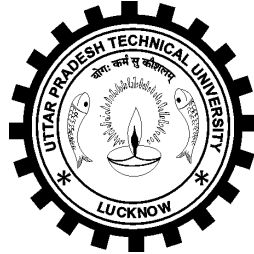


# **U.P. TECHNICAL UNIVERSITY, LUCKNOW**



## **Syllabus**

**1<sup>st</sup> Year (I & II Semester)  
2<sup>nd</sup> Year (III & IV Semester)**

**[Effective from session 2009-10]**

**B. TECH. BIO-TECHNOLOGY**

**U.P. TECHNICAL UNIVERSITY, LUCKNOW**  
STUDY & EVALUATION SCHEME  
**B. TECH. BIOTECHNOLOGY**  
**[Effective Form session 2009-10]**  
**YEAR I, SEMESTER-I**

S. No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	SESSIONAL EXAM.			ESE		
						CT	TA	Total			
<b>THEORY</b>											
1.	EBT-101 or EBT-102	Elementary Mathematics-I Remedial Biology-I	3	1	0	30	20	50	100	150	4
2.	EAS-101	Engg. Physics-I	2	1	0	15	10	25	50	75	3
3.	EAS-102/ EME-102	Engg. Chemistry/ Engg. Mechanics	3	1	0	30	20	50	100	150	4
4.	EBT-103/ ECS-101	Basic Electrical & Electronics Engg. / Computer Concepts & programming in C	3	1	0	30	20	50	100	150	4
5.	EBT-104/ EAS-104	Introduction to Biotechnology / Professional Communication	3	1	0	30	20	50	100	150	4
6.	EME-101/ EAS-105	Manufacturing Processes/ Environment & Ecology	2	0	0	15	10	25	50	75	2
7.	EAS-109	<i>Remedial English Language*</i>	2	0	0	-	-	-	50*	50*	0
<b>PRACTICAL/TRAINING/PROJECT</b>											
7.	EAS-152/ EME-152	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8.	EEE-151/ ECS-151	Electrical Engg Lab / Computer Programming Lab	0	0	2	10	10	20	30	50	1
9.	EWS-151/ ECE-151	Workshop Practice / Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	EAS-151 / EAS-154	Physics Lab/ Professional Communication Lab/	0	0	2	10	10	20	30	50	1
			0	0	2	30	20	50	-	50	1
11	GP-101	General Proficiency	-	-	-	-	-	50	-	50	1
		<b>Total</b>	<b>18</b>	<b>6</b>	<b>9</b>	<b>190/210</b>	<b>140/150</b>	<b>380/410</b>	<b>670/640</b>	<b>1000</b>	<b>27</b>

\*Remedial English language is compulsory Audit-course. Candidate has to secure minimum 30% pass marks

L = Lecture  
T = Tutorial  
P = Practical  
CT = Cumulative Test  
TA = Teacher's Assessment  
ESE = End Semester Exam.

- **Note : Elementary Math-I (EBT-101) and Elementary Math-II (EBT-201) are for the students of PCB group. Remedial Biology-I (EBT-102) and Remedial Biology-II (EBT202) are for the students of PCM group.**

**U.P. TECHNICAL UNIVERSITY, LUCKNOW**  
**STUDY & EVALUATION SCHEME**  
**B. Tech. Biotechnology**  
**[Effective Form session 2009-10]**  
**YEAR I, SEMESTER-II**

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme			Subject Total	credit	
			L	T	P	SESSIONAL EXAM.		ESE			
						CT	TA				Total
<b>THEORY</b>											
1.	EBT-201 or EBT-202	Elementary Mathematics-II/ Remedial Biology-II	3	1	0	30	20	50	100	150	4
2.	EAS-201	Engg. Physics-II	2	1	0	15	10	25	50	75	3
3.	EME-201 EAS-202	Engg. Mechanics/ Engg. Chemistry	3	1	0	30	20	50	100	150	4
4.	ECS-201/ EBT-203	Computer Concepts & Programming/ Basic Electrical & Electronics Engg.	3	1	0	30	20	50	100	150	4
5.	EAS-204/ EBT-204	Professional Communication/ Introduction to Biotechnology	3	1	0	30	20	50	100	150	4
6.	EAS-205/ EME-201	Environment & Ecology/ Manufacturing Processes	2	0	0	15	10	25	50	75	1
<b>PRACTICAL/TRAINING/PROJECT</b>											
7.	EME-252/ EAS-252	Engg. Mechanics Lab/ Engg. Chemistry Lab	0	0	2	10	10	20	30	50	1
8.	ECS-251/ EEE-251	Computer Programming Lab/	0	0	2	10	10	20	30	50	1
9.	ECE-251/ EWS-251	Computer Aided Graphics / Workshop Practice	0	1	3	10	10	20	30	50	2
10.	EAS-254/ EAS-251	Physics Lab/ Professional	0	0	2	10	10	20	30	50	1
		Communication Lab	0	0	2	10	10	20	30	50	1
11.	GP-201	General Proficiency	-	-	-	-	-	50	-	50	1
<b>Total</b>			<b>16</b>	<b>6</b>	<b>9</b>	<b>210/190</b>	<b>150/140</b>	<b>410/380</b>	<b>590/620</b>	<b>1000</b>	<b>27</b>

**U.P. TECHNICAL UNIVERSITY, LUCKNOW**

Study and Evaluation Scheme  
**B.TECH. BIO-TECHNOLOGY**  
 [Effective from the session 2009-10]

YEAR 2<sup>nd</sup> , SEMESTER-III

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
<b>THEORY SUBJECTS</b>											
1.	ECH-301	Fluid Flow & Solid Handling	3	1	0	30	20	50	100	150	4
2.	EAS-302/ EOE-031 / EOE038	Statistical Techniques/Science Based Open Electives	3	1	0	30	20	50	100	150	4
3.	EHU-301 / EHU302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
4.	EBT-301	Biochemistry	3	1	0	30	20	50	100	150	4
5.	EBT-302	Microbiology & Cell Biology	3	1	0	30	20	50	100	150	4
6.	EBT-303	Molecular Dynamics & Bioenergetics	3	1	0	30	20	50	100	150	4
7.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
<b>PRACTICAL/DESIGN/DRAWING</b>											
8.	EBT-351	Fluid Mechanics Lab	0	0	2	10	10	20	30	50	1
9.	EBT-352	Biochemistry Lab	0	0	2	10	10	20	30	50	1
10.	EBT-353	Microbiology Lab	0	0	2	10	10	20	30	50	1
11.	EBT-354	Cell Biology Lab	0	0	2	10	10	20	30	50	1
12.	GP 301	General Proficiency	-	-	-	-	-	50	-	50	1
		<b>Total</b>	-	-	-	-	-	-	-	<b>1000</b>	<b>26</b>

\* Human Values & Professional Ethics will be offered as compulsory Audit Course for which passing marks are 40% in theory & 50% in aggregate. Students will be required to audit it within the period of his/her study. There will not be carry over in this course and a failure student will require to repeat this course.

**Science Based Open Electives :**

Paper Code	Name
EOE-031/EOE-041	Introduction to Soft Computing (Neural Networks, Fuzzy Logic and Genetic Algorithm)
EOE-032/EOE-042	Nano Sciences
EOE033/EOE-043	Laser Systems and Applications
EOE-034/EOE-044	Space Sciences
EOE035/EOE-045	Polymer Science & Technology
EOE-036/EOE-046	Nuclear Science
EOE037/EOE/047	Material Science
EOE-038/EOE-048	Discrete Mathematics

**U.P. TECHNICAL UNIVERSITY, LUCKNOW**  
**Study and Evaluation Scheme**  
**B.TECH. BIO-TECHNOLOGY**  
**[Effective from the session 2009-10]**

YEAR 2<sup>nd</sup> , SEMESTER-IV

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	SESSIONAL EXAM.			ESE		
						CT	TA	Total			
<b>THEORY SUBJECTS</b>											
1.	EHU-402/ EHU-401	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
2.	EOE-041- EOE-048/ EAS-402	Science Based Open Electives / Statistical Techniques	3	1	0	30	20	50	100	150	4
3.	EBT-401	Enzyme Engineering	3	1	0	30	20	50	100	150	4
4.	EBT-402	Immunology	3	1	0	30	20	50	100	150	4
5.	EBT-403	Genetics & Molecular Biology	3	1	0	30	20	50	100	150	4
6.	EBT-404	Bioinformatics-I	3	1	0	30	20	50	100	150	4
7.	EHU-111	*Human Values & Professional Ethics	2	2	0	30	20	50	100	150	-
<b>PRACTICAL/DESIGN/DRAWING</b>											
8.	EBT-451	Immunology Lab	0	0	3	10	10	20	30	50	1
9.	EBT-452	Molecular Biology Lab	0	0	3	10	10	20	30	50	1
10.	EBT-453	Bioinformatics-I Lab	0	0	2	5	5	10	15	25	1
11.	GP 401	General Proficiency	-	-	-	-	-	50	-	50	1
		<b>Total</b>	-	-	-	-	-	-	-	<b>1000</b>	<b>26</b>

**U.P. TECHNICAL UNIVERSITY, LUCKNOW**

Study and Evaluation Scheme  
**B.TECH. BIO-TECHNOLOGY**  
 [Effective from the session 2010-11]

YEAR 3<sup>rd</sup> , SEMESTER-V

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	SESSIONAL EXAM.			ESE		
						CT	TA	Total			
<b>THEORY SUBJECTS</b>											
1.	EHU-501	Engineering and Managerial Economics	3	1	0	30	20	50	100	150	3
2.	ECS-	Data Structure and Algorithm	3	1	0	30	20	50	100	150	4
3.	EBT-501	Genetic Engineering	3	1	0	30	20	50	100	150	4
4.	EBT-502	Bio-Informatics-II	2	1	0	15	10	25	50	75	3
5.	EBT-503	Bioprocess Engineering-I	2	1	0	15	10	25	50	75	3
6.	EBT-504	Modern Analytical Techniques	3	1	0	30	25	50	100	150	4
7.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
<b>PRACTICAL/DESIGN/DRAWING</b>											
8.	EBT-551	Genetic Engineering Lab	0	0	3	10	10	20	30	50	1
9.	EBT-552	Bioinformatics-II Lab	0	0	2	10	10	20	30	50	1
10.	EBT-553	Bioprocess Engineering Lab	0	0	2	10	10	20	30	50	1
11.	EBT-554	Analytical Techniques Lab	0	0	3	10	10	20	30	50	1
12.	GP 501	General Proficiency	-	-	-	-	-	50	-	50	1
		<b>Total</b>	-	-	-	-	-	-	-	<b>1000</b>	<b>26</b>

**U.P. TECHNICAL UNIVERSITY, LUCKNOW**

Study and Evaluation Scheme  
**B.TECH. BIO-TECHNOLOGY**  
 [Effective from the session 2010-11]

YEAR 3<sup>rd</sup>, SEMESTER-VI

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	SESSIONAL EXAM.			ESE		
						CT	TA	Total			
<b>THEORY SUBJECTS</b>											
1.	EHU-601	Industrial Management	3	0	0	30	20	50	100	150	3
2.	EBT-011- EBT-013	Departmental Elective-I	3	1	0	30	20	50	100	150	4
3.	EBT-021- EBT-023	Departmental Elective-II	2	1	0	15	10	25	50	75	3
4.	EBT-601	Fermentation Biotechnology	3	1	0	30	20	50	100	150	4
5.	EBT-602	Food Biotechnology	3	1	0	30	20	50	100	150	4
6.	ECH-	Heat & Mass Transfer	3	1	0	30	20	50	100	150	4
7.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
<b>PRACTICAL/DESIGN/DRAWING</b>											
8.	EBT-651	Fermentation Biotechnology Lab	0	0	3	10	10	20	30	50	1
9.	EBT-652	Food Biotechnology Lab	0	0	3	10	10	20	30	50	1
10.	ECH-	Heat Transfer Lab	0	0	2	5	5	10	15	25	1
11.	GP 601	General Proficiency	-	-	-	-	-	50	-	50	1
		<b>Total</b>	-	-	-	-	-	-	-	<b>1000</b>	<b>26</b>

**U.P. TECHNICAL UNIVERSITY, LUCKNOW**  
**Study and Evaluation Scheme**  
**B.TECH BIO-TECHNOLOGY**  
**[Effective from the session 2011-12]**

YEAR 4<sup>th</sup> , SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	SESSIONAL EXAM.			ESE		
						CT	TA	Total			
<b>THEORY SUBJECTS</b>											
1.	EOE-071- EOE-074	Open Elective-I	3	1	0	30	20	50	100	150	4
2.	EBT-031- EBT-033	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	EBT-041- EBT-043	Departmental Elective-IV	3	1	0	30	20	50	100	150	4
4.	EBT-701	Down Stream Processing	3	1	0	30	20	50	100	150	4
5.	EBT-702	Bioethics, Biosafety & IPR	3	0	0	30	20	50	100	150	4
6.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
<b>PRACTICAL/DESIGN/DRAWING</b>											
7.	EBT-751	Down Stream Processing Lab	0	0	3	-	20	20	30	50	1
8.	EBT-752	Project	0	0	3	-	50	50	-	50	2
9.	EBT-753	Seminar	0	0	2	-	50	50	-	50	1
10.	EBT-754	Industrial Training Viva-Voce	0	0	2	-	50	50	-	50	1
11.	GP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		<b>Total</b>	<b>15</b>	<b>3</b>	<b>10</b>	<b>150</b>	<b>270</b>	<b>470</b>	<b>530</b>	<b>1000</b>	<b>26</b>

**Open Electives-I**

EOE-071      Entrepreneurship Development  
EOE-072      Quality Management  
EOE-073      Operation Research  
EOE-074      Introduction to Biotechnology

**U.P. TECHNICAL UNIVERSITY, LUCKNOW**  
**Study and Evaluation Scheme**  
**B.TECH BIO-TECHNOLOGY**  
**[Effective from the session 2011-12]**

YEAR 4<sup>th</sup>, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	SESSIONAL EXAM.			ESE		
						CT	TA	Total			
<b>THEORY SUBJECTS</b>											
1.	EOE-081- EOE-084	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	EBT-051- EBT-053	Departmental Elective-V	3	1	0	30	20	50	100	150	4
3.	EBT-061- EBT-063	Departmental Elective-VI	3	1	0	30	20	50	100	150	4
4.	EBT-801	Genomics & Proteomics	3	0	3	30	20	50	100	150	3
5.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
<b>PRACTICAL/DESIGN/DRAWING</b>											
6.	EBT-851	Project	0	0	12	-	100	100	250	350	8
7.	GP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		<b>Total</b>	<b>12</b>	<b>3</b>	<b>12</b>	<b>120</b>	<b>180</b>	<b>350</b>	<b>650</b>	<b>1000</b>	<b>24</b>

**Open Electives-II**

**Paper Code**

**Name**

EOE-081	Non Conventional Energy Resources
EOE-082	Non Linear Dynamic System
EOE-083	Product Development
EOE-084	Automation and Robotics

**B.TECH. BIOTECHNOLOGY**  
**List of Departmental Electives**

**Elective-I**

<b>S.No.</b>	<b>Paper Code</b>	<b>Name</b>
1.	EBT-011	Pharmacoinformatics
2.	EBT-012	Plant Biotechnology
3.	EBT-013	Bioprocess Engineering-II

**Elective-II**

1.	EBT-021	Protein Engineering
2.	EBT-022	Biochemical Reaction Engineering
3.	EBT-023	Biomedical Instrumentation & Measurements

**Elective-III**

1.	EBT-031	Immunoinformatics
2.	EBT-032	Animal Biotechnology
3.	EBT-033	Metabolic Engineering

**Elective-IV**

1.	EBT-041	Insilico Drug Designing
2.	EBT-042	Nanobiotechnology
3.	EBT-043	Bioreactor Analysis & Design

**Elective-V**

1.	EBT-051	Agriculture Biotechnology
2.	EBT-052	Economics of Biotechnology
3.	EBT-053	Secondary Metabolites

**Elective-VI**

1.	EBT-061	Immunodiagnosics
2.	EBT-062	Medical Biotechnology
3.	EBT-063	Environmental Biotechnology

## **EBT-101 : Elementary Mathematics –I**

### **UNIT-I: CALCULUS**

#### **Limits and Derivatives:**

Derivative introduced as rate of change both as that of distance function and geometrically, intuitive idea of limit. Definition of derivative, relate it to slope of tangent of the curve, derivative of sum, difference, product and quotient of functions. Derivatives of polynomial and trigonometric functions.

#### **UNIT-II :**

**Continuity and Differentiability:** Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concept of exponential and logarithmic functions and their derivative. Logarithmic differentiation. Derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations.

#### **Applications of Derivatives:**

Applications of derivatives: rate of change, increasing/decreasing functions, tangents & normals, approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).

#### **UNIT – III :**

**Integrals:** Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, only simple integrals of the type to be evaluated. Definite integrals as a limit of a sum, Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

**Applications of the Integrals:** Applications in finding the area under simple curves, especially lines, areas of circles/parabolas/ellipses (in standard form only), area between the two above said curves (the region should be clearly identifiable).

#### **UNIT –IV : Differential Equations**

Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equations by method of separation of variables, homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type:  $py = q$ , where  $p$  and  $q$  are functions of  $x$ .

#### **UNIT –V : PROBABILITY**

Random experiments: outcomes, sample spaces (set representation). Events: occurrence of events, 'not', 'and' and 'or' events, exhaustive events, mutually exclusive events Axiomatic (set theoretic) probability, connections with the theories of earlier classes. Probability of an event, probability of 'not', 'and' & 'or' events. Multiplication theorem on probability. Conditional probability, independent events, total probability, Baye's theorem, Random variable and its probability distribution, mean and variance of haphazard variable. Repeated independent (Bernoulli) trials and Binomial distribution.

#### ***Recommended Textbooks.***

- 1) Mathematics Part I - Textbook for Class XI, NCERT Publication
- 2) Mathematics Part II - Textbook for Class XI, NCERT Publication

#### ***Recommended Textbooks.***

- 1) Mathematics Part I - Textbook for Class XII, NCERT Publication
- 2) Mathematics Part II - Textbook for Class XII, NCERT Publication

#### **Reference books:**

- 1) Higher engineering mathematics by B.V.Ramana (Tata Macgraw Hill)
- 2) Advanced modern engineering mathemtics by Glyn james ( pearson education)

## **EBT-102 : Remedial Biology –I**

### **UNIT -I**

#### **Diversity in Living World**

Diversity of living organisms Classification of the living organisms (five kingdom classification, major groups and principles of classification within each kingdom).

Systematics and binomial System of nomenclature.

### **UNIT -II**

Salient features of animal and plant classification, viruses, viroids, lichens, Botanical gardens, herbaria, zoological parks and museums.

### **UNIT -III**

#### **Structural Organisation**

Tissues in animals and plants. Morphology, anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence, flower, fruit and seed.

### **UNIT - IV**

#### **Cell: Structure and Function**

Cell: Cell theory; Prokaryotic and eukaryotic cell, cell wall, cell membrane. Nucleus and nuclear organization. Mitosis, meiosis, cell cycle (elementary idea). Basic chemical constituents of living bodies.

### **UNIT - V**

#### **Plant Physiology**

Movement of water, food, nutrients and gases, Respiration, Photosynthesis, Plant growth and development.

#### ***Recommended Textbooks.***

1) Biology - Textbook for Class XI, NCERT Publication

*Recommended Textbooks.*

1) Biology - Textbook for Class XII, NCERT Publication

#### **Reference book:**

Biology by Peter H Raven, George B Johnson, Kenneth A. Mason, Jonathan Losos, Susan Singer (Macgraw Hill)

## **EAS-101 : ENGINEERING PHYSICS-I**

<b>L</b>	<b>T</b>	<b>P</b>
<b>2</b>	<b>1</b>	<b>0</b>

### **Unit – I**

#### **Relativistic Mechanics:**

Inertial & non-inertial frames, Michelson- Morley experiment, Einsteins postulates. Lorentz transformation equations. Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity Mass energy equivalence.

06 Hrs.

### **Unit - II**

#### **Optics:**

**Interference:** Interference of light, Biprism experiment, displacement of fringes, Interference in thin films- wedge shaped film, Newton's rings,

**Diffraction** - Single, Double & N- Slit, Diffraction grating, Grating spectra, Rayleigh's criterion and resolving power of grating.

10 Hrs.

### **Unit - III**

**Polarization-** Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Fresnel's theory of optical activity, Polarimeters .

**Laser:** Spontaneous and stimulated emission of radiation, Einstein's Coefficients, construction and working of Ruby, He-Ne lasers and laser applications.

08 Hrs.

### **Unit – IV**

#### **Fiber Optics and Holography**

Fundamental ideas about optical fiber, Types of fibers, Acceptance angle and cone, Numerical aperture, Propagation mechanism and communication in optical fiber. Attenuation, Signal loss in optical fiber and dispersion.

Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

06 Hrs.

#### **Reference Books:**

- |   |   |  |
|---|---|--|
| (i) Concepts of Modern Physics                    | - | Aurthur Beiser (Mc-Graw Hill)                          |
| (ii) Introduction to Special theory of Relativity | - | Robert Resnick - Wiely                                 |
| (iii) Optics                                      | - | Ajoy Ghatak (TMH)<br>Brijlal & Subramanian (S. Chand ) |
| (iv) Optical Fibre & Laser                        | - | Anuradha De. ( New Age )                               |
| (v) Fundamental of Physics                        | - | Resnick, Halliday & Walker (Wiely )                    |
| (vi) Principles of Physics                        | - | R.A. Serway & J.W. Jewett<br>(Thomson Asia Pvt. Ltd.)  |

### **EAS102/EAS202 : ENGINEERING CHEMISTRY**

<b>L</b>	<b>T</b>	<b>P</b>
<b>3</b>	<b>1</b>	<b>0</b>

#### **UNIT-I : CHEMICAL BONDING AND STATES OF MATTER**

M.O. theory and its applications in diatomic molecules. Hydrogen bond, metallic bond and their applications. Various states of matter including liquid crystallite state, classification and applications of liquid crystals. Types of unit cell, space lattice (only cubes, Bragg's Law. Calculation and density of the unit cell, one and two dimensional solids such as graphite and its conduction properties. Fullerenes and their applications.

## **UNIT-II: REACTION KINETICS, PHASE RULE AND ELECTROCHEMISTRY**

Order and molecularity of reactions, Zero order, first order and second order reactions. Integrated rate equations. Theories of reaction rates. Phase rule and its applications to one component system (water). Equilibrium potential, electrochemical cells, galvanic and concentration cells, electrochemical theory of corrosion and protection of corrosion. Fuel cells.

## **UNIT-III : STRUCTURAL AND MECHANISTIC CONCEPTS OF ORGANICS**

Inductive, electromeric mesomeric and hyperconjugative effects. Stability of reaction intermediates e.g. carbocation and free radicals. Mechanism of nucleophilic substitutions. Mechanism of the following reactions:

- (i) Aldol condensation
- (ii) Cannizaro reaction
- (iii) Beckman rearrangement
- (iv) Hoffmann rearrangement and
- (v) Diels-Alder reaction.

E-Z nomenclature, R.S. configuration, optical isomerism, chirality and its implications, conformations of butene.

## **UNIT-IV : POLYMERS AND ORGANOMETALLICS**

Polymerization and its classification. Thermoplastic and Thermosetting resins. Elastomers and synthetic fibres. Ion exchange resins. Organic conducting and biodegradable polymers. Classification and general methods of synthesis of organics and their applications in polymerizations and catalysis.

## **UNIT-V : ANALYTICAL METHODS AND FUELS**

Titrimetric analysis with reference to acid-base, redox, precipitations and complexometric titrations. Elementary ideas and simple applications of u.v., visible, infra-red and <sup>1</sup>H NMR spectral techniques. Water treatment methods for boiler feed water by calgon process, zeolites and ion-exchange resins. Classification of fuels. Analysis of coal, determination of calorific values. Biomass and biogas.

### **Text Books**

1. Advanced Inorganic Chemistry, by Cotton, F.A., Wilkinson G., Murrillo, C.A. and Bochmann, Wiley, Chichester, 1999.
2. March's Advanced Organic Chemistry : Reactions, Mechanisms and Structure Smith, Michael B./March, Jerry, John Willey & sons, 6<sup>th</sup> Edition, 2007.

3. Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005.
4. Organic Chemistry, Finar, I.L. : Addison – Wesley Longman, Limited, 2004.

#### Reference Books

1. Text Book of Polymer Science by F.W. Billmeyer, John Wiley & sons, 1994.
2. Liquid Crystals and Plastic Crystals, vol.-I, edited by G.W. Gray and P.A. Winsor, Ellis Harwood Series in Physical Chemistry, New York.
3. Corrosion Engineering by M.G. Fontana McGraw Hill Publications.

### EME-102 / EME-202 : ENGINEERING MECHANICS

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#### UNIT I

**Two Dimensional Force Systems:** Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position , Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Distributed force system, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications. 5

**Friction:** Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction, Application. 3

#### UNIT II

**Beam:** Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beams. 5

**Trusses:** Introduction, Simple Truss and Solution of Simple truss, Method of Joints and Method of Sections. 3

#### UNIT III

**Centroid and Moment of Inertia:** Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry. 6

#### UNIT IV

**Kinematics of Rigid Body:** Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion, Relative Velocity. 4

**Kinetics of Rigid Body:** Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium. 4

#### UNIT V

**Simple Stress and Strain:** Introduction, Normal and Shear stresses, Stress- Strain Diagrams for ductile and brittle material, Elastic Constants, One Dimensional Loading of members of varying cross-sections, Strain energy. 3

**Pure Bending of Beams:** Introduction, Simple Bending Theory, Stress in beams of different cross sections. 3

**Torsion:** Introduction, Torsion of shafts of circular section, torque and twist, shear stress due to torque. 3

#### Text books:

1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
3. Mechanics of Materials by E.P.Popov, Prentice Hall of India Private Limited.

## EBT -103/ EBT-203 : Basic Electrical and Electronics Engineering

### Unit-I

6

#### **D C Circuit Analysis and Network Theorems:**

Circuit Concepts: Concepts of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear element transformation.

Kirchhoff's laws; loop and nodal methods of analysis

**Network Theorems:** Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem

### Unit-2

6

**Electrical machines:** Principles of electro mechanical energy conversion,

DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics and applications of dc motors

Single phase induction motor : Principle of operation and introduction to methods of starting applications.

### Unit-3

14

#### **Semiconductor Diodes and Applications:**

p-n junction, depletion layer, diode ratings (average current, repetitive peak current, peak-inverse voltage) p-n junction as rectifiers (half wave and full wave) filter (Shunt capacitor filter), clipping circuits, clamping circuits, Zener Diode.

#### **Bipolar Junction Transistor (BJT):**

basic construction, transistor action, CB, CE and CC configurations, input/ output characteristics, Different types of transistor biasing

**JFET:** Basic construction, principle of working, concept of pinch-off maximum drain saturation current, input and transfer characteristics characteristic equation, CG, CS and CD configurations, fixed and self biasing of JFET amplifier

### Unit-4

10

#### **Switching Theory and logic design:**

number system, conversion of bases (decimal, binary, octal and hexadecimal numbers) addition and subtraction, BCD numbers, Boolean algebra, logic gates, concept of universal gates canonical forms, minimization using K-map

### Unit-5

4

#### **Electrical Instruments:**

Types of instruments, construction and working principles of PMMC and moving iron type voltmeters & ammeters, single phase dynamometer wattmeter and induction type energy meter.

#### **Electronics Instruments:**

working principle of digital voltmeter, digital multimeter (block diagram approach) CRO (its working with block diagram) measurement of voltage, current, phase and frequency using CRO

#### **Text Books and Reference Books:**

- 1) Robert L. Boylestad/ Louis Nashelsky "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education
- 2) Devid A. Bell "Electronic Devices and Circuits", 5th Edition, OXFORD University Press 2008
- 3) Morris Mano "Digital Computer Design", PHI 2003
- 4) H.S. Kalsi "Electronic Instrumentation", 2nd Edition, TMH 2007
- 5) D.E. Fitzgerald & A. Grabel Higginbotham, " Basic Electrical Engineering "
- 6) I.J. Nagarath, " Basic Electrical Engineering" Tata McGraw Hill

## ECS-101/ECS-201 : COMPUTER CONCEPTS AND PROGRAMMING IN C

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### UNIT 1:

Introduction to any Operating System [Unix, Linux, Windows], Programming Environment, Write and Execute the first program, Introduction to the Digital Computer; Concept of an algorithm; termination and correctness. Algorithms to programs: specification, top-down development and stepwise refinement. Introduction to Programming, Use of high level programming language for the systematic development of programs. Introduction to the design and implementation of correct, efficient and maintainable programs, Structured Programming, Trace an algorithm to depict the logic, Number Systems and conversion methods

### UNIT 2:

Standard I/O in "C", **Fundamental Data Types and Storage Classes:** Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, **Operators and Expressions:** Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity,

### UNIT 3:

**Conditional Program Execution:** Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, **Program Loops and Iteration:** Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue, **Modular Programming:** Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules.

### UNIT 4:

**Arrays:** Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size, **Structures:** Purpose and usage of structures, declaring structures, assigning of structures, **Pointers to Objects:** Pointer and address arithmetic, pointer operations and declarations, using pointers as function arguments, Dynamic memory allocation, defining and using stacks and linked lists.

### UNIT 5:

Sequential search, Sorting arrays, Strings, Text files, **The Standard C Preprocessor:** Defining and calling macros, utilizing conditional compilation, passing values to the compiler, **The Standard C Library:** Input/Output : fopen, fread, etc, string handling functions, Math functions : log, sin, alike Other Standard C functions.

#### Lecture-wise Break-UP

Week	Lecture 1	Lecture 2	Lecture 3	Lab Meeting
Week-1	Introduction to any OS, Programming Environment	A Simple C program	Need of Datastructures & Algorithms	Get familiar with OS and Environment.
Week-2	An Example,	Different Types of	Number Systems	Get familiar with C

	Termination, Correctness	Programming Languages		compiler Implement and Test Small Routine in C
Week-3	Number Systems	Standard I/O in C	Data Types and Variables	Implement and Test Small Routine in C
Week-4	Data Types and Variable	Data Types and Variable	Operators & Expression	Evaluation of Expression
Week-5	Operators & Expression	Operators & Expression	Operators & Expression	Evaluation of Expression
Week-6	IF, SWITCH Statements	IF, SWITCH Statements	Nested If Statement	Iteration
Week-7	Repetition structure in C	Repetition structure in C	Modular Programming	Iteration, Function
Week-8	Modular Programming	Modular Programming	Arrays	Recursion, Function
Week-9	Arrays	Structures	Structures	Arrays, Structures
Week-10	Pointers	Pointers	Pointers	Linked Lists
Week-11	Searching	Selection	Sorting	Searching, Selection
Week-12	Sorting	Strings	Strings	Sorting, Strings
Week-13	Files	Files	Std C Preprocessor	Files
Week-14	Std C Library	Std C Library	Std C Library	Use of Std. C Library

**Text Books :**

1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B.Koffman, Pearson Addison-Wesley, 2006.
2. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition [India Edition], 2007

**EBT -104/ EBT -204 : Introduction to Biotechnology**

**Unit I**

**Introduction to Biotechnology**

Fundamentals of Biochemical Engineering, Biotechnology and Society. Principles and Processes; Application in Health, food, medicine and Agriculture; genetically modified (GM) organisms; biosafety issues.

**Unit II**

**Biomolecules**

Building Blocks of Biomolecules-Structure and dynamics. Structure and function of Macromolecules (Carbohydrates, Proteins ,Lipids). Classification of Enzymes; Purification and characterization of enzymes from natural sources. Comparison of chemical and enzyme catalysis.

**Unit III**

Cell as a basic unit of life. Introduction: Definition, Study of Microbes, Types of microbes, Classification of microbes. Origin of microbiology. Application of microbes in fermentation Biotechnology. Cellular Techniques including chromatography.

## Unit IV

History of Bioinformatics. Introduction and application. Biological databases ( nucleotide and protein data bases, Structure databases) and their retrieval.. Sequence file formats . Information Sources Analysis using Bioinformatics tools.

## Unit V

### Genomics

Introduction Genome Sequencing Projects, Gene Prediction and counting, Genome similarity, SNP's and comparative genomics.

### TEXT BOOKS:

1. Text book of Biotechnology by H.K.Dass ( Wiley India publication)
2. Biotechnology by B.D.Singh (Kalyani Publishers)
3. Text book of Biotechnology by R.C.Dubey ( S.Chand and company)

### Reference books:

- 1) Introduction to Biotechnology by William J. Thieman, Michael A. Palladino, Publisher: Benjamin Cummings
- 2) Basic Biotechnology by Colin Ratledge Publisher: Cambridge University Press

## EAS-104/EAS-204 : PROFESSIONAL COMMUNICATION

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### Unit -1 Basics of Technical Communication

Technical Communication: features; Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of Communication: Downward, Upward, Lateral or Horizontal (Peer group); Importance of technical communication; Barriers to Communication.

5

### Unit - II Constituents of Technical Written Communication

Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods -Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation- various steps.

8

### Unit - III Forms of Technical Communication

Business Letters: Sales and Credit letters; Letter of Enquiry; Letter of Quotation, Order, Claim and Adjustment Letters; Job application and Resumes.

Official Letters: D.O. Letters; Govt. Letters, Letters to Authorities etc.

Reports: Types; Significance; Structure, Style & Writing of Reports.

Technical Proposal; Parts; Types; Writing of Proposal; Significance.

Technical Paper, Project. Dissertation and Thesis Writing: Features, Methods & Writing.

10

### Unit - IV Presentation Strategies

Defining Purpose; Audience & Locale; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Space; Setting Nuances of Voice Dynamics; Time-Dimension.

7

### Unit - V Value- Based Text Readings

Following essays form the suggested text book with emphasis on Mechanics of writing,

- (i) The Aims of Science and the Humanities by M.E. Prior
- (ii) The Language of Literature and Science by A.Huxley
- (iii) Man and Nature by J.Bronowski
- (iv) The Mother of the Sciences by A.J.Bahm
- (v) Science and Survival by Barry Commoner
- (vi) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
- (vii) The Effect of Scientific Temper on Man by Bertrand Russell.

10

### Text Book

1. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, New Delhi .
2. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press 2007, New Delhi.

### Reference Books

1. Effective Technical Communication by Barun K. Mitra, Oxford Univ. Press, 2006, New Delhi
2. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., New Delhi.
3. How to Build Better Vocabulary by M.Rosen Blum, Bloomsbury Pub. London.
4. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors; Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Banerji- Macmillan India Ltd. Delhi.
6. Manual of Practical Communication by L.U.B. Pandey & R.P. Singh; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, Delhi.

## EME-101/EME-201 : MANUFACTURING PROCESSES

### Unit-I Basic Metals & Alloys : Properties and Applications

**Properties of Materials:** Strength, elasticity, stiffness, malleability, ductility, brittleness, toughness and hardness. Elementary ideas of fracture, fatigue & creep. 2

**Ferrous Materials:** Carbon steels, its classification based on % carbon as low, mild, medium & high carbon steel, its properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel. Elementary introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching & tempering and case-hardening. 3

**Non-Ferrous metals & alloys:** Common uses of various non-ferrous metals & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys such as Duralumin. 2

### Unit-II Introduction to Metal Forming & Casting Process and its applications

**Metal Forming:** Basic metal forming operations & uses of such as : Forging , Rolling , Wire & Tube-drawing/making and Extrusion, and its products/applications. Press-work, & die & punch assembly, cutting and forming, its applications. Hot-working versus cold-working. 4

**Casting:** Pattern & allowances. Molding sands and its desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses. 3

### Unit-III Introduction to Machining & Welding and its applications

**Machining:** Basic principles of Lathe-machine and operations performed on it. Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding. 4

**Welding:** Importance & basic concepts of welding, classification of welding processes. Gas-welding, types of flames. Electric-Arc welding. Resistance welding. Soldering & Brazing and its uses. 3

**Unit-IV Misc. Topics**

**Manufacturing:** Importance of Materials & Manufacturing towards Technological & Socio-Economic developments. Plant location. Plant layout – its types. Types of Production. Production versus Productivity. 3

**Non-Metallic Materials:** Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials. 2

**Misc. Processes:** Powder-metallurgy process & its applications, Plastic-products manufacturing, Galvanizing and Electroplating. 2

**EAS105/EAS205 : ENVIRONMENT & ECOLOGY**

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**UNIT-I**

Definition, Scope & Importance, Need For Public Awareness- Environment definition, Eco system – Balanced ecosystem, Human activities – Food, Shelter, Economic and social Security. 3

Effects of human activities on environment-Agriculture, Housing, Industry, Mining and Transportation activities, Basics of Environmental Impact Assessment. Sustainable Development. 3

**UNIT-II**

Natural Resources- Water Resources- Availability and Quality aspects. Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth, Material cycles- Carbon, Nitrogen and Sulphur Cycles. 4

Energy – Different types of energy, Electro-magnetic radiation. Conventional and Non-Conventional sources – Hydro Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Bio-gas. Hydrogen as an alternative future source of Energy. 4

**UNIT-III**

Environmental Pollution and their effects. Water pollution, Land pollution. Noise pollution, Public Health aspects, Air Pollution, Solid waste management. 3

**Current Environmental Issues of Importance :** Population Growth, Climate Change and Global warming- Effects, Urbanization, Automobile pollution. 3

Acid Rain, Ozone Layer depletion, Animal Husbandry. 3

## UNIT-IV

Environmental Protection- Role of Government, Legal aspects, Initiatives by Non-governmental Organizations (NGO), Environmental Education, Women Education.

3

### Text Books

1. Environmental Studies – Benny Joseph – Tata McgrawHill-2005
2. Environmental Studies – Dr. D.L. Manjunath, Pearson Education-2006.
3. Environmental studies – R. Rajagopalan – Oxford Publication - 2005.
4. Text book of Environmental Science & Technology – M. Anji Reddy – BS Publication..

### Reference Books

1. Principles of Environmental Science and Engineering – P. Venugoplan Rao, Prentice Hall of India.
2. Environmental Science and Engineering – Meenakshi, Prentice Hall India.

## EAS-109 : REMEDIAL ENGLISH LANGUAGE

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### Unit -1 Basic Applied Grammar and Usage

The Sentences; Kinds of Sentences; Kinds of Phrases; Parts of Speech: Noun: Kinds, Gender; Case; Usage: Rules for Singular Nouns, Nouns in Plural form but Singular in sense etc. Nouns ending in - ics. Nouns ending in - es etc;

Pronoun: Definition, Kinds; Number, Gender, Person, Usage.

Adjectives and Determiners: Kinds, Position; Comparatives and Superlatives,

Conversion of Adjectives as Nouns, as adverbs, as Verbs. Determiners- Kinds. Usage of Adjectives and Determiners.

Articles: Kinds, Articles and Number System, Articles and Gender System, Omission of Articles, Repetition of Articles.

Adverbs: Kinds; Formation, Position of Adverbs, Degree of Comparison, Usage.

Preposition: Kinds, Prepositions and Adverbial Participles, Position; correct Usage, Meaning & Usage.

Verbs: Kinds; Auxiliaries; Principal Auxiliaries: Usage; Be, Have, Do, Modal

auxiliaries: Usage- Can/Could, May/Might; Must; Shall/Should; Will/Would; Ought to, Semi-Modals- Need; Dare; Used to.

Non-Finite Verbs: Kinds of Non-Finite: Infinitives, Gerund; Participle.

Concord: Of Numbers, Of Person. Exceptions to Grammatical; Concord; Concord System.

Conjunction: Coordinating Conjunction; Subordinating Conjunction.

Interjection: Definition, Types.

Mood: Indicative, Imperative, Subjunctive.

Active and Passive Voice.

Conditional Sentences.

10

### **Unit - II The Structure of Sentences/Clauses**

Adverb Clause; Adjective Clause; Noun Clause. Sentences: Simple, Double, Multiple and Complex. Transformation of Sentences:

Simple to complex and vice versa; Transformation of Degree; Simple to Compound and vice versa; Interrogative into Assertive; Affirmative into Negative and vice versa:

Transformation of Statement into Exclamation. Sequence of Tenses: Usage.

8

### **Unit - III Paragraph Writing**

Structure of Paragraph; Construction of Paragraph; Techniques of Paragraph Writing, Unity; Coherence; Emphasis. Expansion: Definition, Method of Expansion; Making of Expansion. Paraphrasing : Use of Paraphrasing; Exercises.

5

### **Unit - IV Comprehension & Precis Writing**

Role of Listening; Ear Training, Reading Comprehension; Reasons for poor Comprehension; Improving Comprehension Skills; Developing Skills of Comprehension; Exercises. Precis Writing: Difference from Comprehension; Techniques of Precis Writing; Topic Sentences and its Arrangement.

### **Short Essay Writing**

Definition of Essay; Types of Essay, Relevant Essay Writing for Engineers/Professionals; Use of Essay Writing,

Dimensions of Essay Writing : Literary, Scientific, Sociological: Contemporary Problem Solving Essays.

Horizons of Essay Writing: Narrative Essays; Descriptive Essays; Reflective Essays;

Expository Essays; Argumentative and Imaginative Essays. Exercise.

5

### **Text Book**

1. A Remedial Course in English for Colleges Books 1-3 by B.K. Das & A. David, Oxford Univ. Press, New Delhi.

### **Reference Books**

1. Current English Grammar and Usage with composition by R.P. Sinha, Oxford Univ. Press, New Delhi.
2. English Grammar, Composition and Usage by J.C. Nesfield, Macmillan India Ltd. Delhi.
3. Oxford Practice Grammar by John Eastwood, Oxford Univ. Press, New Delhi.
4. Fowler's Modern English Usage by R.W. Burchfield, O.U.P. New Delhi.
5. English Grammar & Composition by P.C. Wren & Martin, S. Chand & Co. Ltd., New Delhi.

## **EBT-201: Elementary Mathematics –II**

### **UNIT-I: ALGEBRA**

Statement of Fundamental Theorem of Algebra, solution of quadratic equations in the complex number system.

### **Linear Inequalities:**

Linear inequalities. Algebraic solutions of linear inequalities in one variable and their representation on the number line. Graphical solution of linear inequalities in two variables. Solution of system of linear inequalities in two variables- graphically.

### **UNIT –II: Permutations & Combinations:**

Fundamental principle of counting. Factorial  $n$ . ( $n!$ ) Permutations and combinations, derivation of formulae and their connections, simple applications.

#### **Sequence and Series:**

Sequence and Series. Arithmetic progression (A. P.). arithmetic mean (A.M.) Geometric progression (G.P.), general term of a G.P., sum of  $n$  terms of a G.P., geometric mean (G.M.), relation between A.M. and G.M. Sum to  $n$  terms of the special series  $n$ ,  $n^2$  and  $n^3$ .

### **UNIT-III: COORDINATE GEOMETRY**

#### **1. Straight Lines:**

Brief recall of 2D from earlier classes. Slope of a line and angle between two lines. Various forms of equations of a line: parallel to axes, point-slope form, slope-intercept form, twopoint form, intercepts form and normal form. General equation of a line. Distance of a point from a line.

#### **2. Conic Sections:**

Sections of a cone: circle, ellipse, parabola, hyperbola, a point, a straight line and pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse and hyperbola. Standard equation of a circle.

#### **3. Introduction to Three -dimensional Geometry**

Coordinate axes and coordinate planes in three dimensions. Coordinates of a point. Distance between two points and section formula.

### **UNIT-IV: VECTORS AND**

#### **1. Vectors:**

Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratios of vectors. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Scalar (dot) product of vectors, projection of a vector on a line. Vector (cross) product of vectors.

### **UNIT – V :THREE-DIMENSIONAL GEOMETRY**

#### **Three - dimensional Geometry:**

Direction cosines/ratios of a line joining two points. Cartesian and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes. (iii) a line and a plane. Distance of a point from a plane.

#### **Recommended Textbooks.**

- 1) Mathematics Part I - Textbook for Class XI, NCERT Publication
- 2) Mathematics Part II - Textbook for Class XI, NCERT Publication

#### **Recommended Textbooks.**

- 1) Mathematics Part I - Textbook for Class XII, NCERT Publication
- 2) Mathematics Part II - Textbook for Class XII, NCERT Publication

#### **Reference books:**

- 1) Higher engineering mathematics by B.V.Ramana (Tata Macgraw Hill)
- 2) Advanced modern engineering mathematics by Glyn james ( pearson education)

## **EBT-202 : Remedial Biology –II**

### **UNIT – I**

#### **Human Physiology-I**

Digestion and absorption. Breathing and respiration. Body fluids and circulation.

## UNIT-II

### Human Physiology-II

Neural control and coordination, chemical coordination and regulation

## UNIT – III

### Reproduction

Reproductive system in male and female, menstrual cycle, production of gametes, fertilization, embryo development.

## UNIT –IV

**Reproductive Health & human Welfare :** Population and birth control, sexually transmitted diseases, infertility. Cancer and AIDS. Adolescence and drug / alcohol abuse. Basic concepts of immunology, vaccines.

## UNIT -V

### Evolution

Evolution: Origin of life, theories and evidences, adaptive radiation, mechanism of Evolution, origin and evolution of man

#### **Recommended Textbooks.**

1) Biology - Textbook for Class XI, NCERT Publication

#### **Recommended Textbooks.**

1) Biology - Textbook for Class XII, NCERT Publication

#### **Reference books:**

- 1) Human anatomy and physiology by Marieb ( Pearson Education)
- 2) Textbook of human physiology by Chakraborty and Ghosh (2nd ed. Calcutta, The New Bookstall)
- 3) Human Physiology by Pocock and Richards (Oxford University press)

## EAS-201 : ENGINEERING PHYSICS- II

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### Unit - I

#### Wave Mechanics and X-ray Diffraction

Wave- particle duality, de-Broglie matter waves, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation – particle in one dimensional box.

Diffraction of X-rays by crystal planes, Bragg's spectrometer, Compton's effect. 10 Hrs.

### Unit – II

Dielectric and Magnetic Properties of Materials:

Dielectric constant and Polarization of dielectric materials, Types of Polarization (Polarizability) . Equation of internal fields in liquid and solid ( One- Dimensional), Clausius Mossotti-Equation, Ferro and Piezo electricity (Qualitative), Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Langevin's theory for dia and paramagnetic material, Phenomena of hysteresis and its applications.

**Ultrasonic:** Generation, detection and application of ultrasonics 08 Hrs.

### Unit-III

#### Electromagnetics

Displacement Current, Maxwell's Equations ( Integral and Differential Forms). Equation of continuity, EM- Wave equation and its propagation characteristics in free space and in conducting media, Poynting theorem and Poynting vectors. 06 Hrs.

### Unit-IV

#### Superconductivity and Science and Technology of Nanomaterials:

Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect ), Type I and Type II superconductors, Temperature dependence of critical field, BCS theory (Qualitative), High temperature superconductors. Characteristics of superconductors in superconducting state, Applications of Super-conductors.

Introduction to Nanomaterials- Basic principle of nanoscience and technology, creation and use of buckyballs, structure, properties and uses of Carbon nanotubes, Applications of nanotechnology. 06 Hrs.

#### Reference books:

- |    |                                   |   |  |
|----|-----------------------------------|---|--|
| 1- | Concept of Modern Physics         | - | by Beiser (Tata Mc-Graw Hill)                                    |
| 2- | Solid State Physics               | - | by C. Kittel, 7 <sup>th</sup> edition (Wiley Eastern)            |
| 3- | Materials Science and Engineering | - | by V. Raghavan (Prentice- Hall India)                            |
| 4- | Solid State Physics               | - | by S.O. Pillai, 5 <sup>th</sup> edition (New Age International ) |
| 5- | Nanotechnology                    | - | by Rechar Booker and Earl Boysen (Wiley Publishing )             |
| 6- | Introduction to Electrodynamics   | - | by David J. Griffith (PH I)                                      |

### EAS152/EAS-252 : ENGINEERING CHEMISTRY (PRACTICALS)

#### List of Experiments

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in bleaching powder.
5. Determination of iron content in the given water sample by Mohr's methods.
6. pH-metric titration.
7. Determination of Equivalent weight of iron by the chemical displacement method. The equivalent weight of copper is 63.5.
8. Viscosity of an addition polymer like polyester by Viscometer.

9. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KSCN as a colour developing agent and the measurements are carried out at  $\lambda_{\max}$  480nm.
10. Element detection and functional group identification in organic compounds.
11. Preparation of Bakelite resin.

**EME-152/252 : ENGINEERING MECHANICS LAB.**

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(Any 10 experiments of the following or such experiments suitably designed)

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a steel specimen.
2. To determine the compression test and determine the ultimate compressive strength for a specimen
3. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the toughness.
4. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine..
5. To study the slider-crank mechanism etc. of 2-stroke & 4-stroke I.C. Engine models.
6. Friction experiment(s) on inclined plane and/or on screw-jack.
7. Simple & compound gear-train experiment.
8. Worm & worm-wheel experiment for load lifting.
9. Belt-Pulley experiment.
10. Bending of simply-supported and cantilever beams for theoretical & experimental deflection.
11. Torsion of rod/wire experiment.
12. Experiment on Trusses.
13. Statics experiment on equilibrium
14. Dynamics experiment on momentum conservation
15. Dynamics experiment on collision for determining coefficient of restitution.
16. Experiment on Moment of Inertia.

**EEE151/EEE251 : ELECTRICAL ENGINEERING LABORATORY**

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**List of Experiments**

**Note : A minimum of 10 experiments from the following should be performed**

1. Verification of Kirchhoff's laws
2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor

4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor.
6. Determination of parameters of ac single phase series RLC circuit
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
8. To study speed control of dc shunt motor using (i) armature voltage control (ii) field flux control.
9. Determination of efficiency of a dc shunt motor by load test
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. To measure energy by a single phase energy meter and determine error.
12. To study P-N diode characteristics
13. To study full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.
14. To study various logic gates (TTL)
15. To study Operational Amplifier as Adder and Subtractor
16. To study transistor as a switch.

### **ECS 151/ECS 251 : COMPUTER PROGRAMMING LAB**

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**0 0 2**

Suggested Assignments to be conducted on a 3-hour slot. It will be conducted in tandem with the theory course so the topics for problems given in the lab are already initiated in the theory class. The topics taught in the theory course should be appropriately be sequenced for synchronization with the laboratory. A sample sequence of topics and lab classes for the topic are given below:

1. Familiarization of a computer and the environment and execution of sample programs
2. Expression evaluation
3. Conditionals and branching
4. Iteration
5. Functions
6. Recursion
7. Arrays
8. Structures
9. Linked lists
10. Data structures

Week	Lecture 1	Lecture 2	Lecture 3	Lab Meeting
Week-1	Introduction to any OS, Programming Environment	A Simple C program	Need of Datastructures & Algorithms	Get familiar with OS and Environment.
Week-2	An Example, Termination, Correctness	Different Types of Programming Languages	Number Systems	Get familiar with C compiler Implement and Test Small Routine in C
Week-3	Number Systems	Standard I/O in C	Data Types and Variables	Implement and Test Small Routine in C
Week-4	Data Types and Variable	Data Types and Variable	Operators & Expression	Evaluation of Expression
Week-5	Operators & Expression	Operators & Expression	Operators & Expression	Evaluation of Expression
Week-6	IF, SWITCH Statements	IF, SWITCH Statements	Nested If Statement	Iteration
Week-7	Repetition structure in C	Repetition structure in C	Modular Programming	Iteration, Function
Week-8	Modular Programming	Modular Programming	Arrays	Recursion, Function
Week-9	Arrays	Structures	Structures	Arrays, Structures
Week-10	Pointers	Pointers	Pointers	Linked Lists
Week-11	Searching	Selection	Sorting	Searching, Selection
Week-12	Sorting	Strings	Strings	Sorting, Strings
Week-13	Files	Files	Std C Preprocessor	Files
Week-14	Std C Library	Std C Library	Std C Library	Use of Std. C Library

It is suggested that some problems related to continuous domain problems in engineering and their numerical solutions are given as laboratory assignments. It may be noted that some of basic numerical methods are taught in the Mathematics course.

### EWS-151/EWS-251 : WORKSHOP PRACTICE

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0 1 3

- Carpentry Shop:** 1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane.  
3. To prepare half-lap corner joint, mortise & tennon joints. 4. Simple exercise on woodworking lathe.
- Fitting Bench Working Shop:** 1. Study of tools & operations 2. Simple exercises involving fitting work.  
3. Make perfect male-female joint. 4. Simple exercises involving drilling/tapping/dieing.

3. **Black Smithy Shop:** 1. Study of tools & operations 2. Simple exercises base on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.
4. **Welding Shop:** 1. Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.
5. **Sheet-metal Shop:** 1. Study of tools & operations. 2. Making Funnel complete with 'soldering'.  
3. Fabrication of tool-box, tray, electric panel box etc.
6. **Machine Shop:** 1. Study of machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading 6. Single point cutting tool grinding.
7. **Foundry Shop:** 1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core.  
4. Casting

### **ECE-151/ECE-251 : COMPUTER AIDED ENGINEERING GRAPHICS**

**L T P**  
**0 1 3**

#### **Unit-I**

##### **1. Introduction to Computer Aided Sketching**

Introduction, Drawing Instruments and their uses, BIS conventions, lettering Dimensioning and free hand practicing.

Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Coordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line convention, material conventions and lettering.

#### **2-Sheet**

##### **2. Orthographic Projections**

Introduction, Definitions- Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems). **2-Sheet**

##### **3. Orthographic Projections of Plane Surfaces**

###### **(First Angle Projection Only)**

Introduction, Definitions-projections of plane surfaces-triangle, square rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates.) **1-Sheet**

#### 4. Projections of Solids (First Angle Projection Only)

Introduction, Definitions- Projections of right regular- tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. (No problems on octahedrons and combination solid) **2-Sheet**

#### 5. Sections and Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, section views, Sectional views, apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. (No problems on section of solids) **1-Sheet**

Development of lateral surface of above solids, their frustums and truncations. (No problems on lateral surfaces of trays, Tetrahedrons spheres and transition pieces).

#### 6. Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric Projection of simple plane figures, Isometric Projection of tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of three Solids). **1-Sheet**

**Note : At least 3 drawing assignments must be on any popular Computer Aided Design and Drafting (CADD) Software .**

#### Text Book

1. Engineering Drawing – N.D. Bhatt & V.M. Panchal, 48<sup>th</sup> edition, 2005 Charotar Publishing House, Gujarat.
2. A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belgaum.

#### Reference Book

1. Computer Aided Engineering Drawing – S. Trymbaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi, 3<sup>rd</sup> revised edition-2006.
2. Engineering Graphics – K.R. Gopalakrishna, 32<sup>nd</sup> edition, 2005 – Subash Publishers Bangalore.
3. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production – Luzadder Warren J., duff John M., Eastern Economy Edition, 2005 – Prentice- Hall of India Pvt. Ltd., New Delhi.

#### EAS-151/EAS-251 : PHYSICS LAB

L T P  
0 0 2

#### List of Experiments

**Any ten experiments, at least four from each group.**

#### Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.

5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

### **Group – B**

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying -  
Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a  
given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to  
determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

### **EAS-154/EAS-254 : PROFESSIONAL COMMUNICATION LABORATORY**

**L T P  
0 0 2**

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken  
Communication based on International Phonetic Alphabets (I.P.A.)

#### **LIST OF PRACTICALS**

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab  
conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on  
Paralinguistics/Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on  
proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.

6. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

### Reference Books

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman, New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B.Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

## **ECH-301 :FLUID FLOW AND SOLID HANDLING**

**L T P**  
**3 1 0**

### Unit-I

#### **SOLIDS AND THEIR HANDLING**

1. Properties of solids, screening, industrial screening equipment. Determination of particle size, screen analysis, size reduction of solids, stages of reduction, operating variables, intermediate and fine size reduction, power requirement and mechanism.  
Power driven machines: Crushers, grinders and conveyers. [08]

### Unit-II

#### **Filtration**

- Theory, continuous and batch equipments. [08]  
Flow of solids through fluids, classification and sedimentation.

### Unit-III

#### **FLUID FLOW**

1. Properties of fluids.
2. Fluid statics: Euler's equation, Hydrostatic Law and Pressure Measurement.
3. Transport of fluids, energy relationships, pipe fittings, minor losses in pipe flow. [08]

### Unit-IV

- Flow measurements: Orifice meter, Nozzel and venturi meters, rotameter and pitot tube. [08]

### Unit-V

- Pumping and compressing: reciprocating pumps, rotary pumps, centrifugal Pumps and blowers.  
Introduction of fluidization. [08]

### Reference Book

1. Introduction of Fluid Mechanics by Robert W.Fox and Slan T. Mcdonald, John urley & sons, Ny. Fourth Ed.
2. Unit Operation in Chamilal Engg., Mccable Smit V<sup>th</sup> Ed.

**Unit-I**

Data type, classification and summarization of data, diagrams and Graphs, Measures of Dispersion, Skewness and kurtosis. 8

**Unit-II**

Introduction to probability, Laws of probability, Baye's theorem, Binomial distribution Poison distribution, Normal distribution and Gaussian distribution.

**Unit-III**

Positive and Negative correlation, Pearson and Mathew correlation coefficient, Non parametric tests, Receiver operating characteristics (ROC) curve, Linear and Non linear regression, multiple regression.

**Unit-IV**

Hypothesis tests, Chi square tests and F-tests, Variant, One way and two way analysis of variants, ANOVA.

**Unit-V**

Principles of experimental design and analysis.

Text books and references

1. Geogr W. and William G., Statistical Methods; IBH Publication.
2. Ipsen J et al; Introduction to Biostatistics, Harper & Row Publication.
3. N.T.J. Baily; Statistical methods in Biology; English University Press.
4. R.Rangaswami; A Text book of Agricultural statistics; New Age Int. Pub.
5. P.S.S.Sundar Rao; An Introduction to Biostatics; Prentice Hall.
6. Zar J; Biostatistics; Prentice Hall, London.

**EBT-301 : Biochemistry**

**UNIT-I**

pH, Buffers, Biological Buffers, Water, Vitamins, Brief description of animal and plant hormones.

**UNIT-II**

Carbohydrate as biomolecule. Classification of carbohydrates. Metabolism – Glycolysis, TCA cycle, Gluconeogenesis, PEP, ETC, Oxidative phosphorylation. Disorder/ diseases of carbohydrate metabolism.

**UNIT –III**

Fats and lipids – Structure and function, biosynthesis of fatty acids, Degradation of fatty acids. Cholesterol Biosynthesis and degradation. Disorder/ diseases of lipid metabolism.

**UNIT –IV**

Amino acids and proteins. Biosynthesis of amino acids from Acetyl Co enzyme. Biodegradation of amino acids, Determination, transamination, Urea Cycle. Proteins as coenzymes. Structure of proteins. Disorder/ diseases of amino acids metabolism.

**UNIT –V**

Purines and pyrimidines – Structure and properties. Their biosynthesis and degradation. Vitamins Biosynthesis. , Disorder of purines and pyrimidines metabolism.

**Text books:**

1. Biochemistry and molecular biology by Elliot and Elliot. (Oxford university Press)
2. Biochemistry by trehan ( New age international)
3. Biochemistry by Lehninger ( CBS Publication)

Reference books:

1. Biochemistry by Voet and Voet ( Wiley New York)
2. Biochemistry by Stryer ( Freeman Int. Edition)

**EBT-302 : MICROBIOLOGY & CELL BIOLOGY**

**UNIT – I**

Morphology and Classification of bacteria. Culture media. Isolation and identification of microbes, culture techniques. Preservation of cultures.

**UNIT-II**

Physical and chemical methods for the control of microbes. Enumeration of bacteria. Microbial growth kinetics. Cell cultivation system. Strain improvement.

**UNIT-III**

Biological nitrogen fixation. Biofertilizers. Bacterial Photosynthesis :Photosynthetic structures, types of bacterial photosynthesis, photosynthesis pigments, photosynthetic electron transport system, photophosphorylation, dark phase of photosynthesis; CO<sub>2</sub> utilization.

**UNIT-IV**

Applications of microbiology.  
Environmental; Microbiology of domestic water and waste water. Microbes in bioremediation.  
Medical Microbiology: tuberculosis, typhoid, diarrhoea, amoebiasis, Rabies  
Other applications.

**UNIT-V**

Cell organelles. Protein targeting, cell aging. Biology of cancerous cells.

Text books:

1. Microbiology by Pelczar (W C Brown publication)
2. Genral Microbiology by stainer ( Mac Millan Publication)
3. Microbiology by Pawar and Dagniwala ( Himalaya publishing House)

Reference books:

1. Microbiology –an introduction by Tortora ( Pierson education Publication)
2. Industrial microbiology by Prescott and Dunn

**EBT-303 : MOLECULAR DYNAMICS & BIOENERGETICS**

**UNIT-I**

Energy, energy flow cycle, energy conversion; Structure and properties of ATP; High energy compounds, Thermodynamic considerations, Coupling reactions of ATP and NDP (nucleotide di phosphate); photosynthesis.

## **UNIT-II**

Biological membrane: structure, permeability, properties, passive transport and active transport, facilitated transport, energy requirement, mechanism of  $\text{Na}^+$ /  $\text{K}^+$ , glucose and amino acid transport; Organization of transport activity in cell; Active potentials; Role of transport in signal transduction processes. Signal Transduction.

## **UNIT-III**

Metabolism and bioenergetics; Generation and utilization of ATP; Metabolism of Nitrogen containing compounds: nitrogen fixation, amino acids and nucleotides;

## **UNIT-IV**

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

## **UNIT-V**

Electron Flow as source of ATP Energy, Site of Oxidative Phosphorylation, ATP synthetase, Electron- Transferring Reactions, Standard Oxidation, Electron Carrier, electron transport complexes, Incomplete reduction of Oxygen, Mechanism of Oxidative Phosphorylation, Oxidation of Extra mitochondrial NADH, ATP yield and P: O Ratio, Role of Electron Transport Energy, Respiratory Inhibitors, Regulatory control among Glycolysis, the Citric Acid Cycle and Oxidative Phosphorylation

### **Text books:**

1. Introduction to Chemical Engineering thermodynamics by Smith and Vannes ( Mcgraw Hill)
2. Chemical engineering thermodynamics by Y.V.C. rao ( New age international)

### **Reference books:**

1. Engineering Thermodynamics by J.B.Hawkins ( John Wiley Publication)
2. Engineering Thermodynamics by Spading and Cole( ELBS0.

## **EBT-401 : ENZYME ENGINEERING-**

### **Unit- I**

Extraction and Purification of Crude Enzyme extracts from plant, animal and microbial sources-some case studies; methods of characterization of enzymes; development of enzymatic assays.

### **Unit II**

Mechanisms of Enzyme Action; Concept of active site and energetics of enzyme substrate complex formation; Specificity of enzyme action; Kinetics of single substrate reactions; turnover number; estimation of Michaelis-Menton parameters. Importance of  $K_M$ , Multi-substrate reaction mechanisms and kinetics.

### **UNIT III**

Types of Inhibition- kinetic models; Substrate and Product Inhibition; Allosteric regulation of enzymes; Deactivation kinetics.

### **UNIT-IV**

Physical and Chemical techniques for enzyme Immobilization – adsorption, matrix

entrapment, encapsulation, cross-linking, covalent binding - examples; Advantages and disadvantages of different Immobilization techniques; Overview of applications of immobilized enzyme systems, Applications of enzymes in analysis; Design of enzyme electrodes and their applications as biosensors in industry, health care and environment.

#### **UNIT-V**

Design of Immobilized Enzyme Reactors-Packed- bed, Fluidized-bed Membrane reactors; Bioconversion calculations in free- enzyme CSTRs and immobilized enzyme reactors.

#### **Text books:**

1. Fundamentals of enzymology by Nicolas C. price and Lewis Stevens . Oxford University Press
2. Enzymes by Trevor palmer, East west Press
3. Enzyme Technology by Messing

#### **Reference books:**

1. Enzymes : Dixon and Webb.(IRL Press)
2. Enzyme technology by Chaplin and Bucke. Cambridge Univerity Press
3. Biochemical engineering fundamentals, second edition. James E Bailey, David F., Ollis, McGraw Hill Intl. Edition

### **EBT-402 : IMMUNOLOGY**

#### **UNIT--1**

Introduction to immunity, Characteristics of innate and adaptive immunity, Humoral and Cell mediated immune response, Hematopoiesis, Cells and Molecules of the immune system, Primary and Secondary lymphoid organs, Inflammation, Characteristics of T&B cell epitopes, T &B cell maturation, activation and differentiation.

#### **UNIT-2**

Characteristics and types of Antigens, Factors affecting the immunogenicity, Haptens and adjuvants, ABO blood group antigens, Epitopes, Structure, functions and characteristics of different classes of antibodies, Antigenic Determinants on Immunoglobulins.

#### **UNIT-3**

Structure and Function of MHC molecules, Exogenous and Endogenous pathways of antigen processing and presentation, Complement system, Structure, function and application of cytokines, regulation of immune response, immune tolerance.

#### **UNIT-4**

Antigen and antibody interactions, cross reactivity, precipitation reactions, serological techniques – ELISA, RIA and western blotting Production and application of monoclonal antibodies, dose of antigens, Vaccines.

#### **UNIT-5**

Immunity against infectious diseases (virus, bacteria and protozoan), Hyper-sensitivity, Autoimmunity, Cancer, AIDS and Transplantation immunology.

#### **Text books:**

1. Immunology and immunotechnology by Ashim k. Chakravarty (Oxford university Press)

2. Immunology by C. Fatima
3. Immunology by Kuby (Free man publication)

Reference books:

1. Essentials of immunology by Roitt ( Blackwell scientific publication)
2. Immunology by Benacera

## **EBT : 403 GENETICS AND MOLECULAR BIOLOGY**

**L T P**  
**3 1 0**

### **Unit I**

Fundamental principles of genetics, gene interaction, multiple alleles, complementation, linkage, recombination and linkage mapping, extra-chromosomal inheritance, chromosomes basis of heredity. [8]

### **Unit II**

DNA as the genetic material, structure & types of DNA transposable elements; Central Dogma, DNA repairing, Mutations, Cell type regulation. [8]

### **Unit III**

DNA replication process in prokaryotes & Eukaryotes, Activity of DNA polymerases and topoisomerases, Reverse transcriptase. [6]

### **Unit IV**

Transcription process in prokaryotic and eukaryotic, Post transcriptional modification processes open reading frames. [8]

### **Unit V**

Genetic Code, Wobbel hypothesis, translation process in Prokaryotes and Eukaryotes Regulation of gene expression in prokaryotes and Virues. Hormonal control of gene expression in eukaryotes. [8]

### **Textbooks and references:**

1. Albert B, Bray Denis et al.: Molecular Biology of The Cell, latest ed.
2. Watson, Hopkin, Roberts et al.: Molecular Biology of the Gene, 4 th ed.
3. Genetics- Strickberger, 2 nd.
4. Microbial Genetics – D. Frifielder.
5. Baltimore- Molecular Biology of the Cell.
6. Benjamin Levin – Genes VIII, 8 th ed.
7. Advance Genetics by G.S. Miglani, Narosa Publishing House.

## **EBT-404 : Bioinformatics –I**

### **UNIT-I**

Primary and secondary databases. Specialized sequence databases of EST, TFB Sites, SNP's, gene expression. Pfam, PROSITE, BLOCK( Secondary databases). Data retrieval with ENTREZ, SRS, DBGET

### **UNIT-II**

Principles of DNA sequencing (chemical chain termination, Dideoxy chain termination method, Automatic sequencer). RNA sequencing . Protein sequencing ( Edmand degradation method)

### **UNIT-III**

Sequence alignment ( pairwise and multiple, global and local). Sequence alignment algorithm (FAST , BLAST, Needleman and Wunsch, Smith Waterman ). Database similarity searches (BLAST, FASTA and PSI BLAST). Amino acid substitution matrices ( PAM BLOSUM)

### **UNIT-IV**

Protein structure prediction ( Chou Fasman method) : Secondary and tertiary structures. Homology Modelling, ORF prediction, Gene prediction, Micro array data analysis. Profiles and motifs.

### **UNIT-V**

Structure visualization methods ( RASMOL, CHIME etc.) . Protein Structure alignment and analysis. Application of Bioinformatics in drug discovery and drug designing.

Text books:

1. Bioinformatics : Principles and applications by Ghosh and Mallick (oxford) university press)
2. Bioinformatics by Andreas D Boxevanis (Wiley Interscience)
3. Fundamental concept of bioinformatics by Dan e. krane

Reference books:

1. Introduction to bioinformatics by Attwood and Parry Smith ( Pierson education Publication)
2. instant notes in Bioinformatics by Westhead, parish and Tweman ( Bios scientific publishers)

## **EBT-351 : FLUID MECHANICS LAB**

**L T P**  
**0 0 3**

Experiments related to measurement of flow by venturi meter, orifice meter, notches, rotameter, velocity measurement by pitot tube. Verification of Bemoulli's theorem. Vortex, friction factor, equivalent length of fittings, pump characteristics, Streamlines.

## **EBT-352 BIOCHEMISTRY LAB**

**L T P**  
**0 0 3**

1. Estimation of carbohydrates
2. Estimation of proteins
3. Estimation of nucleic acids
4. Isoelectric precipitation
5. Separation of aminoacids by paper chromatography.
6. Extraction of lipids
7. Thin layer chromatography
8. Gel electrophoresis
9. Assay of enzyme activity and enzyme kinetics
10. Identification and estimation of an intermediate of ENP pathway
11. Cell fractionation

## **EBT 353 : MICROBIOLOGY LAB**

**L T P**  
**0 0 6**

1. Preparation of nutrient agar slants, plates and nutrient broth and their sterilization.

- (Microwave Oven, Heating mantles, Fridge, Heating Oven, Tube racks)
2. Inoculation of agar slants, agar plate and nutrient broth  
(Incubators, Water bath, Laminar hood, dry heat sterilizer i.e. bead sterilizer)
  3. Culture of microorganisms using various techniques.  
(Shakers i.e. Cooling and Open shaker).
  4. Simple and differential staining procedures, endospore staining, flageller staining, cell wall staining, capsular staining, negative staining.  
(Moist chambers, spirit lamps, slides, loops & microscopes, haemocytometer)
  5. Bacterial colony counting.  
(Moist chambers, spirit lamps, slides, loops & microscopes, haemocytometer)
  6. Observation of different vegetative, capsular and spore forms of bacteria & fungus under various microscopes).
  7. Isolation of microbes from soil samples and determination of the number of colony forming units.  
(U.V. spectrophotometer, Colony counter etc.)
  8. Study of growth curve of *E. coli*

#### Practical Books and References

1. Lab Manual in microbiology by P Gunasekaran (New Age Int. Pub.)

#### **TBT 354 : CELL BIOLOGY LAB**

**L T P**  
**0 0 6**

#### Experiments

1. Microscopy
2. Identification and staining of different types of cells.
3. Measurement of various Cell Organelles.
4. Lipid Solubility of Membranes.
5. Determination of Osmosis
6. Determination of Pinocytosis process
7. Isolation of Chloroplasts from spinach Leaves.
8. Detection of Mitosis with the help of microscope.

#### **EBT : 451 IMMUNOLOGY LAB**

**L T P**  
**0 0 6**

1. Different types of antigen –antibody cross reaction
2. Isolation, purification and identification of immunoglobulin from goat blood.
3. Double diffusion techniques for identification of antigen-antibody samples
4. Immunoelectrophoresis techniques.
5. ELISA (Enzyme linked Immunosorbent Assay)
6. RIA (Radio Immuno Assay)
7. Immunoblotting using ELISA-dot or Western blot techniques.

#### **Reference books**

1. Handbook of Experimental Immunology, Vol. I & II, IV- Blackwell Scientific Publications.
2. Practical Immunology- Hudson L. and Hay H. C. Blackwell Scientific Publications.
3. Hybridoma Techniques: A Lab Course- Muthukkaruppan Vr, Basker S and F. Singilia.  
Macmillan India Ltd.

## **EBT : 452 MOLECULAR BIOLOGY LAB**

**L T P**  
**0 0 3**

1. Estimation of DNA content in the given sample by diphenylamine method.  
(Nitrogen cylinders, -20°C fridge, grinders, cooling centrifuges, etc.)
2. Estimation of RNA content by the Orcinol method.
3. Determination of T<sub>m</sub> of DNA and RNA.
4. Isolation of Plasmid DAN.
5. Isolation of bacterial/fungal genomic DAN.
6. Isolation of plant DNA.
7. Purification of DNA through columns.  
(Sorval, Cyclomixer, Electrophoresis units both vertical & horizontal, transilluminator, U.V. Torch, Gel documentation system, Thermal cycler etc.)

## **EBT-453 BIOINFORMATICS-I LAB**

**L T P**  
**0 0 3**

1. Construction of database for specific class of proteins/enzymes, genes/ ORF/ EST/Promoter sequences/ DNA motifs or protein motifs using oracle.
2. Access and use of different online protein and gene alignment softwares
3. Gene finding related search for a given nucleotide sequence in order to predict the gene
4. ORF prediction for different proteins out of some given nucleotide sequences.
5. Exon identification using available softwares for a given nucleotide sequences
6. Secondary structure prediction for amino acid sequences of a given protein.