase circuits and 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 & I.J.Nagrath PHI.
2. Principles of Electrical Engineering - V.K.Mehta, S.Chand Publications.2nd edition.

II Year, B. Tech, BT – I - Sem.

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

BASIC ELECTRONICS (4C332)

After studying this course, the students will be able to

1. Understand the operation of diode and its application as rectifier.
2. Understand the Fundamentals of BJT operation, Characteristics and different biasing circuits.
3. Understand the Fundamentals of JFET operation, Characteristic.
4. Understand the working of amplifiers and oscillators
5. Understand the Basic regulator circuits and voltage multipliers.
6. Understand the number systems and its applications

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. -06 periods

Text Books

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.*

References

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

I Year II Semester

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

(4H233) CHEMISTRY FOR BIOTECHNOLOGISTS
(Only for BT)

L	T	P/D	C
2	2	-	2

UNIT – I POLYMER TECHNOLOGY

Polymer, polymerization - Types of Polymerization.

Plastics – thermosetting and thermoplastics , preparation, properties and **Engineering applications of the following: PVC, Teflon, Bakelite, Nylon 6,6 and epoxy resins.**

Rubber – natural and artificial rubber, vulcanization of natural rubber, **Buna-S, Buna-N and their Engineering applications.**

conducting polymers- classification, preparation of **polyacetylene, polyaniline and their Engineering applications.**

UNIT - II SURFACE CHEMISTRY AND COLLOIDS

Surface Chemistry: Adsorption – Types of Adsorption, Isotherms Langmuir adsorption isotherm. **Engineering applications of adsorption.**

Colloids: Classification of colloids, Electrical and optical properties, micelles, gold number, Types of emulsions, preparation, Emulsifier, liquid in solids(gel), classification, preparation and properties **Engineering applications of colloids in industry.**

UNIT - III CHEMICAL BONDING AND THERMOCHEMISTRY

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

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, Flame temperature.

UNIT – IV REACTION KINETICS

Significance of rate law and rate reactions , 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. Activation energy- Concept, Kinetics study and mechanism of reactions (with suitable system) parallel and consecutive reactions.

UNIT - V REACTION MECHANISMS

Classes of organic compounds & functional groups. inductive, electromeric , mesomeric effect. types of reactions –addition reaction-nucleophilic substitution & elimination reactions.—Fridel-Craft reaction, Aldol Condensation, Diels Alder reaction, Beckmann rearrangement & Hoffmann reaction. **Engineering Applications (Drug and pharmaceutical industry)**

UNIT - VI GREEN CHEMISTRY

Introduction, Concepts, Principles of green chemistry, development of green chemistry, importance of measurement in green chemistry, Principles of green engineering.

Engineering Applications of green chemistry: Manufacture of polylactic acid for **plastic production**, Production of **biodegradable polymer (poly hydroxyl alkanoates (PHA)).**

Text Books:

1. 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. "Organic Chemistry", 6/e, Morrison and Boyd, Prentice- Hall India.
3. Sharma, R.K.; Sidhwani,I.T. & Chaudhari, M.K. *Green Chemistry Experiments: A Monograph*, I.K. International Publishing Hopuse pvt Ltd. New Delhi, Bangalore(2013).

(4H272) English Language lab – II

P/D – C
2 - 1

Maximum Marks: 75
Internal – 25 / External - 50

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

Lab Activities:

1. Reading Comprehension / Vocabulary Activities
2. Reading Comprehension / Vocabulary Activities
3. Reading Comprehension / Vocabulary Activities
4. Reading Comprehension / Vocabulary Activities
5. Reading Comprehension / Grammar
6. Reading Comprehension / Grammar
7. Reading Comprehension / Grammar
8. Reading Comprehension / Grammar

Communication Skills:

1. Speaking Activity: Agreement and Disagreement
2. Speaking Activity: Hobbies / Books
3. Speaking Activity: Hobbies / Movies / Travel
4. Speaking Activity: Picture Perception
5. Speaking Activity: Picture Perception
6. Speaking Activity: Extemporaneous

Speaking Activity: Debate

(4E271) DATASTRUCTURES AND C++ LAB
(Common to all Branches)

								L	T	P/D	C
								-	-	3	2
a	b	c	d	e	f	g	h	i	j	k	l

Lab Objective:

On completion of all the exercises, a student should be able to:

- Represent and Implement the operations on basic linear and non-linear data structures
 - Implement basic C++ programs using object oriented programming concepts
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.

Code:4B273

ENGINEERING WORKSHOP – II
(Common to all branches except CSE & IT)

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

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

After completing the subject, students will be able:

- to understand the various tools used for filing and perform fitting on simple joints.
- to fabricate components made up of tin sheets.
- to make simple wooden joints using carpentry tools

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. Black Smithy

Fabrication of S - Shape

Fabrication of Hook shape

I Year II Semester

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

(4F273) IT WORKSHOP-II

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 2007
2. <https://office.microsoft.com/en-us/support/> (office help and how-to)
3. W3schools.com

I Year II - Sem.**(4CC80) BASIC ELECTRONICS LAB
(COMMON TO CSE/IT)**

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

1. Transistor CE Characteristics (Input and Output)
2. Full wave Rectifier with and without filters.
3. CE Amplifiers.
4. RC Phase Shift Oscillator
5. Class A Power Amplifier
6. Micro Processor

I Year II - Sem.**(4AC91) BASIC ELECTRICAL ENGINEERING LAB****(Common to MECH, CSE, IT & BT)**

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

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

1. OC & SC tests on Single – Phase transformer (Predetermination of efficiency and regulation at given power factors).
2. Brake test on 3-phase induction motor (performance characteristics).
3. Speed control of DC shunt motor by
 - a) Armature Voltage Control .
 - b) Field flux control method.
4. Brake test on DC shunt motor.
5. Swinburn's test on DC shunt machine.
6. Load test on 1- phase transformer.

II Year I Semester**(4G302) PROCESS ENGINEERING CALCULATIONS**

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

L T P/D C
3 2 -- 3

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, 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, 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, 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.

II Year I Semester

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

**(4H315) MATHEMATICS FOR
BIOTECHNOLOGY-III
(For Bio-Technology)**

L T P/D C
3 2 - 3

Unit-I: Matrices and Linear systems of equations: Introduction, Rank of a Matrix, Elementary Transformation-Echelon Form, Normal Form, Inverse of a Matrix by Gauss-Jordan method, Linear Dependence and Independence of Vectors, Linear Systems Gauss Elimination method, Rank method – Applications.

Unit-II: Eigenvalues, Eigenvectors: Eigenvalues and Eigenvectors of a Matrix- Properties of Eigenvalues and Eigenvectors, Cayley-Hamilton theorem(without proof) and its Applications, Diagonalization of a Matrix.

Unit-III: Interpolation: Introduction, Finite differences, Forward Differences, Backward differences, Central differences, Newton's formulae for interpolation, Gauss interpolation 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 Method.

TEXT BOOKS:

1. Mathematical Methods of Science and Engineering, Kanti B.Datta, CENGAGE Learning.
2. Higher Engineering Mathematics, B.S. Grewal, Khanna Publications, New Delhi.
3. Engineering Mathematics, B. V. Ramana, Tata McGraw Hill Publishing Company Ltd.
4. Erwyn Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 8th Edition.

REFERENCE BOOKS:

1. A Text Book of KREYSZIG's Engineering Mathematics, Dr. A. Ramakrishna Prasad, Wiley Publications.
2. Advanced Engineering Mathematics, S. R. K. Iyengar and R.K. Jain, Narosa Publishing House, London, 2002.

II Year I Semester**(4G303) BIOCHEMISTRY**

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

L T P/D C
4 1 - 4

UNIT I: Carbohydrates- Structure, Properties, Classification and Biological functions- monosaccharides, disaccharides, oligo and polysaccharides, Glycolysis, Citric acid cycle, overview of Aerobic and anaerobic respiration

UNIT II: Amino acids - Structure, properties, classification and biological functions of amino acids - Reductive Amination & Transamination & Urea cycle, overview Biosynthesis of amino acids

UNIT III: Proteins: Structure, properties, classification and biological functions, structural organization of Proteins, Protein folding, Protein degradation.

Unit IV: Enzymes: Introduction, Properties, classification, Nomenclature; Industrial and medical applications , active sites, enzyme specificity. Michaels – Menton’s Equation, Competitive and Noncompetitive Inhibition, Allosteric Enzymes

Unit V: Enzyme Immobilization : Physical and chemical techniques for enzyme immobilization – adsorption, matrix entrapment, encapsulation, cross-linking, covalent binding etc.

UNIT V: Lipids: Structure, properties, classification and biological functions- Fatty acid metabolism, Lipoproteins – classification and function, Lipids as surfactants in industry

TEXT BOOKS:

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

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**(4G304) MICROBIOLOGY**

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

L T P/D C
4 1 - 4

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

UNIT II: Major Groups Of Microorganisms: General characteristics of Bacteria, Archaea and Eubacteria, 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**(4G305) CELL BIOLOGY**

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

L T P/D C

L T P/D C
4 1 - 4

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

(4BC04) BASIC MECHANICAL ENGINEERING

(Common to All Branches Except Mechanical Engineering)

L	T	P/D	C
3	2	--	3

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

After completing the subject, students will be able:

- State First law and Second law of thermodynamics and differentiate between S.I. & C.I engines and differentiate between 4-stroke 2&-stroke engines
- Classify different types of Boilers and differentiate impulse turbine and reaction turbine and understand their working principle
- Understand the working principle of vapour compression and vapour absorption Refrigeration systems reciprocating and centrifugal pumps and classify different types of Hydraulic turbines
- Understand the working principles of different types of welding and casting methods
- Understand the cold and hot working processes and sheet metal operations
- Understand the principle of operation of different machine tools like lathe, grinding, milling and shaping machines.

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.

Internal combustion engines: Internal combustion engines, definition, classification, components, working of two-stroke, four stroke cycle engines, SI and CI Engines, Performance parameters, Need for cooling, and lubrication of IC engines.

UNIT-II

- a) **Steam Power plant, Boiler, Steam Turbines:** Layout of steam power plant, Water tube and Fire tube Boilers :- “Cochron”, Babcock and Wilcox Boiler and High Pressure Boilers. (Benson & La-mount only).
- b) **Steam turbines:- Impulse & Reaction Turbines**
- c) **Gas turbine-power plants :- Closed & Open cycle types**

UNIT- III

- a) **Hydraulic pumps & turbines:-** Centrifugal Pumps, Pelton wheel, Francis turbine and Kaplan Turbine -- Layout of Hydro electric power plant
- b) **Refrigeration & Air conditioning systems:-** Description of Vapour Compression and Vapour Absorption systems

UNIT-IV**Manufacturing Processes:**

Foundry Practice:- Patterns, Moulding and Moulding materials, casting methods-Sand Casting, Shell mould Casting, Investment Casting, Die Casting ,Centrifugal casting – Principle and Application of these processes

Welding:- Types of Welding- Electric Arc welding - Coated electrode, TIG welding & MIG welding, Gas welding and cutting, Resistance welding- Spot welding, Soldering and Brazing .

UNIT-V

Mechanical working :- Hot and Cold working, Rolling- Rolling products, Types of Rolling mills, Forging-operations, forging methods, Extrusion-methods, Metal Spinning and Wire Drawing

Press working operations:-Cutting, Bending, Drawing and Squeezing

UNIT-VI

Machine tools: Construction of lathe, shaper, drilling, milling, grinding and CNC machine tools-Advantages, Machine controls, vertical & horizontal spindles.

TEXT BOOKS :

Mathur, M.L., Mehta, F.S. and Tiwari, R.P., Elements of Mechanical Engineering, Jain Brothers, New Delhi, 2005.

R.K. Rajput, "Elements of Mechanical Engineering", Laxmi Publications, 1994.

REFERENCES :

P.N.Gupta, M.P. Poonia, "Elements of Mechanical Engineering", Standard Publishers Distributors Nai Sarak, Delhi.

R.C.Gupta, "Mechanical Engineering", Khanna Publishers, Delhi.

II YEAR I Semester

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

(4HC73) Functional Communicative Written English (FCWE)

L – T – P/D - C

- - 3 - 2

*Maximum Marks: 75**Internal – 25 / External - 50***UNIT 1: Speed Reading Strategies**

- a. **Vocabulary skills:** Word recognition, guessing the meaning from the context, analysis of word structure (prefix – suffix)
- b. **Prediction Techniques:** Index, headings, sub-headings, nonverbal context and linguistic clues
- c. **Scanning skills:** Speed Reading, Regional practice
- d. **Skimming Skills** for identifying the central idea and recognizing the main ideas
- e. **Identifying** the writing pattern of the passage/text
- f. **Intensive reading:** Identifying difference between facts/opinions and drawing inferences and conclusions

UNIT 2: Group Discussions

- a. **Definitions:** Difference between a Group Discussion and Debate
- b. **Purpose of Group Discussion:** Problem Solving, Decision Making and Personality Assessment
- c. **Features / Characteristics** of successful Group Discussion: Agreement on Group Goals, Goal Oriented, Interactive Agreement for procedures, cooperative and friendly atmosphere
- d. **Evaluation method** in Group Discussion for selection: Subject knowledge, oral communication skills, leadership skills and team management
- e. **Group Discussion strategies:** Appropriate strategy for effective participation in Group Discussion, contributing systematically, creating a friendly and cooperative atmosphere, moving the discussion along, promoting optimal participation, handling conflict and effective closure
- f. **Techniques for Individual contribution:** Topic analysis, Discussing opinions, problems, case studies

UNIT 3: Nature of Technical Communication

- a. Definition of Communication
- b. Stages of Communication; Channels of Communication; Nature of Technical Communication
- c. Aspects of Technical Competence – *Subject, Linguistic, Organizational Competence*
- d. Features of Technical Competence – Audience, Objective Language, Format Style and Visual Aids
- e. Difference between General Communication and Technical Communication
- f. Need and Importance of Technical Communication; Types of Technical Communications
- g. Technical Communication Skills:
 - i. **Listening** - General, Academic and Professional
 - ii. **Speaking** - Asking and Answering Questions, Experiencing Opinion and Comments, Academic and Professional oral Interaction, Academic and Professional Discussions
 - iii. **Reading** – General, Academic, Professional
 - iv. **Writing** - General, Academic, Professional
- h. Barriers to Effective Communication: Improper encoding, Bypassing, Frame of Reference, Physical Distractions, Psychological and Emotional Interference and Intercultural differences

UNIT 4: Presentation Skills

- a. Nature and importance of Oral Presentation
- b. Planning the presentation
- c. Define the purpose
- d. Analysis the Audience and Occasion
- e. Choose a suitable Title/Topic.
- f. Preparing the Presentation: Develop the central idea, main ideas, supporting material, plan and prepare visual aids
- g. Presentation: Introduction, Body and Conclusion
- h. Rehearsing and Presentation: Vocal aspects, body language, Time management, Handling questions, meeting unexpected situations
- i. Handling Stage Fright
- j. DOs and DON'Ts of Presentations

UNIT 5: Writing Strategies

- a. Pre-writing; Writing; Re-writing
- b. Letter Writing - Formal and Informal Letter Writing; Inquiry Letters, Replies to Letters of urging action, Complaint, Bank and Insurance, Business and Industrial Sales, Correspondence, Social Correspondence
- c. E – Correspondence: Purpose, Structure, Layout and Form, Tone, Types,
- d. E-mails: Principles and Fundamentals
- e. E-mail Messages: Advantages of E-mail
- f. Characteristics of successful E-messages
- g. Formatting E-mail messages
- h. Standard E-mail practices
- i. E-mail writing strategies
- j. DOs and DON'Ts in E-Correspondence
- k. Nature and Significance of Report Writing
- l. Types of Reports: Informational and Analytical Reports, Routine and Special Reports, Oral and Written Reports, Formal and Informal Reports
- m. Formats of Reports: Printed, Letter, Memo, Manuscript
- n. Structure of Formal Reports
- o. Writing Strategies: Preparation steps to write a Report

Suggested Books:

1. *Technical communication- Meenakshi Raman and Sangeetha Sharma (Oxford Publications)*
2. *Effective Technical Communication – Ashraf Rizwi*
3. *Developing Communication Skills – Krishna Mohan and Meera Benarjee*
4. *SOFT SKILLS – Dr. K. Alex, S.Chand publications*
5. *Advanced Technical communication - Kavita Tyagi and Padma Mistri*

II Year I Semester**(4G371) BIOCHEMISTRY LABORATORY**

L	T	P/D	C
-	-	3	2

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

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

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

II Year I Semester**(4G372) MICROBIOLOGY AND CELL BIOLOGY LABORATORY**

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.
1. Practical Manual in microbiology, Plant tissue culture and pathology – K.R. Aneja , New age Publication, 2001

II Year II Semester**(4GC06) ENVIRONMENTAL STUDIES
(Common to all branches)**

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

L
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)

UNIT II: NATURAL RESOURCES

Definition, classification, Forest resources-use and over-exploitation, deforestation, Forest Conservation Act, 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

UNIT III: ENVIRONMENTAL COMPONENTS

Atmosphere- Definition, layers, state (weather and climate) acid rain, green house effect, ozone layer depletion, Seasons in India, 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, Lithosphere- Chemical composition of the earth (core, mantle, crust)

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

UNIT V: ENVIRONMENTAL POLLUTION AND CONTROL

Air pollution: Definition, causes, effects and Control measures, Case study: Bhopal Gas Tragedy, London smog, Chernobyl disaster, Water Pollution- Definition, types, Water quality parameters, Drinking water treatment and standard, 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, Environmental Laws- Environment Protection Act, Air (Prevention and Control of Pollution) Act, 1981,, Water (prevention and control of Pollution) Act, 1984, National Biodiversity Act, 2002

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 B.Tech. II Semester**(4HC16) PROBABILITY AND STATISTICS**
(Common to All Branches)

L	T	P/D	C
3	2	3	

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

UNIT-I : Probability:

Introduction, Sample Space and Events – Counting, Probability, The Axioms of probability, Addition theorem, Conditional, Multiplication theorem, Theorem of Total Probability, Baye’s Theorem.

UNIT-II**Probability Distributions:**

Random variable – Discrete and Continuous, Distribution functions of probability- mass and density, Expectation, Probability distributions - Binomial, Poisson and Gaussian (Normal) distribution–Related properties.

UNIT-III**Sampling Distributions:**

Populations and samples, Sampling distribution of the Mean (known) and The sampling distribution of the mean (unknown), proportions, sums and differences. Central limit theorem and its applications. Estimation- Point Estimation, Interval Estimation, Bayesian Estimation.

UNIT -IV**Inferences Concerning Means and Proportions:**

Tests of Hypothesis, Type-I and Type-II Errors, Hypothesis testing concerning to One mean and two means of large and small size samples. Test of Hypothesis Concerning to Proportions.

UNIT-V

Test of significance: Student t-test, F-test, χ^2 test- Goodness of fit, Independence of Attributes.

UNIT-VI**Quality Control:**

Control Charts for Measurements, Control Charts for Attributes, Tolerance Limits, Acceptance Sampling.

Text Books:

1. Probability and Statistics for Engineers: Miller and John E. Freund, PHI Publishers, 9th Edition.
2. Probability and Statistics, V.Srinivas and R.Umamaheshwar Rao, Paramount Publishing House.

REFERENCE BOOKS:

1. Fundamentals of Mathematical Statistics: Gupta and Kapoor – S. Chand and Co.
2. Engineering Mathematics, B. V. Ramana, Tata McGraw Hill Publishing Company Ltd.

II Year II Semester**(4G406) THERMODYNAMICS FOR BIOTECHNOLOGISTS**

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: 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**(4G407) GENETICS**

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

L T P/D C
4 1 - 4

UNIT – I: MENDELIAN and NON MENDELIAN GENETICS -I

Mendel's Laws of inheritance, Incomplete dominance and co-dominance, multiple alleles,

UNIT – II: MENDELIAN and NON MENDELIAN GENETICS -II

Epistasis, lethal genes, Genes and environment, sex determination, Sex-linked inheritance, extra chromosomal inheritance

UNIT – III: MOLECULAR GENETICS

Evidences for Nucleic acids as genetic material - Hershey Chase, Avery and McLeod, General Features,

UNIT – IV: CHROMOSOME STRUCTURE AND PLOIDY

Ultrastructure of eukaryotic chromosome, Types of Chromosomes, Variation in chromosome number, Definition & Classification of mutations

UNIT – V: LINKAGE AND CROSSING OVER

Linkage & crossing over, Recombination, chromosomal mapping, Karyotyping,

UNIT- VI : POPULATION GENETICS

Allele frequencies and genotype frequencies, Random mating and Hardy-Weinberg principle, Quantitative inheritance

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**(4G408) INSTRUMENTAL METHODS OF ANALYSIS**

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

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, Spectro fluorimetry, 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 : Methods in Biochemical Analysis:

Carbohydrates, Lipids, Protein and Nucleotide biochemical analysis; Use of Radioactive and stable isotopes and their detection in biological systems

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 Analysis, CBS Publishers & Distributors, 1992
4. F. Settle. Hand book of Instrumental techniques for Analytical Chemistry, Prentice Hall, 1997.

II Year II Semester**(4G409) BIOPROCESS 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 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.

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

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

(4H410) Effective English Communication and Soft Skills (EECSS)

L – T – P/D - C
 - - 3 - 2

UNIT 1: The Art Of Communication

Introduction: Analytical Communication for leaders

1. Non-verbal Communication
 - a. Body Language
 - b. Listening
 - c. Writing
2. Oral Communication (Speaking)

8 detrimental facts to Communication:

1. At peace with self
2. Awareness
3. Transparency (Being yourself)
4. Helping Hand
5. Realistic Response (Unemotional)
6. Resolving Misunderstandings
7. Overcoming Fear
8. Blamelessness

UNIT 2: Soft Skills

1. What are Soft Skills?
2. Importance of Soft Skills
3. Attributes regarded as Soft Skills
4. Social Skills
5. Exhibiting; Identifying and Improving your Soft Skills
6. Top 60 soft skills
7. Practicing soft skills

Attitude: "ATTITUDE IS EVERYTHING!"

1. Meaning; Features of attitudes
2. Attitude and Behavior
3. Formation of attitudes
4. Change of Attitudes: How to change Attitude for the betterment?
5. Attitude in a workplace
6. The power of positive attitude - Developing positive attitude
7. Positive attitude and its benefits; Negative attitude and its results
8. Examples of negative attitudes
9. Overcoming negative attitude

Exercise 1: Measure your soft skills

Exercise 2: Measure your attitude

UNIT 3: Time Management; Goal Setting; Team Dynamics

Time management

Introduction:

1. The 80:20 rule
2. Take a good look at the people around you
3. Examine your work
4. Sense of time management
5. Features of time; Three secrets of time management
6. Time management matrix: Analysis of time matrix; Effective scheduling; Grouping of activities
7. Five steps to successful time management
8. Difficulties in time management: Evils of not planning; Overcoming procrastination
9. Time management tips for students
10. Interesting facts about time
11. Ideal way of spending a day
12. Time wasters – Time savers

Goal Setting

Introduction:

1. The purpose of goal setting
2. Types of Goals
3. How to set goals
4. Qualities of effective goals: Steps toward setting effective goals
5. How to achieve goals-Reasons for not meeting the goals.

Team Dynamics

Introduction:

1. Meaning
2. Aspects of team building: Skills needed for teamwork
3. A model of team building: Team Vs Group
4. Characteristics of an effective team: Role of a team leader and team members
5. Inter-Group collaboration: Advantages of inter-group collaboration; Difficulties faced in inter-group collaboration; Factors shaping inter-group collaboration.

Exercise 1: Test your time management skills

Exercise 2: Test your goal setting

Exercise 3: Test your teamwork skills

UNIT 4: Etiquettes and Manners

Etiquette: Introduction:

1. Modern etiquette
2. Benefits of etiquette
3. Classification of etiquette
4. Accompanying women
5. Taboo topics
6. Proposing the toast.

Manners: Introduction:

1. Why should you practice good manners?
2. Poor manners noticed in youth
3. Practicing good manners
4. Manners at the wheel : Driving and Manners in the flight
5. Respecting the sacred : Visiting holy places, Dealing with the challenged, Attending funeral
6. Professional manners: Social skills (manners), Getting along with people, Manners to get respect from others
7. Annoying office habits.

Exercise 1: Test your etiquette

Exercise 2: Test your manners

UNIT 5: Résumé writing and Interview skills

Résumé: Introduction:

1. Types of Résumé
2. Difference among Bio-data, Curriculum Vitaé and Résumé
3. The terms: The purpose of Curriculum Vitaé writing
4. Types of Résumés
5. Tips to write Résumé: Curriculum Vitaé / Résumé preparation
6. The DOs and the DON'Ts of Résumé preparation
7. Resume check up
8. Design of a Curriculum Vitaé: Entry level Résumé, Content of the Résumé
9. References, Power words
10. Key skills that can be mentioned in the Résumé
11. Cover letter: Cover letter tips

Interview skills: Introduction:

1. Why an Interview?
2. Types of interviews (*Face to Face / Panel Interviews*, etc.)
3. Types of questions asked
4. Reasons for selecting a candidate / Reasons for rejecting a candidate
5. On the day of interview
6. Attending job fair
7. Common mistakes
8. What not to ask during an Interview
9. Dress code at an interview
10. FAQs
11. Quick / Basic Interview and job search related tips

Exercise 1: Write a resume

Exercise 2: Conduct Mock Interviews

Books recommended:

1. *Soft Skills - Dr.K.Alex, published by S.Chand*
2. *Technical communication- Meenakshi Raman and Sangeetha Sharma (Oxford Publications)*
3. *Effective Technical Communication – Ashraf Rizwi*

* * * * *

II Year II Semester

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

(4G473) COMPREHENSIVE VIVA

L T P/D C
- - - 1

II Year II Semester

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

(4G473) BIOPROCESS ENGINEERING LABORATORY

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

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

(4G474) INSTRUMENTAL METHODS OF ANALYSIS LABORATORY

L	T	P/D	C
-	-	3	2

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

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

II Year II Semester

(4G476) TECHNICAL PAPER WRITING & SEMINAR -IV

III year I Semester

(4ZC01) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (OPEN ELECTIVE – I)

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

L T P/D C
3 1 - 3

OBJECTIVE

To gain knowledge in market economics and its application in the fields of biotechnology

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 & Chrystal, Economics, Oxford University Press.

COURSE OUTCOME (CO)	
CO:1	To understand the global, environmental, political, economic, legal and regulatory context of business.
CO:II	To create value through identifying customer needs and implementing integrated production and distribution of goods, services, and information
CO:III	To demonstrate leadership and team work capabilities
CO:IV	Analyzing financial statements, portfolio management, investment decisions
CO:V	To demonstrate capabilities in new venture creation & entrepreneurship
CO:VI	Achieve higher levels of proficiency and self actualization through pursuing lifelong learning

III Year I Semester

(4G512) 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

OBJECTIVE

To provide ability to identify, formulate and solve problems in key areas of biochemical reaction engineering and to design and conduct experiment, analyze and interpret data in material and energy balances.

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 KM, 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

COURSE OUTCOME (CO)	
CO:I	Ability to demonstrate fundamentals of reaction mechanism, types of reactions, integral analysis of batch reactor data.
CO:II	Ability to understand the essential features that control microorganism growth and design fermenters for batch and continuous cultivation to apply a reaction engineering analysis to the controlled growth of microorganisms in biological reactors.
CO:III	Ability to demonstrate Kinetics of homogeneous reaction in batch reactors, design of ideal reactor, and principles of non-isothermal reactions.
CO:IV	Ability to demonstrate global or homogenous kinetic expressions to formulate material and energy balances for batch CSTR and plug flow reactors that exhibit ideal behavior with reversible and multiple reaction steps.
CO:V	Ability to demonstrate Non ideal flow reactor modules, design equations in biochemical reactors.
CO:VI	Ability to understand the type of reactors for plant and animal cells

III Year I Semester

(4G511) MOLECULAR BIOLOGY

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

L T P/DC
4 1 - 4

Objectives:

To understand Central Dogma of Molecular Biology, i. e. Structure of DNA & its Replication, Synthesis of RNA and Proteins and their modifications

UNIT – I: Structure of DNA and its Replication: Central dogma, Evidences for DNA as genetic material. Watson and Crick model of DNA, different forms of DNA (A, B, Z). Models of DNA replication, Characteristics and functions of bacterial DNA polymerases, Mechanism of prokaryotic DNA replication in Prokaryotes, Eukaryotic DNA polymerases and mechanism of replication, Inhibitors of DNA replication

Unit - II: DNA damage and Repair: Introduction, DNA damage - deamination, alkylation, pyrimidine dimers, types of DNA repair and their mechanisms –Direct repair, Base excision repair, Nucleotide excision repair, mismatch repair, recombinational repair, Photoreactivation, SOS repair; Telomeres and telomerase.

Unit – III: Transcription: Structure and functions of RNA (rRNA, mRNA, tRNA, Sn RNA), Characteristics and function of bacterial RNA polymerases; Mechanism of transcription and its regulation in Prokaryotes. Eukaryotic RNA polymerases, Transcription factors. Post transcriptional modifications of mRNA, Inhibitors of transcription.

Unit – IV: Translation- I: Genetic code and Wobble Hypothesis, Ribosome assembly, mechanism of activation of amino acids. Mechanism of translation in Prokaryotes, codon usage, Inhibitors of protein synthesis.

Unit - V: Translation- II: Protein synthesis in Eukaryotes, Differences between prokaryotic and eukaryotic protein synthesis, Co and Post translational modifications, Inhibitors of protein synthesis.

Unit - VI: Gene Regulation: Prokaryotic system: The operon model, Lactose, Arabinose & Tryptophan operons, Eukaryotic system: Gene rearrangement, Promoters, Repressors, Activators and Enhancer elements, Gene amplification, Histone modifications & their role in gene regulation

TEXT BOOKS

1. Molecular Biology of the Gene, James D Watson et. al., 7th Edition, 2014, Pearson Publications.
2. Molecular Biology, 2007, David Freifelder, Narosa Publications.

REFERENCES:

1. Molecular Cell Biology, 2012, Lodish, H., Berk A., Zipursky, S.L. Matsudaria, P. Baltimore, D. and Darnell, J. W.H. Freeman and Company.
2. Cell and Molecular Biology, 8th Edition, 2010, De Robertis & De Robertis, Lippincott Williams & Wilkins.

S. No.	COURSE OUTCOMES	POs
1	Compare & Identify different types of DNA & Elaborate on its Replication.	a, c, e, l
2	Identify DNA damage and Describe various repair mechanisms	a, b, c, e, f, l
3	Compare & Differentiate different types of RNA, how their Synthesis occurs and Differentiate post transcriptional modifications of different RNA.	a, c, l
4	Describe Genetic Code and Understand how Proteins are Created in Prokaryotes	a, b, l
5	Understand how Proteins are Created, Compare and Analyze Prokaryotic & Eukaryotic Translation and Compile various Post translational modifications in Eukaryotes	a, b, c, l
6	Evaluate how genetic information is regulated in Prokaryotes & Eukaryotes.	a, b, l

III Year I Semester

(4G512) BIOINFORMATICS

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

L T P/DC
4 1 - 4

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, Protein structure , secondary structure prediction and Homology Modeling.

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.

(CO)	COURSE OUTCOME	POs
CO:1	Demonstrate knowledge and understanding of the biological, computational, engineering and mathematical sciences relevant to biotechnology	a
CO:II	Develop the ability to identify the computational problems within the living systems at molecular level	b,c
CO:III	To understand some basic computer science programming and bioinformatics software	c,e
CO:IV	Be familiar with tools for proteomic and genomic analyses.	c,e
CO:V	Gain an understanding of working in interdisciplinary teams of biologists, biochemists, medical researchers, geneticists, and computer engineers.	i,l
CO:VI	Gain an understanding of bioinformatics problems and their solutions and apply in health care	b,e,d

III year I Semester

(4G513) IMMUNOLOGY

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

OBJECTIVE

To gain knowledge in various aspects of human immune system, its types, functioning and its response to foreign materials, and to design and conduct research investigations on transplantation and immunological disorders using modern engineering and IT tools.

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, Bone Marrow, 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** –autoimmune diseases and mechanisms and **Tumor immunology-** immunity to tumors and immune evasion by tumors

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

COURSE OUTCOME (CO)	
CO:I	Ability to understand the differences between Innate and acquired immunity and immune system
CO:II	Ability to understand the structure and functional aspects of the primary and secondary lymphoid organs(bone marrow, thymus, spleen and others lymphoid organs
CO:III	Ability to Differentiate various immunoglobulin classes and subclasses basing on their structure and function and also understand the mechanism of generation of antibody diversity
CO:IV	Ability to understand the complement system and its role in immunity to pathogens. Classify different antigen-antibody reactions with suitable examples and acquire a comprehensive knowledge of hybridoma technology for monoclonal antibody production and their applications.
CO:V	Ability to understand the process of antigen presentation in the context of MHC resulting in T cell activation. and effector functions and also shall be able to classify hypersensitivity reactions and understand their mechanism and their relevance in diseases
CO:VI	Ability to demonstrate transplantation and graft rejection and their underlying mechanisms. Acquire a comprehensive understanding of tumour immunology and also shall be able to define autoimmunity and understand the models of autoimmune diseases

OPEN ELECTIVE –II**III YEAR I SEMESTER (4FC21)****DATABASE MANAGEMENT SYSTEMS**

L	T	P/D	C
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UNIT I: Data Base Systems: Data Vs Information, Data base System Applications, data base System VS file System – View of Data – Data Abstraction –Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor, History of Data base Systems.

Data base design and ER diagrams – Design Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model –Data Modeling checklist. Application- ER diagram for a tiny college

UNIT II: Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views.Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus. Application-Student database design.

UNIT III:Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers, Embedded SQL. Application-working with Aviation company database.

UNIT IV:Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form. Application-Faculty Evaluation Report.

UNIT V :Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability- Lock –Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity, Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems- Remote Backup systems, Application-Production Management System.

UNIT VI :Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure, Query Optimization techniques. Application – Creating B+ tree on Instructor File.

TEXT BOOKS :

1. Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition.
2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
3. Database Management Systems, Peter Rob, A.Ananda Rao,Carlos Coronel ,CENGAGE Learning

REFERENCES :

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.

2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education

OPEN ELECTIVE –II

III year I Semester

L	T	P	C
3	-	-	3

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:

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

References:

1. Natural Hazards and Disaster Management: R.B. Singh, Rawat Publications
2. Remote Sensing and GIS by A.M. Chandra and S.K. Ghosh, Narosa Publishing house

3. GIS – Fundamentals, Applications and Implementations: Dr. K. Elangovan, New India publishing agency

OPEN ELECTIVE –II

III year I Semester (4ZC03) BANKING OPERATIONS, INSURANCE AND RISK ASSESSMENT

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

Code: 4ZC03

L T P C
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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 Evtantly
- 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.

COURSE OUTCOME (CO)	
CO:I	Students understand the global, environmental, political, economic, legal and regulatory context of banking industry.
CO:II	Students understand individual ethical behavior and community responsibilities in organization and society.
CO:III	Students develop capacity to apply knowledge in new and unfamiliar circumstances through a conceptual understanding of relevant disciplines
CO:IV	Able to manage diversity, contemporary societal and global issuesStudents demonstrate leadership and team work capabilities and able to enhance in verbal, written and presentation communication skills
CO:V	Students analyze derivatives & risk management, investment decisions And demonstrate capabilities in Insurance business environment
CO:VI	Students achieve higher levels of proficiency and self actualization through pursuing lifelong learning

OPEN ELECTIVE –II

III year I Semester

(4ZCO4) ENTREPRENEURSHIP

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.

COURSE OUTCOME (CO)	
CO:1	Students understand essential features of Entrepreneurship
CO:II	Students understand the forms of entrepreneurship and role of government in the promotion of an entrepreneur
CO:III	Students understand SWOT Analysis, Entrepreneurs and legal regulatory systems.
CO:IV	Students understand project planning and feasibility studies
CO:V	Students understand financial aspects of the entrepreneurship
CO:VI	Students understand the significance of women entrepreneurship and issues of employment generation

OPEN ELECTIVE –II

III year I Semester (4EC26) SAP-I ABAP WORKBENCH FUNDAMENTALS

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Course Objective		
<ol style="list-style-type: none"> 1. Understand the SAP NetWeaver AS fundamentals 2. Work with the ABAP Workbench tools 3. Write simple ABAP programs 4. Understand the ABAP Dictionary 		
Course Outcomes		
<ol style="list-style-type: none"> 1. To acquire through knowledge of SAP Net weaver architecture, ABAP fundamentals (like language elements, modularization, ABAP dictionary) 2. To write simple ABAP programs and reports 3. To be able to debug and analyze errors and performance of programs 		
Unit	Content	Hours
1	Introduction to enterprise resource planning(ERP) <ol style="list-style-type: none"> 1. ERP explained 2. System wide concepts 3. SAP applications and components 4. Sample end to end business process 	4
2	SAP Netweaver application server fundamentals <ol style="list-style-type: none"> 1. SAP systems and SAP applications portfolio 2. SAP Graphical User Interface and Navigation in AS ABAP systems 3. System core 4. Communication and integration technologies 	8
3	ABAP Work bench foundations - Part 1 <ol style="list-style-type: none"> 1. ABAP Program processing 2. ABAP Work bench tools 3. ABAP Language basics, open SQL 4. Modularization techniques 	10
4	ABAP Work bench foundations - Part 2 <ol style="list-style-type: none"> 1. Complex data objects, structures and internal tables 2. Data modeling and Data retrieval 3. Classic ABAP reports 4. Program analysis tools 5. Program calls and memory management 	10
5	ABAP Dictionary <ol style="list-style-type: none"> 1. Domains, Data elements and structures 2. Transparent tables, Pool tables and cluster tables 3. Input Checks 4. Dictionary object dependencies 5. Changes in table structure 6. Views 7. Search Helps 	10
6	Classical UI Programming <ol style="list-style-type: none"> 1. Selection Screens 2. Screens (Dynpros) 	10

OPEN ELECTIVE –II

III year I Semester

(4ZC12) PROJECT MANAGEMENT AND FINANCE

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

T P C
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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.

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

L T P/D C
- - 3 1

OBJECTIVE

To demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions

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

COURSE OUTCOME (CO)	
CO:I	Students learn and solve problems related to number systems
CO:II	Students find averages of numbers and groups
CO:III	Students solve problems related to ratio and proportion
CO:IV	Students find simple interest, solve time work and distance problems
CO:V	Students solve mensuration problems
CO:VI	Students interpret the various kinds of data and find the relation between them.

III year I Semester

(4G575) GROUP PROJECT

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

L T P/D C
- - 3 1

OBJECTIVE

To enhance key knowledge and hands on practical training with the research project as a team

Group Project (75 Marks)

A group project shall be carried out by a group of students consisting of 2 to 3 in number in third year first semester. This work shall be carried out under the guidance of the teacher and shall involve design, fabrication, software development or any other significant activity. This can be of interdisciplinary nature also. There will be 75 marks in total with 25 marks of internal evaluation.

The **internal evaluation** shall consist of:

Day to day work	10 marks
Report	05 marks
Demonstration / presentation	10 marks
End examination	50 Marks

The end examination will be carried out by a committee consisting of an external examiner, head of the department, a senior faculty member and the supervisor.

COURSE OUTCOME (CO)	
CO:I	Students use the concepts learned in the courses, so far, in conceptualizing, designing and executing the projects.
CO:II	Enables to apply modern IT tools and technologies
CO:III	Inculcates an enthusiasm to use the creative ideas to execute projects to meet the current needs of the society.
CO:IV	Enhances communicative skills and team work
CO:V	The students learn the ability to work as an individual with multidisciplinary approach
CO:VI	Students use the concepts learned in the courses, so far, in conceptualizing, designing and executing the projects.

B.Tech III/I**(4G576) IMMUNOLOGY LABORATORY**

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

1. Quantification of immunoglobulin in human serum by radial immunodiffusion
2. Ouchterlony double diffusion.
3. Counter current electrophoresis
4. Haemagglutination: Blood grouping / typing
5. RBC counting.
6. WBC counting / total leukocyte count of blood.
7. Differential leukocyte count.
8. Isolation and viability determination of lymphocyte from peripheral blood.
9. Separation of Serum Proteins by Electrophoresis
10. Enzyme-linked Immunosorbent Assay (ELISA)
11. Immuno-fluorescence
12. Assessment of polyclonal antibodies in a sera sample.
13. Immunoglobulin precipitation / purification

III Year I Semester (4G577) BIOINFORMATICS LABORATORY

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

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- - 3 2

OBJECTIVE

To gain hands on training and practical experiences on bioinformatics its application in different biotechnology

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

COURSE OUTCOME (CO)	
CO:I	Ability to explore various bioinformatics resources and learn how to perform routine data analysis by using computational software.
CO:II	Ability to perform sequence alignment using various online tools and assess the homology between various species.
CO:III	Ability to use Phylogenetic analysis softwares and interpret the Phylogenetic relationship at the molecular level.
CO:IV	Ability to analyze the genome sequence information for gene prediction and restriction digestion.
CO:V	Ability to understand the spatial arrangement of various amino acids in protein three dimensional conformation using visualization softwares.
CO:VI	Ability to use drug designing softwares and apply them in drug discovery process

III Year I Semester (4G578) TECHNICAL PAPER WRITING & SEMINAR - V

L	T	P/D	C
-	-	2	1

Pre-Requisites: All Courses till this semester

Course Outcomes:

- o 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.
- o Student learnt to arrange the contents of the presentation and scope of the topic, in an effective manner.
- o Each student then presents the technical topic they chose in front of the panel and the fellow students, using the oratory skills.
- o 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

Amendment

Decision on the awarding of the marks for the **Technical Paper Writing and Seminar**

The CAC resolved to award the marks for technical paper writing and seminar as stated below. The allocation of marks for various items will be same for all B. Tech I year to IV year (The candidates admitted in 2013-14 to 2016-17). The technical paper writing and seminar will be evaluated for 100 marks and students must secure 40% i.e, 40 marks to be successful.

The faculty members In-charge of seminars must give model presentation and prepare model technical report to create good knowledge among the students before presentation and submission of the technical report.

Sl.No	Topic	Marks
1	Selection of topic and literature survey	10 marks
2	Relevance, level of content and report with usual sub topics (This sub topics -Summary, introduction , historical background , basic theory, detailed description, applications, conclusions and future scope)	15 marks
3	Presentation	20 marks
4	Discussion	5 marks
5	Mid semester Viva (after first mid test)	20 marks
6	Final Viva	20 marks
7	Attendance	5 marks
8	Class notes	5 marks
Total Marks		100 marks

III year II Semester (4G614)

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

OBJECTIVE

To understand the basic concepts of fluid-flow and heat transfer phenomena and to design and conduct experiment, analyze and interpret data in transportation of fluids and modes of heat transfer.

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 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: APPLICATIONS OF HEAT TRANSFER Analogy between heat, mass and momentum transfer. Applications of heat transfer in Bioprocessing - batch sterilization and continuous sterilization, 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 II Semester

(4GC06) ENVIRONMENTAL STUDIES
(Common to all branches)

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

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L T P/D C
3 1 - 3

OBJECTIVE

To gain comprehensive knowledge in environmental science, environmental issues and the management and to use professional engineering solutions in environmental context to respond effectively to the needs of sustainable development.

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)

UNIT II: NATURAL RESOURCES Definition, classification, Forest resources-use and over-exploitation, deforestation, Forest Conservation Act, 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

UNIT III: ENVIRONMENTAL COMPONENTS Atmosphere- Definition, layers, state (weather and climate) acid rain, green house effect, ozone layer depletion, Seasons in India, 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, Lithosphere- Chemical composition of the earth (core, mantle, crust)

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

UNIT V: ENVIRONMENTAL POLLUTION AND CONTROL Air pollution: Definition, causes, effects and Control measures, Case study: Bhopal Gas Tragedy, London smog, Chernobyl disaster, Water Pollution- Definition, types, Water quality parameters, Drinking water treatment and standard, 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, Environmental Laws- Environment Protection Act, Air (Prevention and Control of Pollution) Act, 1981,, Water (prevention and control of Pollution) Act, 1984, National Biodiversity Act, 2002

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.

COURSE OUTCOME (CO)	
CO:I	Ability to demonstrate the knowledge of Components of Ecology And Ecosystems and Environmental organizations, Environmental activists
CO:II	Ability to demonstrate the knowledge of Metal Ions In Biological System like Nitrogen Fixation, Oxygen transport
CO:III	Ability to demonstrate the knowledge of Environmental Chemistry in atmosphere, Hydrosphere, Litho sphere.
CO:IV	Ability to demonstrate the knowledge of Bio Diversity And Its Conservation
CO:V	Ability to demonstrate the knowledge and regulatory issues and case studies in Air and water
CO:VI	Ability to demonstrate the knowledge in Waste water treatment, soil, noise, marine and waste management.

III year II Semester

(4G615) PLANT BIOTECHNOLOGY

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

L

L	T	P/D	C
3	1	-	3

Objective:

To learn the concepts, techniques and applications of Plant Cell, Tissue & Organ Culture and to apply them for crop improvement and new product development.

UNIT I: INTRODUCTION TO CELL AND TISSUE CULTURE: Concept of Totipotency, Tissue culture media (composition, preparation); Initiation and maintenance of aseptic culture, callus and cell suspension culture, Somatic embryogenesis, Organogenesis; Clonal propagation

UNIT II: TISSUE CULTURE APPLICATIONS: Protoplast isolation, culture fusion and somatic hybridization; Haploid Production, its application and limitations; Somaclonal variations; Short term and long term Germplasm conservation (Cryopreservation)

UNIT III: PRODUCTION OF PHYTOCHEMICALS: Study of various culture types for production of secondary metabolites in vitro, Strategies for enhancing product yield; Bioreactor systems for mass cultivation of plant cells, Production of Phyto-pharmaceuticals at commercial level (Shikonin, Berberine, Vinca alkaloids)

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, Salinity) and Biotic Stress (Herbicide resistance, Insect resistance, Bacterial & Fungal 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.

S. No.	COURSE OUTCOMES	POs
1	Understand & Explain Totipotency, Aseptic Culture systems & Micropropagation	b, c, l
2	Apply <i>in vitro</i> concepts for protoplasts to generate hybrids, produce Haploids, & Somaclones and compare Germplasm conservation methods	b, c, d, l
3	Synthesize commercial Phytochemicals <i>in vitro</i> and Enhance their productivity	b, c, d, l
4	Compare and Evaluate Plant Genetic Transformation systems	b, c, d, l
5	Create Transgenic plants with increased productivity and performance	b, c, d, l
6	Create Transgenic plants with novel products by Molecular farming	b, c, d, l

III Year II Semester

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

(4G616) GENETIC ENGINEERING

L T P/D C
3 1 - 3

Unit I: 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 II: 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 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, YEpl, YAC.

Unit IV: SCREENING AND DETECTION OF CLONES: Screening of Recombinants, Restriction analysis Blot analysis - Southern, Northern & Western blot; dot and slot blot, DNA methylation, Purification of Genomic DNA, Genomic and cDNA library construction and screening.

Unit V: 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.

Unit VI: Expression Strategies for Heterologous Genes: expression in bacteria, expression in Yeast, expression in insects and insect cells, expression in mammalian cells, expression in plants.

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.

COURSE OUTCOME (CO)		POs
CO:I	Classify quantify and isolate different types of plasmids and transposons	b,c,d,l
CO:II	Classify and illustrate the different types of DNA manipulating techniques	b,c,d,l
CO:III	Classy and illustrate methods of transfer of gene delivery vehicles	b,c,d,l
CO:IV	To analyze screening and detection of clones	b,c,d,l
CO:V	To Analyze and Identify DNA using PCR and Molecular markers	b,c,d,f,l
CO:VI	Discuss various methods of expression of heterogeneous DNA in various hosts, their advantages and disadvantages	b,c,d,f,l

III year II Semester

(4G617) MASS TRANSFER AND SEPARATIONS

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: 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. boundary layer on flat plates 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, two-component systems, ideal liquid solution, non-ideal liquid solutions, choice of solvent for absorption, continuous contact equipments, absorption of one component in packed tower, 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, rate of batch drying, rate of drying curve, direct driers, indirect driers, various drying operations, Spray drier, Fluidized Bed drier, Pneumatic drier

UNIT VI: ADSORPTION: Physical adsorption, Chemisorptions, adsorption isotherms, adsorption hysteresis, 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.

Course Outcomes		PO
CO-I	To build basic knowledge in diffusion. Diffusion in different phases. Applications of diffusion in gels and biological solutions.	a
CO-II	Analyzes convective mass transfer, Interface mass transfer and resistances in it.	a, b
CO-III	Understands the basic mechanism of absorption. Application of absorption in Industries and able to design the absorption units.	c
CO-IV	Simplifies the mechanism of distillation, its importance in process industry and able to design distillation column.	c, d
CO-V	Determines the importance of liquid-liquid extraction and its application in chemical and biotechnology industry. Understands drying techniques and its applications.	b
CO-VI	List the type of adsorption isotherms, applications of immobilized enzymes in industry	e

III year II Semester

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

PROFESSIONAL ELECTIVE-I (4G618) MOLECULAR TOXICOLOGY

Unit I: Introduction to Toxicology Definition, History and Scope, Classes of Toxicants, acute toxicity, chronic Toxicity, LC₅₀, LD₅₀, EC₅₀, ED₅₀, IC₅₀, NOAEL, MOAEL, Dose-response relationships, Bioaccumulation, Bioconcentration and biomagnifications

Unit II: Absorption and Distribution of Toxicants: Fate and mechanism of transport in vivo, Routes of absorption, Toxicant distribution-physico-chemical properties and protein-binding, volume of distribution

Unit III: Metabolism and Excretion of Toxicants: Phase-I and Phase-II reactions, Renal elimination, hepatic elimination and respiratory elimination, Concept, free radicals, lipid peroxidation, role of oxidative stress in disease, biomarkers of oxidative stress-SOD, Catalase, LPO, Glutathione-S-Reductase, Glutathione peroxidase

Unit V: Toxicity Testing Methods: In vivo- algae, fish, mouse, In vitro-Cell lines, indicators of toxicity in cultured cells, Ames Mutagenity testing, micronuclei test, Genotoxicity-Comet Assay,

Unit VI: Nanotoxicology: Characteristics of Potentially toxic nanomaterials. Biological fate and distribution of engineered nanoparticles. In vitro toxicity studies of engineered nanomaterials-fullerene, copper oxide, titanium dioxide, evaluation of the toxicity of nanoparticles using zebra fish embryos and adult fish

TEXT BOOKS

- 1) A Text Book of Modern Toxicology- Edited by Ernest Hodgson, Wiley-Interscience

III year II Semester

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

PROFESSIONAL ELECTIVE-I BIOPROCESS ECONOMICS AND PLANT DESIGN

L T P/D C
3 1 - 3

UNIT I: PROCESS DESIGN DEVELOPMENT: Technical feasibility survey, process development, flow diagrams, equipment design and specifications.

UNIT II: GENERAL DESIGN CONSIDERATION: Marketability of the product, availability of technology, raw materials, equipments, human resources, land and utilities, site characteristics, waste disposal, govt. regulations and other legal restrictions, community factors and other factors affecting investment and production costs.

UNIT III: COST ESTIMATION: Capital investments- fixed capital investments including land, building, equipments and utilities, installation costs (including equipments, instrumentation, piping, electrical installation and other utilities), working capital investments. Manufacturing costs- Direct Production costs (including raw materials, human resources, maintenance and repair, operating supplies, power and other utilities, royalties. etc.), fixed charges (including depreciation, taxes, insurance, rental costs etc.),

UNIT IV: PLANT OVERHEADS & PROFITABILITY ANALYSIS: Administration, safety and other auxiliary services, payroll overheads, warehouse and storage facilities etc. Profitability Analysis- return on original investment, interest rate of return, accounting for uncertainty and variations and future developments.

UNIT V: OPTIMIZATION: Optimization techniques - Linear and Dynamic programming, Optimization strategies.

UNIT VI: NON STATISTICAL OPTIMIZATION : Self directing Optimization, case studies with simple response and multiple response analysis.

TEXT BOOKS:

1. Peters and Timmerhkus, Plant design and Economics for Chemical Engineers, McGraw Hill 4th Edition, 1989.
2. Rudd and Watson, Strategy of Process Engineering, Wiley. 1987
3. Volesky and J. Votrubla, Modelling and optimization of fermentation process. Elsevier, Amsterdam 1992.

REFERENCE:

1. Gearing Up For Patents, The Indian Scenario, Universities Press By Ganguli.

III Year II Semester

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

Professional Elective-I: (4G620) BIOPHARMACEUTICAL TECHNOLOGY

L	T	P/D	C
3	1	-	3

UNIT I: INTRODUCTION TO PHARMACEUTICALS- History & Definition of Drugs. Sources of Drugs- Plant, Animals Microbes and Minerals different dosage forms. Routes of drug administration.

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

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

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

UNIT V: APPLICATIONS OF BIOPHARMACEUTICALS- Controlled and sustained delivery of drugs. Biomaterial for the sustained drug delivery. Liposome mediated drug delivery. Drug delivery methods for therapeutic proteins.

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

TEXTBOOK:

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

REFERENCE

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

III Year II Semester**Professional Elective-I: (4FC22)****BIGDATA ANALYTICS**

L	T	P/D	C
3	1	-	3

UNIT I INTRODUCTION TO BIG DATA: Introduction to BigData Platform – Traits of Big data - Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - ReSampling - Statistical Inference - Prediction Error.

UNIT II DATA ANALYSIS : Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics - Rule Induction - Neural Networks: Learning And Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods.

UNIT III MINING DATA STREAMS : Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

UNIT IV FREQUENT ITEMSETS AND CLUSTERING : Mining Frequent Itemsets - Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets in a Stream – Clustering Techniques – Hierarchical – K-Means – Clustering High Dimensional Data – CLIQUE And PROCLUS – Frequent Pattern based Clustering Methods – Clustering in NonEuclidean Space – Clustering for Streams and Parallelism.

UNIT V FRAMEWORKS AND VISUALIZATION : MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques;

UNIT VI: Systems and Analytics Applications - Analytics using Statistical packages-Approaches to modeling in Analytics – correlation, regression, decision trees, classification, association Intelligence from unstructured information-Text analytics-Understanding of emerging trends and technologies- Industry challenges and application of Analytics

TEXT BOOKS:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
4. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
5. Pete Warden, "Big Data Glossary", O'Reilly, 2011.
6. Jiawei Han, MichelineKamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

III Year II Semester**SAP – II
SAP ABAP WORKBENCH CONCEPTS****Teaching Scheme**

Lecture-4 Hours/Week
Practical-2 Hours/Week

Examination Scheme

in Semester Assessment: 30Marks
End Semester Assessment: 70Marks

Course Objectives

1. Write object oriented programs with ABAP
2. Understand the techniques in enhancements and modifications
3. Create simple Web Dynpro for ABAP applications

Course Outcomes

1. To carry out enhancements and modifications to SAP standard, in future proof manner
2. To develop simple Web Dynpro for ABAP applications
3. To be able to understand Functional Specifications and write Technical Specifications

Unit Content

- | | |
|----------|---|
| 1 | ABAP Objects-Part 1 |
| | <ol style="list-style-type: none"> 1. Object-Oriented Programming (OOPS Programming) 2. Fundamentals Object-Oriented syntax 3. Inheritance and casting 4. Interfaces and casting 5. Events |
| 2 | ABAP Objects-Part2 |
| | <ol style="list-style-type: none"> 1. Global Classes and Interfaces 2. Exception handling 3. ABAP Object-Oriented examples-ALV and BAdIs 4. Abstract classes, factory methods, singletons |
| 3 | Shared Objects and shared Memory Areas |
| | <ol style="list-style-type: none"> 1. Shared Objects 2. Shared Memory Access |
| 4 | Dynamic Programming |
| | <ol style="list-style-type: none"> 1. Generic data types 2. Field symbols and data references 3. Runtime Type Identifications (RTTI) 4. Runtime Type Creation (RTTC) |
| 5 | Enhancements and Modifications |
| | <ol style="list-style-type: none"> 1. Adjustment of SAP Standard Software 2. Enhancing Dictionary elements 3. Customers Exits 4. Business Add Ins (BAdIs) 5. Modifications of the SAP standard applications 6. Implicit and Explicit Enhancements |
| 6 | Fundamentals of Webdynpro for ABAP |
| | <ol style="list-style-type: none"> 1. Web Dynpro Components, Windows and Views 2. Web Dynpro Controllers 3. Web Dynpro Context 4. Web Dynpro User Interface 5. Controller and Context programming |

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

B. Tech. III Year II semester

LOGICAL REASONING
(Common to All Branches)

Code: 3HC77

L T P/D C
- - 2 2

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			

B. Tech. III Year II semester**COMPREHENSIVE VIVA II****Code: 4G677**

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

(4G678) PLANT BIOTECHNOLOGY LAB

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

L T P/D C
- - 4 2

Objective:

To Learn the Techniques of Plant Cell, Tissue and Organ Culture and apply them for Phytochemical production and Genetic Transformation

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 & FACILITIES:

Autoclave, pH Meter, Laminar air flow chamber, Shaker- incubator, Plant Growth Chamber, Soxhlet Apparatus, Compound Microscope, Tissue Culture Racks, Culture/Incubation Room

S. No.	COURSE OUTCOMES	POs
1	Demonstrate and Make-use-of Equipments & Facilities in Tissue Culture Lab	b, c, d, l
2	Learn Techniques of Sterilization and Establish Aseptic environment	b, c, d, l
3	Prepare Tissue Culture Media and Modify it for further use	b, c, d, l
4	Generate Callus and Establish Suspension Cultures	b, c, d, l
5	Predict and Induce Indirect and Direct Organogenesis	b, c, d, l
6	Isolate, Visualize and Detect Protoplasts	b, c, d, l
7	Extract, Estimate and Compare Phytochemicals	b, c, d, l
8	Apply <i>in vitro</i> Techniques to genetically transform plant material	b, c, d, l

III Year II Semester**(4G679) GENETICS, MOLECULAR BIOLOGY AND GENETIC ENGINEERING LAB**

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

L T P/D C
- - 3 2

OBJECTIVE

This course provides necessary practical skills on recombinant DNA technology and molecular biology and biotechnology techniques

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

REFERENCES:

1. Current protocols in Molecular Biology by Maniatis.

COURSE OUTCOME (CO)		POs
CO:1	Solve and interpret problems based on Mendelian and Non Mendelian genetics	b,c,d,l,l
CO:II	Solve and interpret problems based on Sex linked inheritance and Multiple alleles	b,c,d,l,l
CO:III	Experiment with various biological samples to isolate Nucleic Acids from them	b,c,d,l, l
CO:IV	To Interpret the results of gels patterns of Agarose gel electrophoresis	b,c,d,l,l
CO:V	To infer the purity of isolated DNA samples	b,c,d,l,l
CO:VI	To able to construct a recombinant strain of bacteria by cloning green fluorescent protein containing plasmid	b,c,d,l, l
CO: VII	To able to construct and interpret restriction digestion and restriction mapping	b,c,d,l,l
CO: VIII	Distinguish transformants from non transformants using various screening techniques	b,c,d,l,l
CO: IX	To identify the gene of interest using Southern Hybridization techniques	b,c,d,l,l
CO: X	identify and characterize proteins using SDS PAGE	b,c,d,l,l

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

B. Tech. III Year II semester**TECHNICAL PAPER WRITING AND SEMINAR- VI****Code: 4G680**

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

Amendment

Decision on the awarding of the marks for the **Technical Paper Writing and Seminar**

The CAC resolved to award the marks for technical paper writing and seminar as stated below. The allocation of marks for various items will be same for all B. Tech I year to IV year (The candidates admitted in 2013-14 to 2016-17). The technical paper writing and seminar will be evaluated for 100 marks and students must secure 40% i.e, 40 marks to be successful.

The faculty members In-charge of seminars must give model presentation and prepare model technical report to create good knowledge among the students before presentation and submission of the technical report.

Sl.No	Topic	Marks
1	Selection of topic and literature survey	10 marks
2	Relevance, level of content and report with usual sub topics (This sub topics -Summary, introduction , historical background , basic theory, detailed description, applications, conclusions and future scope)	15 marks
3	Presentation	20 marks
4	Discussion	5 marks
5	Mid semester Viva (after first mid test)	20 marks
6	Final Viva	20 marks
7	Attendance	5 marks
8	Class notes	5 marks
Total Marks		100 marks

IV year I Semester

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

(4ZC02) 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 & Wehrich: 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		X	X	X	

(4G721) 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, Trickling filters, Anaerobic treatment -contact digesters

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

UNIT VI: ECO-FRIENDLY PRODUCTS: Bioplastics –PHB, Polylactide (PLA) , Biofertilizers – *Rhizobium*, *Azotobacter*, *Azospirillum*, Phosphate solubilizing microorganisms, biopesticides – *Trichoderma*, *Bacillus thuringensis*, Biofuels (biodiesel , biohydrogen)

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 sem

(4G722) BIOREACTOR DESIGN AND BIOPROCESS CONTROL

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

L T P/D
C
3 1 -

3

UNIT I: FUNDAMENTALS OF BIOREACTOR DESIGN: Introduction, production requirements, stoichiometry, media design, contributions of total production cost in bioprocessing. Bioreactor configurations: Stirred tank, bubble column, airlift, packed bed, fluidized bed reactors.

UNITII: PRACTICAL CONSIDERATIONS FOR BIOREACTOR CONSTRUCTION Aseptic operation, Inoculation and sampling, sparger design, evaporation control. Batch operation of a mixed reactor, total time for batch reaction cycle.

UNIT III: IDEAL REACTOR OPERATION: Fed batch operation of a mixed reactor, continuous operation of a mixed reactor, continuous operation of a plug flow reactor,

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

UNIT V: FIRST 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 VI: CONTROLLERS AND STABILITY: Development of block diagram, controllers and final control elements, Ideal transfer function of operational, P, PI, PD and PID controllers. Closed loop transfer functions for servo regulators problems. Overall Transfer function for multi loop control systems. Stability and control system by Routh's criterion.

TEXT BOOKS:

1. Pauline M Doran, " Bioprocess Engineering Principles", Academic Press, 1995
2. Process Systems Analysis and Control Donald Coughnowr, Second edition McGraw Hill, International Ed. 1991.

REFERENCE:

1. Chemical Process Control, stephanoupolis G., Prentice Hall, N.Delhi, 1990.
2. Industrial Instrumentation, Donald P. Eckman.

IV year I Semester

(4G723) DOWNSTREAM PROCESSING

L	T	P/D	C
4	1	-	4

UNIT I: INTRODUCTION: Role and importance of downstream processing in biotechnological processes.. 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: SOLID-LIQUID SEPARATION-I: Centrifugation, Types of centrifuges, scale up of centrifugation, Filtration, continuous rotary filtration.

UNIT III: SOLID-LIQUID SEPARATION-II: Cell disruption methods: mechanical, enzymatic and chemical methods for intracellular products, flocculation and sedimentation.

UNIT IV: CONCENTRATION/FRACTIONATION OF PRODUCTS I: Membrane-based separations (micro, ultra filtration, hyper filtration, electrodialysis and dialysis), theory, design and configuration of membrane separation equipment applications, Precipitation of proteins by different methods methods (with salts, organic solvents, and polymers), , aqueous two-phase extraction, supercritical extraction, in situ product removal.

UNIT V: CONCENTRATION/FRACTIONATION OF PRODUCTS II: Chromatographic techniques- Adsorption, Ion exchange, Gel filtration, affinity chromatographic separation processes, GC, HPLC, electrophoretic separations, Lyophilization.

UNIT VI: ALTERNATIVE SEPARATIONS METHODS: Crystallization theory: rate of nucleation, rate of crystal growth, and particle size distribution of crystals, 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 Dekker 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	

(4G724) 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: 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.

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

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	

PROFESSIONAL ELECTIVE-II (4G725) FOOD SCIENCE AND TECHNOLOGY

L T P/D C
4 1 - 4

UNIT I: INTRODUCTION : Objectives of Food science and Technology: To acquaint with the fundamentals and application of biotechnology in relation to raw materials for food processing, nutrition, food fermentations. Carbohydrates, proteins and lipids: classification, physical, chemical, nutritional, and functional properties of foods; auto-oxidation of lipids and rancidity.

UNIT II: FOOD MICROBIOLOGY AND PRESERVATION: Microorganisms associated with food – Meats, Seafood, Dairy products. Factors affecting growth and survival of Microorganisms in foods. Spoilage in Meats, Fish. Food -borne infections – Salmonellosis, shigellosis), Food intoxications – Botulism , aflatoxins.Principles of food preservation: Physical (Blanching, Pasteurization, Freezing), Irradiated foods –Radappertization, Radicidation, and radurization of foods. Chemical method of Preservation: Benzoic acid and Parabens, nitrites and nitrates, Phenolics.

UNIT III: FOOD FERMENTATIONS Food Fermentations; Traditional fermented foods of India Dahi, Sinki,Kinema Fermented foods based on milk (cheese), Meat (Sausages) and Vegetables (Sauerkraut) ,Probiotics and prebiotics and its health impacts.

UNIT IV: FOOD ADDITIVES AND ANALYSIS:Food additives- definitions, classification and functions of Colors , Flavors (natural and Synthetic) in various foods . Enzymatic methods of food analysis, Analysis of pesticides in foods.

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.

UNIT VI: QUALITY CONTROL: Concept of quality: Quality attributes- physical, chemical, nutritional, microbial, and sensory; their measurement and evaluation. Food laws and regulations: introduction to various food laws (Voluntary) Agmark Standards (AGMARK), Codex Alimentarius Standards, BIS Standards and Specifications,Food Safety Management Systems: Pre-requisites of HACCP.

TEXT BOOKS AND REFERENCES

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..
4. George, J. B., "Basic Food Microbiology", CBS Publishers Distributors, 1987. 4th edition.
5. Lindsay, Willis Biotechnology, Challenges for the flavor and food Industries, Elsevier Applied Science, 1988.
6. Management and control of quality. James R Evans, William M Lindsey. Thomson South-western
7. The Essentials of Quality Control Management, Peter N T Pang, Trafford publishing

8. Guide to Quality Management system for the food industry. Ralph Early

IV year I Semester

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

PROFESSIONAL ELECTIVE-II

(4G726) CLINICAL RESEARCH AND REGULATORY AFFAIRS

L T P/D C
4 1 - 4

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

PROFESSIONAL ELECTIVE-II (4G727) MOLECULAR PATHOGENESIS

L	T	P/D	C
4	1	-	4

UNIT-I Microbial virulence factors : Components of microbial pathogenicity, Population diversity in microbes and methods to detect diversity.

UNIT-II **Host factors in pathogenesis :** Host defense- physical (skin, mucosa), Chemical (pH, enzymes) and immunological (brief) ; modes of pathogen entry.

UNIT-III **Host-pathogen interaction :** Virulence, mechanisms – colonization, disease without colonization. Damage to host, Virulent genes and regulation, bacterial biofilms.

UNIT- IV Experimental methods to study host-pathogen interaction : Selection of pathogen Model, measurement of virulence, Identification of potential virulence factors
example 1. Bacterial , 1 viral and 1 parasitic.

UNIT V Modulation of host response : Immune modulation and evasion, Interleukins (IL-4, IL-2, IFN gamma, IL-12), Chemokines (IL-8, RANTES, CCR/CXCR), Interferons (alpha, beta and gamma).

UNITVI Paradigms of pathogenesis : Gastroduodenal ulcers, Tuberculosis and other mycobacterial infections, HIV/AIDS, hepatitis, malaria, round worm infestation.

IV year I Semester

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

PROFESSIONAL ELECTIVE-III

(4G728) COMPUTATIONAL MOLECULAR BIOLOGY

L T P/D C
4 1 - 4

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: Methods of Docking – Flexible and Rigid Docking, Docking algorithms – Genetic algorithm, QSAR overview and its significance in 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

IV Year I Semester

(4G729) BIOTECHNOLOGY FOR CROP IMPROVEMENT
(PROFESSIONAL ELECTIVE – III)

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

L T P/D C
4 1 - 4

Objective:

To learn the concepts, techniques and applications of Plant Breeding & Molecular Marker systems and apply them for crop improvement and new product development.

UNIT I: PLANT BREEDING: Conventional plant breeding strategies – Seed development, Embryo rescue, Hybridization, Inbred lines, Pure lines, Heterosis, Backcrossing, CMS, Mutation Breeding.

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: Techniques for plant transformation, 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. Phytoremediation of contaminated soils,

UNIT V: TRANSGENIC CROPS II: Genetic Engineering of crops for useful agronomic traits for male sterility, food quality, improved crop productivity. Plants as bioreactors, transgenic plants for quality improvement of protein, lipid & carbohydrate content, Plantibodies, Plant derived vaccines,

UNIT VI: MOLECULAR BIOLOGY OF PLANT PROCESSES: Tissue specific gene expression, Discovery / Cloning of Plant Genes: Probe based screening, Genomic and proteomic approaches. Risks and benefits of release of GM crops. Regulation of research and development of transgenic plants.

TEXT BOOKS:

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

REFERENCES

1. Molecular Marker Systems in Plant Breeding and Crop Improvement, Edited by. Horst Lörz & Gerhard Wenzel, Biotechnology in Agriculture & Forestry Series 55, Springer Verlag Berlin Heidelberg, 2005 (ISBN 978-3-540-74006-3).

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

S. No.	COURSE OUTCOMES	POs
1	Understand & Explain various Plant Breeding methods	b, c, l
2	Understand and Differentiate various Molecular Markers.	b, c, d, l
3	Apply various Marker & Map based selection systems for crop improvement	b, c, d, l
4	Compare and Evaluate Plant Genetic Transformation systems and Apply them for generating Transgenics with improved productivity and performance	b, c, d, l
5	Create Transgenic plants with useful agronomic traits and novel products	b, c, d, l
6	Adapt Molecular Biology processes to Create Plant modification systems and Determine Biosafety issues of Transgenic Plants	b, c, d, l

IV Year I Semester

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

(4G730) CANCER BIOLOGY

L T P/D C
3 1 - 3

OBJECTIVE

To gain knowledge in biological phenomenon of cancer, molecular mechanism of carcinogenesis, treatment and techniques involved, and to facilitate students to conduct investigations using research based knowledge and methods and find modern biotechnology engineering solutions to combat cancer.

UNIT I: FUNDAMENTALS OF CANCER BIOLOGY: Nomenclature of cancer, classification of human cancers, Epidemiology of Human cancer. Various causes of Cancer- carcinogens, genetic susceptibility

Unit II: MUTATION AND CANCER: Regulation of cell cycle, modulation of cell cycle in cancer, mutation that cause change in signal molecules, effect on receptor, signal switches, tumor suppressor genes

UNIT III: PRINCIPLES OF CARCINOGENESIS: Types of chemical carcinogens, Chemical Carcinogenesis, Targets of Chemical Carcinogenesis. Physical carcinogenesis, mechanism of radiation Carcinogenesis. Role of viruses in cancer, role of diet in cancer, cancer stem cells

UNIT IV: ONCOGENES: Oncogenes / Proto oncogene, identification and detection of Oncogenes, Retroviruses and Oncogenes, Growth Factor and Growth Factor receptors that are Oncogenes.

UNIT V: PRINCIPLES OF CANCER METASTASIS: Angiogenesis and its role in metastasis significances of invasion, three-step theory of Invasion, basement Membrane disruption, role of proteinases in tumour cell invasion., heterogeneity of metastatic phenotype, steps in metastatic cascade

UNIT VI: CANCER DETECTION AND THERAPY: Various methods used for detection of cancers, Advances in Cancer detection., new molecules for cancer therapy- Different forms of therapies for cancer- chemotherapy, radiation therapy, and immuno therapy their 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

COURSE OUTCOME (CO)		POs
CO:I	Classify different types of cancer and assess various causes attributed to cancer	b, f
CO:II	To determine various types mutations which causes cancer	a
CO:III	To determine the role of chemical , Physical and Biological carcinogens and demonstrate their cancer causing ability	d
CO:IV	To understand the role of oncogenes in cancer development	b, f
CO:V	To have an elaborate understanding about cancer invasion and metastasis	c
CO:VI	To compare various detection methods and therapies available for cancer	b

IV year I Semester

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

**IV Year I semester
PROJECT PHASE – I**

Code: 4G731

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	

IV Year I semester
INDUSTRY ORIENTED MINI PROJECT

Code: 4G732

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

(4G780) 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

(4G781) 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			

IV Year I semester**TECHNICAL PAPER WRITING AND SEMINAR- III****Code: 4G782**

L	T	P/D	C
-	-	2	1

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

- o 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.
- o Student learnt to arrange the contents of the presentation and scope of the topic, in an effective manner.
- o Each student then presents the technical topic they chose in front of the panel and the fellow students, using the oratory skills.
- o 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

Amendment

Decision on the awarding of the marks for the **Technical Paper Writing and Seminar**

The CAC resolved to award the marks for technical paper writing and seminar as stated below. The allocation of marks for various items will be same for all B. Tech I year to IV year (The candidates admitted in 2013-14 to 2016-17). The technical paper writing and seminar will be evaluated for 100 marks and students must secure 40% i.e, 40 marks to be successful.

The faculty members In-charge of seminars must give model presentation and prepare model technical report to create good knowledge among the students before presentation and submission of the technical report.

Sl.No	Topic	Marks
1	Selection of topic and literature survey	10 marks
2	Relevance, level of content and report with usual sub topics (This sub topics -Summary, introduction , historical background , basic theory, detailed description, applications, conclusions and future scope)	15 marks
3	Presentation	20 marks
4	Discussion	5 marks
5	Mid semester Viva (after first mid test)	20 marks
6	Final Viva	20 marks
7	Attendance	5 marks
8	Class notes	5 marks
Total Marks		100 marks

IV year II Semester

(4G833) BIOETHICS, BIO SAFETY & IPR

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
4 1 - 4

Objective:

To learn the principles and applications of Bioethical, Biosafety and IPR issues and apply them to Biotechnology concepts.

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: BIOETHICS & BIOSAFETY 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

REFERENCES:

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.

S. No.	COURSE OUTCOMES	POs
1	Understand & Explain Bioethical Principles & apply them for different Life forms	b, d, e, f, h, l
2	Understand and Differentiate various Biosafety levels for different Life forms	b, c, f, g, l
3	Apply Biosafety regulations for Biotechnology	b, c, f, g, l
4	Understand and Compare different IPRs and Apply them for relevant case studies	b, d, f, l
5	Understand IPRs, Compare International & National IPR conventions / treaties	b, d, f, l
6	Apply Bioethical & Biosafety Principles for Clinical Trials and Determine Good Clinical Practices	b, c, d, e, h, l

IV Year II Semester

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

(4G834) BIOSENSORS AND NANOTECHNOLOGY

L T P/D C
3 1 - 3

Course objectives: To impart a sound knowledge on the principles of Biosensors and Bionanotechnology involving the different application oriented topics required for Biotechnology

UNIT I: BIOSENSORS- Definition of Biosensors Advantages and limitations, various components of biosensors Biocatalysis based biosensors, bioaffinity based biosensors, biologically active material and analyte, Types of membranes used in biosensor constructions

UNIT II: TYPES OF BIOSENSORS- Types, Principles and applications- optical, Amperometric/ potentiometric/ piezoelectric, mechanical & Chemiluminiscence-based biosensors.

UNIT III: APPLICATION OF BIOSENSORS: 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 IV: INTRODUCTION TO NANOTECHNOLOGY: Definition of nano scale with reference to biosystems; 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 V: NANOMOLECULAR BIOLOGY: Microarrays (DNA and Protein); Role of genetically engineered polymer proteins

UNIT VI: NANOBIOTECHNOLOGY APPLICATIONS- Drug delivery, Photodynamic therapy, molecular motors, nanoluminescent tags, Designer biopolymers- Procollagen, Tissue engineering. Applications in Agriculture - Smart Delivery Systems, Food industry - Food Processing, Environment - remediation of soil and water.

Text Books:

1. Biosensors: An Introduction, Brian R Eggins, John Wiley and Sons
2. M. Ratner and D.Ratner, Nanotechnology-a gentle introduction to the next big idea, Pearson Education, 2007.
3. R. R. Birge, Protein based computers, Scientific American, 1995

Reference

1. Biosensors, Elizabeth A. H. Hall, open University Press Biotechnology Series
2. L. E. Foster, Nanotechnology-Science, Innovation and opportunity, Person education inc, 2007.
3. Nanoelectronics and nanosystems-Karl Goser-Springer Engineering Series.

COURSE OUTCOMES (CO)		
CO:1	To classify different types of biosensors based on their biological detectors	c
CO:II	Classify different types of transducers used in Biosensors and illustrate their applications	d
CO:III	Discuss various applications of Biosensors in medical, agriculture food and environment	c, g,f
CO:IV	To classify different types of nanotechnology based on their biological detectors	c
CO:V	To understand the makeup of nanomolecular devices and their applications	d
CO:VI	Discuss various applications of nanobiotechnology in various fields of biotechnology	C, g, f

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

**IV Year II semester
PROJECT PHASE - II**

Code: 4G835

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			

IV Year II semester
COMPREHENSIVE VIVA - III

Code: 4G883

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			

B. Tech. IV Year II semester**TECHNICAL PAPER WRITING AND SEMINAR- IV****Code: 4G884**

L	T	P/D	C
-	-	2	1

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

- o 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.
- o Student learnt to arrange the contents of the presentation and scope of the topic, in an effective manner.
- o Each student then presents the technical topic they chose in front of the panel and the fellow students, using the oratory skills.
- o 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

Amendment

Decision on the awarding of the marks for the **Technical Paper Writing and Seminar**

The CAC resolved to award the marks for technical paper writing and seminar as stated below. The allocation of marks for various items will be same for all B. Tech I year to IV year (The candidates admitted in 2013-14 to 2016-17). The technical paper writing and seminar will be evaluated for 100 marks and students must secure 40% i.e, 40 marks to be successful.

The faculty members In-charge of seminars must give model presentation and prepare model technical report to create good knowledge among the students before presentation and submission of the technical report.

Sl.No	Topic	Marks
1	Selection of topic and literature survey	10 marks
2	Relevance, level of content and report with usual sub topics (This sub topics -Summary, introduction , historical background , basic theory, detailed description, applications, conclusions and future scope)	15 marks
3	Presentation	20 marks
4	Discussion	5 marks
5	Mid semester Viva (after first mid test)	20 marks
6	Final Viva	20 marks
7	Attendance	5 marks
8	Class notes	5 marks
Total Marks		100 marks

List Of Service Courses Offered By Biotechnology Department To Other Branches

S.No	Course Code	Course Title
1	4GC06	ENVIRONMENTAL STUDIES
2	4GC33	CULTURE, VALUES, PROFESSIONAL ETHICS AND IPR
3	4GC34	APPLIED BIOLOGY
4	4GC35	FUNDAMENTALS OF BIOINFORMATICS
5	4GC36	BIOMEDICAL INSTRUMENTATION
6	4GC37	NANOBIMATERIALS

CULTURE, VALUES, PROFESSIONAL ETHICS & IPR
(Common to all branches)

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

Code: 4GC33

L T P/D C
2 1 - 2

UNIT-1 INDIAN CULTURE: A Introduction to Culture Values and Ethics, Bharata, The Indian Concept of Human Life, Indian Civilization, Sanskrit and Indian Languages, Festivals, Sculpture, Music, Dance, Drama, Ayurveda, Family and its Importance, Indian Marriage System, Status of Women in Indian Society, Education, Purpose, Ancient System, Value Education, Interfaith Understanding, Happiness, Modernism and its Effect on Lifestyle, Mind and its Operation, Control of Mind, Yoga, Exemplary Life Sketches-Albert Einstein, Abraham Lincoln

UNIT-II VALUE SYSTEM: Human Value System, Truthfulness, Righteousness, Peace, Non-Violence, Love, Kindness and Compassion, Humility, Faith, Courage, Optimism, Forgiveness, Ceiling on Desires (Control of Sense organs), Exemplary Life Sketches-M K Gandhi, Abdul Kalam

UNIT-III ETHICS: Ethics in Ancient India, Ethics, Morals, Ethics and Human Life, Core Areas for Ethics, Values, Morality, Integrity, Honesty, Character, Loyalty, Trustworthiness, Courage and Confidence, Confidentiality, Secrecy and Transparency, Justification, Contracts and Spirit Promises and Schedules, Quarrels, Selfishness, Obstacles, Supporting Measures, Reputation and its sale, Decision Making in Ethics, Exemplary Life Sketches-Vishveshwaraiah, Jagadeesh Chandra Bose, Meghanad Saha

UNIT- IV PROFESSIONAL ETHICS: Occupation, Profession, Professional, Professional Organization, Obligations Of a Professional, Temptations, Aptitude, Importance of Professional Ethics for Engineers, Code of Ethics, Need for a Code, Impact of Ethical Behaviour, The Code of Ethics for Engineers, Fundamental Principles and Cannons, Commerce and Ethics, Marketing Ethics, Finance and Ethics, Science, Religion and Ethics, Medical Ethics, Genetics and Ethics, Politics and Ethics, Genders and Ethics, Media and Ethics, Computer Ethics, Exemplary Life Sketches- Narayan Murthy, Homi Jahangir Bhabha

UNIT -V INTELLECTUAL PROPERTY RIGHTS (IPR): Invention and Creativity, Basic Types of Property, Need for Protection of IPR, IP Types Industrial Property (Patents, Trade Marks, Trade Secrets, Industrial Designs and Integrated Circuits), Copyrights and Related Rights, Geographical Indications.

UNIT-VI WIPO Mission and Activities, GATT & Trips, Indian Position on WTO and strategies, Indian IPR legislations-commitments to WTO-Patent Ordinance and the Bill, Draft of a National Intellectual Property Policy, Case Studies on IP

REFERENCES:

1. The ABCs of Ethics by Michael. L. Buckner, Universe. Inc, New York Lincoln, Shanghai
2. Science, Faith and Ethics by Denis Alexander and Robert.S.White, Hendrickson Publishers, Massachusetts, USA, March 2006
3. **Vedic Science Primer by PSR Murthy, BS Publications, Hyderabad**
4. **Medical Ethics-Global View Points, Edited by Diane Andrews, Hennig Feld, Green Haven Press**
5. Divine Stories, Human Value Stories, Volume I and II, Sri Satya Sai Books and Publications
6. IPR, Nalsar Law University Course modules

Code: 4GC34

L	T	C
3	2	3

APPLIED BIOLOGY (Open Elective- I)**Course outcomes:**

1. *Demonstrate a breadth of knowledge in biology*
2. *Overview of Biomolecules and in biological significance*
3. *Knowledge about different human physiological system and its working*
4. *Overview of biomedical instrumentations and its working about EEG, ECG and X ray machines*
5. *Introduction to Mechanochemistry and various instrumentation inspired by nature*
6. *Overview of Nano-Biotechnology and its various applications*

Unit I Introduction to Biology and its relevance to society Cell-functional unit of live organisms - prokaryotic and eukaryotic cell, cell organization – tissues - basic types -cell division: mitosis, meiosis. Application of biological sciences and biotechnology to human health care and medicines - pharmaceuticals and food and agriculture- pollution management and environment

Unit II Introduction to Biomolecules Biomolecular classification, biological significance - carbohydrates, proteins and amino acids - lipids and fats - nucleic acids - vitamins-enzyme

Unit III Human Physiology Human physiology - different systems associated with human- tissues, organ and physiology of the various systems: digestive, respiratory, circulatory, skeletal, nervous, excretory and reproductive system

Unit IV Biomedical Instrumentation Block diagram of medical instrumentation system. Problems encountered with measurement from human beings. Generalized medical instrument specifications working of EEG, ECG, x ray machine, CT- scanners and ultrasound scanner. Cardiac pacemakers, defibrillators, ventilators and infant incubators

Unit V Mechanochemistry Molecular machines/ motors- Engineering design inspired by examples in biology, biosensors and its applications in medicine, health care and industrial monitoring

Unit VI Nano-Biotechnology: Definition of nanoscale with references to biosystem. Nanoinfotech: information storage- nanocomputer, molecular switch, super chip, micro electro mechanical systems (mems), nano electro mechanical systems (nems)- nanosensors

TEXT BOOKS:

Satyanarayana, U. "Biotechnology", 4th Edition, Books and Allied Pvt. Ltd. Kolkata, 2007. Lehninger A.L,

Nelson D.L, Cox .M.M, "Principles of Biochemistry", . CBS Publications 1993

REFERENCE:

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

(4GC35) FUNDAMENTALS OF BIOINFORMATICS
(Open Elective)

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

L T P/D C
3 1 - 3

UNIT I : SCOPE OF BIOINFORMATICS and BIOLOGICAL DATABASES History, definition, importance and applications of bioinformatics in information technology, Introduction to biological data, Organization and management of databases, Nucleotide databases (Genbank), Protein Databases(UNI PROT)

UNIT II: SEQUENCE ALIGNMENT Database searching, Basic concepts of sequence homology Dynamic Programming, Dot Matrix analysis, Smith-Waterman Algorithm, Needleman-Wunsch Algorithm, Scoring matrices: PAM and BLOSUM matrices

UNIT III: 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 IV: MULTIPLE SEQUENCE ALIGNMENT Basic concepts of various approaches for MSA algorithms (e.g. progressive, hierarchical etc.). Algorithm of CLUSTALW and its application

UNIT V: PHYLOGENETIC ANALYSIS Definition and description of phylogenetic trees. Distance based and character based algorithms of phylogenetic analysis

UNIT VI: GENE AND PROTEIN STRUCTURE PREDICTION Biological sequence/structure, Human Genome Project, Gene structure and DNA sequences, Pattern recognition and prediction, Protein Secondary structure prediction methods, Algorithms of Chou Fasman, GOR methods. Protein homology modeling.

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.

COURSE OUTCOMES (CO)

- CO:1 Demonstrate knowledge and understanding of the biological, computational, Engineering and mathematical sciences relevant to biotechnology
- CO:2 Analyze and interpret homology by using basic bioinformatics problems and their solutions
- CO:3 Demonstrate the ability to solve biological problems using basic computer science Programming tools and software
- CO:4 Develop the ability to identify the computational problems within the living Systems at molecular level
- CO :5 Develop the ability to evaluate the evolutionary relationships among various Organisms using computational methods.
- CO:6 Gain an understanding of working in interdisciplinary teams of biologists, Biochemists, medical researchers, geneticists, and allied engineering branches.

COURSE SYNOPSIS

Bioinformatics is the field of science in which biology, computer science, and information technology merge into a single discipline. Bioinformatics is the application of information sciences to biology. This specialized stream of science deals with the creation and maintenance of databases of biological information, which includes nucleic acid sequences, and protein sequences. It also includes the software's that are required for the detailed analysis of the genes and proteins. The field of bioinformatics emerged, primarily because of the significant advances made by the Human Genome Project and other systematic sequencing projects, and the necessity for all biologists to be able to apply—at some level—these techniques to their own research. Bioinformatics occupies a unique niche amongst the sciences, lying at the intersection of biology, genetics, biochemistry, computer science, mathematics, statistics, and numerous other allied fields. The inherent strength of the field of bioinformatics comes from the relationships between investigators in these allied fields; collaborations between these individuals have led to the development of novel methods and approaches, furthering advances in each of these areas.

Bioinformatics was applied in the creation and maintenance of a database to store biological information at the beginning of the "genomic revolution", such as nucleotide and amino acid sequences. In order to study how normal cellular activities are altered in different disease states, the biological data must be combined to form a comprehensive picture of these activities. Therefore, the field of bioinformatics has evolved such that the most pressing task now involves the analysis and interpretation of various types of data, including nucleotide and amino acid sequences, protein domains, and protein structures. The actual process of analyzing and interpreting data is referred to as computational biology.

Important sub-disciplines within bioinformatics and computational biology include: Genomics – Genome annotation, Gene finding, Genome assembly, Prediction of gene expression- Micro arrays , Genome-wide association studies; Proteomics - Protein structure prediction, Protein-protein interactions, drug design, drug discovery Phylogenetic analysis – Sequence alignment, Sequence database search, protein structure alignment , Computational evolutionary biology, Modeling of evolution.

The key challenge for the next few years will be to quickly and efficiently identify the most promising drug candidates from the constantly increasing plethora of possibilities with cost-effectiveness. Current research activities aim at going beyond the realm of human genome sequencing to expand the list of identified proteins and genes. The subject containing SIX units covers from the basic database search protocols to most important concepts of Bioinformatics.

Code: 4GC36

L	T	C
3	2	3

BIOMEDICAL INSTRUMENTATION (Open Elective- I)**Course outcomes:**

7. *Demonstrate a breadth of knowledge in medical instrumentation*
8. *To understand the Electro-physiology of various systems and recording of the bioelectric signals*
9. *To understand the working principles of various Imaging techniques*
10. *To understand the design aspects of various assist and therapeutic device*

Unit I Introduction to Medical Instrumentation: Block Diagram of medical Instrumentation system, origin and characteristics of Biopotential. Problems encountered with measurement from human beings. Generalized medical instrument specifications, types of electrodes external, internal and Microelectrodes, Recording Electrodes – Electrode-tissue interface

Unit II Central Nervous and Cardio-Vascular System Receptors, Motor systems, Neural and neuromuscular measurements, Evoked response of EEG, Structure of Heart, Rhythmicity, ECG theory, Electrocardiograph, Measurement of blood pressure and blood flow, ECG electrodes.

Unit III Biosignal Amplifiers and Signal Processing Electrodes and transducers for biomedical applications, Basic requirements of op-Amp circuits and Instrumentation amplifiers in biomedical applications, ECG data acquisition and biomedical signal Processing

Unit IV Intensive Care Instrumentation and Patient Safety Bedside and central station monitoring systems, Introduction to bio-medical telemetry, Surgical Diathermy, Physiological effects of electricity, Macro shock and Micro shock hazards, Basic approaches to protection against shock

Unit V Imaging and Display System X ray machine, CT- scanners, Ultrasound scanner, nuclear methods, Recorders and displays: Inkjet, Thermal array, Fiber optic face plate CRT, Non fade CRO

Unit VI Therapeutic and Prosthetic devices Cardiac Pacemakers, Defibrillators, Ventilators and Infant Incubators

Text books

1. Leslie Cromwell, Fred J. Weibell and Erich A. Pfeifer, "Biomedical Instrumentation and Measurements", 2nd Edition, PHI, 2006
2. Khandpur.R.S, "Handbook of Biomedical Instrumentation", 2nd edition, 12th reprint, Tata McGraw Hill, 2008.
3. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", 4th edition, Pearson Education, 2008.
4. John G. Webster, "Medical Instrumentation Application and Design", 3rd edition, Wiley India, 2008.

Code: 4GC37

L	T	C
3	2	3

NANO BIOMATERIALS**Objectives:**

- To acquire knowledge about polymeric implant materials
- To know the role of biomaterials for implant coating

Course Outcome:

1. To understand the concepts Polymeric Implant Materials
2. To have knowledge of Bio Materials for Implant Coating
3. To understand the concepts of cardiovascular implants
4. To know the basics of Structure Property Relationship of Biological Materials
5. To have fair understanding of applications of bionanomaterials
6. To know the basics knowledge of tissue engineering

Unit I Polymeric Implant Materials: Classification of biomaterials, Polyolefin; polyamides (nylon); Acrylic polymers (bone cement) and hydrogels; Fluorocarbon polymers; Natural and synthetic rubbers, silicone rubbers.

Unit II Bio Materials for Implant Coating: calcium phosphates, Ti6Al4V and biomedical alloys - implant tissue interfacing -biomimetic and solution based processing – osteo porosis – osteoplaste – regeneration of bones by using bio compactable ceramics – biointeractive hydro gels.

Unit III Cardiovascular Implants: Role of nanoparticles and nanodevices in Blood clotting; Blood rheology; Blood vessels; Geometry of blood circulation; Vascular implants; Cardiac pacemakers; Blood substitutes; Biomembranes, Opthomological applications of nano biomaterial.

Unit IV Structure Property Relationship of Biological Materials: tissues, bones and teeth, collagen rich tissues, elastic tissues - Biopolymers: Preparation of nanobiomaterials – Polymeric scaffolds collagen, Elastins: Mucopolysaccharides, proteoglycans, cellulose and derivates Dextrans, Alginates, Pectins, Chitin.

Unit V Applications of Bionanomaterials: applications to medicine: Dentistry and Biology devices, Nonthrombogenic treatments and Strategies, Dental implantation adhesive and Sealants, Ophthalmologic applications-intraocular lens implants, Artificial organs and tissues.

Unit VI Tissue Engineering: Engineering biomaterial to control cell function - nanostructured collagen mimics in tissue Engineering – building structure into engineered tissues – fibrous proteins and tissue engineering- scaffolds for tissue fabrications – materials for scaffolds – materials for hydrogel scaffolds – scaffolds fabrications technologies—nanocomposite scaffolds – bioactive scaffolds – scaffolds for stem cells – micro and nanopatterned scaffolds.

Text Books

1. Paul K. Chu and Xuanyong, 'Biomaterials fabrication and processing handbook',CRC / Taylor & Francis, 2008
2. K. K. Jain, 'Nanobiotechnology Molecular Diagnostics: Current Techniques and Applications (Horizon Bioscience)', Taylor & Francis, 2006

Reference Books

1. S.V Bhat, 'Biomaterials (2nd Edition)', Narosa Publishing House, New Delhi, 2005.
2. Robert.W.Kelsall and Ian.W.Hamley, Mark Geoghegan, Nano Scale Science and Technology, John Wiley, 2005