Scheme of Instructions of III & IV Semesters of
B.Tech Bio-Technology as per AICTE
Model Curriculum 2019-20

IN

B. Tech (Bio-Technology)

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(An Autonomous Institution)
Affiliated to OU; All U.G. and 5 P.G. Programmes (Civil, CSE, ECE, Mech. & EEE)
Accredited by NBA; Accredited by NAAC - 'A' Grade (UGC);
ISO Certified 9001:2015

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CHAITANYABHARATHI INSTITUTE OF TECHNOLOGY(A)
Department of Bio-Technology
Scheme of Instructions of III & IV Semesters of B.Tech Bio-Technology as per AICTE Model Curriculum 2019-20
B.Tech (Bio-Technology)

SEMESTER III

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours Per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
	THEORY								
1	18MTC06	Engineering Mathematics-III	3	-	-	3	30	70	3
2	18BT C03	Cell and Molecular Biology	3	-	-	3	30	70	3
3	18BT C04	Biochemistry	3	-	-	3	30	70	3
4	18BT C05	Microbiology and Industrial Biotechnology	3	-	-	3	30	70	3
5	18BT C06	Process Principles and Reaction Engineering	3	-	-	3	30	70	3
6	18BT C07	Genetics	3	-	-	3	30	70	3
7	18EG M01	Indian Constitution	2	-	-	2	-	50	Non-Credit
8	18EE M01	Indian Traditional Knowledge	2	-	-	2	-	50	Non-Credit
	PRACTICALS								
9	18BT C08	Biochemistry Lab	-	-	2	2	15	35	1
10	18BT C09	Microbiology Lab	-	-	2	2	15	35	1
Total			**22**	**-**	**4**	**-**	**210**	**590**	**20**
Clock Hours Per Week -26									

L: Lecture T: Tutorial P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18MT C06

ENGINEERING MATHEMATICS-III
(For Bio-Technology)

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:
To learn

1. To solve linear system of equations using Matrix Methods.
2. Understand the basic concept of continuity, differentiability and geometric interpretation of mean value theorems.
3. Concept of partial differentiation, maximum and minimum.
4. Identifying vector, scalar addition, multiplication, geometrical interpretation in 2D, 3D space.
5. Understand the concept of scalar and vector point functions of divergence and curl of vector functions and its physical interpretations.

Course Outcomes: At the end of the course students will be able to

1. Solve system of linear equations and identify the Eigen values and Eigen vectors in engineering problems.
2. Solve the problems based on Mean value theorems
3. Solve maxima and minima problems.
4. Solve vector and scalar triple product related problems.
5. Solve divergence and curl related problems.

UNIT-I

Matrices: Rank of the matrix, Echelon form, System of Homogeneous and Non-Homogeneous linear equations, Linearly dependence and independence of vectors, Eigen values and Eigenvectors. Quadratic forms, Reduction of quadratic form to canonical form by linear transformation.

UNIT-II

Calculus: Rolle's Theorem, Lagranges Mean value theorem, Cauchy's mean value theorem (without proofs). Taylor's series and Maclaurin's series for single variable. Curvature, radius of curvature and Evolutes (Cartesian form only),

UNIT-III

Partial differentiation: Homogeneous functions-Euler's theorem on homogeneous functions, higher order partial derivatives, Derivatives of composite and implicit functions, Taylor's series of two variables.

UNIT-IV

Vector Algebra: Addition of vectors, scalar multiplication, angle between two non zero vectors, linear combination of vectors, component of vectors in three dimensions, scalar product-geometrical interpretations- orthogonal projections, properties of dot product, angle between two vectors, vector product of two vectors and properties, scalar triple product, vectors triple products-results.

UNIT-V

Vector Calculus: Definitions- scalar and vector point functions, vector differential operator, Gradient, Divergence and Curl, Solenoidal and Irrational vectors, properties of gradient, divergence and curl (vector identities)

Text Books:

1. Grewal BS, "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, 2015.
2. Jain ARK, Iyenger SRK, "Advance Engineering Mathematics", 3rd edition, Narosa publications, 2007.
3. Narayan Shanti, Mittal PK, " Differential Calculus" , 30th edition, S Chand publishers, 2005.

Suggested Reading:

1. Vasistha AR, "Matrices", 43rd edition, Krishna Prakashan Media (P) Ltd. 2014.
2. Edwards J, "Differential Calculus For Beginners", Arihant publishers, 2016
3. Kreyszig E, "Advanced Engineering Mathematics", 10th edition, Wiley publishers, 2015

18BT C03

CELL AND MOLECULAR BIOLOGY

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives

1. Student is made to understand the basics of cell biology i.e. concept of cellular organelles and their functions.
2. Students are taught the structure of cytoskeleton, and how it maintains the cell structure integrity.
3. Student is made to understand the basics of molecular biology, and the central dogma of the genetic material

Course Outcomes: At the end of the course students will be able to

1. Recognize the structure and functions of cell organelles.
2. Interpret the knowledge of transport of metabolites and cell cycle checkpoints in their experimental work.
3. Distinguish the organization and Replication of DNA, damages and repairs
4. Identify the structure and function of transcripts and mechanism of transcription by RNA polymerases.
5. Illustrate the mechanism of translation and post translation mechanism

UNIT-I

Cell Structure, Organelles and their Functions: Cell structure and organization in bacteria, plants and animal cells; structure and functions of cell wall, lysosomes, ribosomes, golgi complex, peroxisomes, glyoxysomes, mitochondria, plastids, endoplasmic reticulum, vacuoles, centrioles; cytoskeleton - composition, structure and functions of microtubules, microfilaments and intermediate filaments; nucleus, its ultra structure, (nuclear envelope, nucleoplasm, chromatin fibers).

UNIT-II

Membrane Transport and Cell Cycle: Biomembrane – lipid composition and structural organization, protein components and basic function, transport across membrane – passive diffusion, facilitated diffusion, osmosis, active transport (Na+ /K+ Pump), cotransport; uniport, antiport, symport. Cell cycle: Different

phases of cell cycle; check points of cell cycle; Regulation of cell cycle - cyclins and cyclin dependent kinases

UNIT-III

Organization and Replication of DNA: Structure of DNA – Watson and Crick's model; role of histone and non histone proteins in structural organization of chromosomes; telomere and its importance; DNA Replication: Experimental evidences, enzymology of replication, complex replication apparatus; unidirectional, bi-directional and rolling circle replication; DNA damage and repair: Types of DNA damages- deamination, alkylation, pyrimidine dimmers; DNA Repair mechanisms- photo reactivation, Excision repair, mismatch repair.

UNIT-IV

Mechanism of Transcription: Structure of promoters- RNA polymerases of prokaryotic and eukaryotic organism; transcription- initiation, elongation and termination; post transcriptional processes of eukaryotic RNA: structure and functions of RNA- (rRNA, mRNA, tRNA, snRNA), prokaryotic and eukaryotic transcription. Processing of t-RNA, r-RNA, m-RNA splicing; concept of ribozyme, inhibitors of transcription.

UNIT-V

Mechanism of Translation: Ribosome- structural features; features of genetic code, wobble hypothesis; protein synthesis: translation in prokaryotes and eukaryotes- initiation of translation, elongation of polypeptide chain, termination of translation; Post translation modification, inhibitors of protein synthesis.

Text Books:

1. Geoffrey M. Cooper and Robert E. Hausman, "The cell: A molecular approach", 6th edition, Sinauer Associates, 2013.
2. Gerald Karp, "Cell and Molecular Biology": concepts and experiments, 6th edition, John Wiley & sons, 2009
3. David Freifelder, "Molecular Biology", 2nd edition, Narosa Publication, 2007.

Suggested Reading:

1. Rastogi S.C., "Cell and Molecular Biology", 2nd edition, New Age International, 2006.
2. Benjamin Lewin, Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick, "Lewin's Genes XI", Jones and Bartlett publishers, 2014.

18BT C04

BIOCHEMISTRY

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

1. Students will learn structure of carbohydrates, lipids, proteins and nucleic acids
2. Students will learn functions of carbohydrates, lipids, proteins and nucleic acids
3. Students will learn metabolism of different biomolecules.

Course outcomes: At the end of the course students will be able to

1. Recognize different biomolecules structure and describe the functions of various biomolecules.
2. Evaluate the energy yield from the catabolism of carbohydrates and explain the steps in anabolism.
3. Evaluate the energy yield from lipids and reconstruct lipids.
4. Outline steps involved in catabolism and anabolism of proteins.
5. Summarize steps involved in catabolism and anabolism of nucleic acids.

UNIT-I

Biomolecules: Carbohydrates- classification; Glycoproteins; glycolipid; Classification and nomenclature of lipids; Amino acid – Classification and its structure, peptide bond- structure; Proteins-classification and Biological functions; Forces stabilizing protein structure; Protein structure - primary structure, secondary structure (á-helical, â-pleated sheets), super secondary structures, Ramachandran Plot, tertiary and quaternary structure; Enzymes – properties.

UNIT-II

Metabolism of Carbohydrates: Carbohydrate Metabolism: Glycolysis – Preparatory phase and Payoff phase, substrate level Phosphorylation, regulation of glycolysis, HMP Shunt, Citric Acid Cycle, anaplerotic reactions, Electron Transport System and Oxidative Phosphorylation, Mitchell's chemiosmotic hypothesis; Gluconeogenesis; Glycogen metabolism – Glycogenolysis and Glycogenesis.

UNIT-III

Metabolism of Lipids: Lipid Metabolism: â - Oxidation of saturated, unsaturated fatty acid; Cholesterol Metabolism; Metabolic Pathways- Biosynthesis of Saturated and Unsaturated Fatty Acids, synthesis of Triglycerol; Metabolism of Phospholipids and Sphingolipids.

UNIT-IV

Metabolism of Proteins: Amino acids metabolism- Biosynthesis of aromatic amino acids, Peptides; Metabolic fate of Amino group; Nitrogen Excretion and Urea Cycle; Catabolism of aromatic and branched chain amino acids; Transamination, Oxidative Deamination and Oxidative Decarboxylation.

UNIT-V

Metabolism of Nucleic Acids: Structure of nucleotides, nucleosides and nitrogenous bases; chemical structure of DNA and RNA; Nucleic Acid Metabolism- De nova synthesis of Purine and Pyrimidine, salvage pathway, Ribonucleotides, synthesis of Deoxyribonucleiotides; Degradation of Purine and Pyrimidine Nucleotides.

Texts Books:

1. Eric E.Conn, Paul K Stumpf, George Bruening, Roy H Doi, "Outlines of Biochemistry", 5//E, John Wiely and Sons, 2006.
2. David Lee Nelson and Michael M. Cox, Lehninger "Principles of Biochemistry", 6th edition, W. H. Freeman, 2013.

Suggested Reading:

1. Donald Voet and Judith G. Voet, "Biochemistry", 4th edition, John Wiley & Sons, New York, 2011.
2. Reginald Garrett and Charles Grisham, "Biochemistry", 5th edition, Cengage Learning, 2012.
3. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, "Biochemistry", 6th Edition. W. H. Freeman and Company, 2010.

18BT C05

MICROBIOLOGY AND INDUSTRIAL BIOTECHNOLOGY

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Understand historical perspectives important in development of microbiology.
2. Describe prokaryotic cell structure with functions.
3. Classification of different groups of microorganisms.
4. Concepts of culture media preparation sterilization techniques and microbial growth.
5. Concepts of fermentation process and examples of industrially important products.

Course Outcomes: At the end of the course students will be able to:

1. Outline the historical aspects of microbiology and structure of prokaryotic cell.
2. Identify major characteristics and classification of microorganisms.
3. Describe importance of culture media and microbial growth.
4. Compare physical and chemical sterilization methods.
5. Apply theoretical knowledge for production of microbial metabolites.

UNIT-I

History and Introduction to Microbiology: History and scope of microbiology, contributions of Antony van Leuwenhoek, Louis Pasteur, Robert Koch, Iwanowskii, Edward Jenner; prokaryotic cell structure – plasma membranes, cytoplasmic matrix – inclusion bodies, ribosome, bacterial chromosome and plasmids, cell wall, components external to cell wall – capsule, slime layer, pili, fimbriae, flagella, bacterial endospores and their formation.

UNIT-II

Classification of Microorganisms: General and colony characters of major groups of microorganisms - algae, fungi, protozoa, bacteria and virus; Identification of microorganisms by major taxonomical characteristics (morphological, physiological, ecological, cultural, metabolic/biochemical, immunological and genetic); Classification of microorganisms - Haeckel's three kingdom concept, Whittaker's five kingdom concept, Three domain concept of Carl Woes.

UNIT-III

Microbiological Techniques and Growth: Methods of culturing of microorganisms - culture media, (liquid, semi-solid and solid media, synthetic media and complex media), Isolation of pure cultures (streak, spread and pour plate methods); Concept of sterilization - methods and their application- physical methods (heat, filtration and radiation), chemical methods (phenolics, alcohols, halogens, heavy metals, dyes, quaternary ammonium compounds, aldehydes, gaseous agents); Methods of preservation of microorganisms and their importance (Bacterial cultures); Microbial growth - growth curve, mathematical expression of growth, measurement of microbial growth (cell numbers and cell mass).

UNIT-IV

Production of Microbial Metabolites: Types of fermentation processes: aerobic and anaerobic processes, production of anaerobic fermentation products alcohols (ethanol and n-butanol), Production of beverages (beer and wine), Production of organic acid (citric acid); Production of aerobic fermentation products: classification of antibiotics, production of penicillin.

UNIT-V

Production Of Microbial Enzymes And Specialty Products: Production of commercially important industrial enzymes - proteases, amylases, lipases, cellulase, pectinase, and isomerase, bio-fertilizers and plant growth factors (Gibberellins); natural biopreservatives (Nisin); biopolymers (PHB); high fructose corn syrup.

Text Books:

1. Pelczar Michael J., Krieg Noel R., Chan, E.C., "Microbiology", 5th edition, McGraw Hill higher education1993.
2. Crueger W and Crueger A, Biotechnology: Text Book of Industrial microbiology. 2nd edition, Panima Publisher, 2005.
3. Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, David A-Stahl and Clark, "Brock Biology of Microorganisms", 13th edition, Prentice Hall International Inc, 2010.

Suggested Reading:

1. Powar C.B. and Daginawala H.F., "General Microbiology – Vol I & II", 2nd edition, Himalaya publishing house, 2005.
2. Arti Kapil, Ananthanarayan and Paniker's "Text book of Microbiology", 9th edition, Orient Blackswan, 2013.
3. Roger Y Stanier, "General Microbiology", 5th edition, Palgrave Macmillan Limited, 1999.

18BT C06

PROCESS PRINCIPLES AND REACTION ENGINEERING

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. The aim of the course is to impart knowledge of the basic chemical engineering principles and techniques used in analyzing a chemical process.
2. This course also aims to enable the students to evaluate material and energy balances in different units.
3. Through this course the students are given an understanding of application of principles of unit operations and unit processes in biotech Industries.
4. This course aims at analyzing the kinetics of chemical reactions.
5. The aim of the course is also to give the students an understanding of the theory of biochemical reactors and enhanced skill in formulation and analysis of different types of reactors used in biochemical engineering

Course Outcomes: At the end of the course student are able to

1. To analyze, interpret and solve the problems encountered in the preparation of material and energy balances of the process.
2. To predict the flue gas composition from fuel composition and vice versa.
3. To design and use the generalized flow sheets for different chemical processes.
4. To evaluate and assess the rate equations for any given chemical reaction
5. To compute and compare the basic design calculations of various reactors.

UNIT-I

Dimensions and System of Units: Fundamental quantities, derived quantities and conversions; SI and MKS system of Units; Basic Chemical Engineering calculations-Atomic, Molecular and Equivalent weights, molar concept, Concentration units for pure components, Vapor pressures, Moles, Mixers and

solutions, Morality, Molality, Normality and Partial pressures; Laws of Chemical Combination; Definition of Stochiometry; Composition of mixers and solutions; Weight fraction; Mole fraction; Volumetric composition; Density and Specific gravity, Ideal gas law; Ideal mixtures and solution; Dalton's law of additive pressures; Amagats law of additive volumes.

UNIT-II

Operations in Bioprocesses: Application of principles of unit operations and unit processes in biotech Industries, Application of principles of transport phenomenon (momentum, mass and heat transfer) in bioprocessing. Outline of an integrated bioprocess and the various (upstream and downstream) unit operations involved in bioprocesses, generalized process flow sheets. Laws of conservation of mass, meaning of material balance and its applications, Process flow sheet, Drawing material balance on non reacting steady system, Conversion, yield, Limiting reactants, Excess reactants, Recycling, By-passing, Material balances on steady state reacting systems with recycling and By-passing.

UNIT-III

Material Balances: Law of conservation of energy, Meaning of energy balance and its importance, Inputs of energy balance, Specific heat and sensible heat, Latent heat and heats of transition, Sublimation, Enthalpy of solutions, Standard heats of formation, Standard heats of combustion, Standard heats of reaction, Bess's law, Kirchoffs law, Determination of heat of reaction at temperature other than standard temperature using specific heat relationships, Combustion calculations, Combustion air requirements, determination of flue gas composition from fuel composition and vice versa.

UNIT-IV

Introduction to Reaction Kinetics: Concepts of Reaction Kinetics, Types of reaction, order of reaction, The 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. Searching for mechanism - Arrhenius equation - Growth Kinetics: Batch growth quantifying cell concentration, chemostat growth.

UNIT-V

Introduction To Bioreaction Engineering: Definitions, Differences and similarities between chemical and bioreactors; Classification of bioreactors; Reactor configurations; Description of a conventional bioreactor with all aspects; Design and construction criteria of a bioreactor; Residence time distributions, concentration, and temperature distributions; Models of non-ideal reactors. Animal and plant cell reactor technology- Environmental requirements for animal cell cultivation, reactors for large-scale production using animal cells, plant cell cultivation.

Text Books:

1. Hougen and Watson. K.M., and Ragatz R A, "Chemical Process Principles", 2 nd Edition, Wiley, 1959.
2. Bhatt B I and S M Vora, "Stoichiometry", 4/ e, Tata McGraw Hill, 2006.

Suggested Reading:

1. David M. Himmelblau, James B. Riggs, "Basic Principles and Calculations in Chemical Engineering", 8/e, Prentice Hall, 2012.
2. Swamy AVN, "Fundamentals of Biochemical Engineering", BS Publications, 2007.

With effect from the Academic Year 2019-20

18BT C07

GENETICS

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives

1. Student is made to understand the basics of genetics, ie. Concept of how genes are responsible for inheritance of characteristics.
2. Students are taught the structure of chromosome, and how it stores genetic information.
3. Importance of chromosome taught by showing the effects of mutations on chromosomes.
4. Students are enlightened about crossing over being the basis of genetic diversity.
5. Students are made aware of chromosome related genetic disorders.

Course Outcomes: At the end of the course students will be able to

1. Apply to real life situations, the principles of human heredity.
2. Be able to describe the chromosomal basis of inheritance arised due to abberations in chromosomal structure and number.
3. Be able to map understand the organization of genes due to linkage and crossing over mechanism.
4. Be able to predict the chromosomal basis of mendelism, in sex linked genes and sex determination.
5. Able to analyze concept of non mendelian maternal inheritance and population level genetic processes.

UNIT-I:

Physical Basis Of Heredity: Mendel's laws of inheritance – segregation, independent assortment, modification of mendelian principles: Dominance and recessive genes, co-dominance, incomplete dominance, Gene and Alleles, multiple alleles, gene interactions, epistatic interactions, pleotropism.

UNIT-II

Chromosome Structure and Abberations: Prokaryotic and eukaryotic genome; karyotyping; specialized chromosomes: gaint chromosomes – polytene and lamp brush chromosomes; chromosomal aberrations- structural aberrations (deletions,

duplication, inversion and translocation), numerical aberrations (aneuploidy, euploidy, auto polyploidy and allopolyploidy). Mutations – spontaneous, induced; physical and chemical mutagens; lethal mutation (characteristics and types), AMES test, applications of mutations.

UNIT-III

Linkage And Crossing Over: Concept of linkage and crossing over, cytological basis of crossing over (in Drosophila and Maize), factors affecting recombination frequency, linkage maps; mechanism of recombination – model involving single strand breaks and double strand break in DNA duplex, significance of Crossing over. Two point and three point test cross. Interference. Tetrad analysis.

UNIT-IV

Sex Determination, Sex Linked And Genetic Disorders: Sex chromosomes, sex determination mechanism in animals (insects and humans) and plants, sex determination by genic balance and Y-linked genes. Dosage compensation, Maryleon's hypothesis; sex linkage and its disorders; autosomal disorders in human beings. Garrod's inborn errors of metabolism.

UNIT-V

Extra Chromosomal Inheritance and Quantitative Genetics: Extra chromosomal inheritance – inheritance of mitochondrial and chloroplast genes, maternal inheritance (CMS, nuclear petites in yeast, Mirabilus jalapa). Transgressive segregation, quantitative characters, Gene frequency, gene pool, Hardy- Weinberg Law, equilibrium, Fitness and selection Goodness of fit: Chi-square-test.

Text Books:

1. Snustad, D.Peter, Simmons Michael, "Principles of Genetics 6th edition", John Wiley& Sons publication, 2012.
2. Singh, B.D. "Genetics - 3rd edition", Kalyani Publications, 2004.
3. Gardner, E. J., Simmons, M. J., Snustad, D. P. and Snustad, "Principles of Genetics", John Wiley and Sons, Inc. 1985.

Suggested Reading:

1. Verma PS, Agrawal VK, "Cell Biology, Genetics, Molecular Biology, Evolution and Ecology". S. Chand & Company Ltd., New Delhi, 2004.
2. Gupta PK, "Genetics", 4th Rev Edition (2nd Reprint) Rastogi Publications, 2011.

With effect from the Academic Year 2019-20

Code: 18EG M01

INDIAN CONSTITUTION

(BE/BTech III/IV Semester - Common to all branches)

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Course Objectives

The course will introduce the students to :

1. The history of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Have knowledge of the various Organs of Governance and Local Administration.

Course Outcomes

After successful completion of the course the students will be able to:

1. Understand the making of the Indian Constitution and its features.
2. Have an insight into various Organs of Governance - composition and functions.
3. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
4. Be aware of the Emergency Provisions in India.
5. Understand the Right To equality, the Right To freedom and the Right to Liberty.

Unit-I

Constitution of India: Introduction and salient features. Constitutional history. Directive Principles of State Policy - Its importance and implementation.

Unit-II

Union Government and its Administration: Structure of the Indian Union: Federalism, distribution of legislative and financial powers between the Union and the States.

Parliamentary form of government in India. President: role, power and position.

Unit-III

Emergency Provisions in India: National emergency, President rule, Financial emergency

Unit IV

Local Self Government: District's Administration Head: Role and Importance. Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.

Panchayati Raj: Introduction, Zilla Panchayat, Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and officials.

Unit V

Scheme Of The Fundamental Rights & Duties: Fundamental Duties - the legal status.

Scheme Of The Fundamental Rights - To Equality, to certain Freedom Under Article 19, to Life And Personal Liberty Under Article 21.

Suggested Reading:

1. **The Constitution of India**, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, **Framing of Indian Constitution**, 1st Edition, 2015.
3. M. P. Jain, **Indian Constitution Law**, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu**, Introduction to the Constitution of India**, Lexis Nexis, 2015.

Online Resources:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf

With effect from the academic year 2019-20

18EE M01

INDIAN TRADITIONAL KNOWELDGE

Instruction	2 Hours per week
Duration of SEE	2 Hours
SEE	50 Marks

Course Objectives:

1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: After completion of this course, students will be able to:

1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

UNIT-I

Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT-II

Indian Languages, Culture and Literature:

Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India.

Indian Languages and Literature-II: Northern Indian languages & literature

UNIT-III

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT-IV

Fine arts in India (Art, Technology& Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India .

UNIT-V

Education system in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

Text Books:

1. Kapil Kapoor, Text and Interpretation: The India Tradition,ISBN: 81246033375, 2005.
2. Science in Samskrit, Samskrita Bharti Publisher, ISBN-13: 978-8187276333, 2007.
3. S. Narain, Examinations in ancient India, Arya Book Depot, 1993.
4. Satya Prakash, Founders of Sciences in Ancient India, Vijay Kumar Publisher, 1989.
5. M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014.

Suggested Reading:

1. Kapil Kapoor, Language, Linguistics and Literature: The Indian Perspective, ISBN-10: 8171880649, 1994.
2. Karan Singh, A Treasury of Indian Wisdom: An Anthology of Spiritual Learn,ISBN: 978-0143426158, 2016.

18BT C08

BIOCHEMISTRY LAB

Instruction	2 P Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course objectives:

1. Students will learn the laboratory safety and standard operating procedures
2. Students will learn how to estimate and analyze different biomolecules

Course outcomes: At the end of the course students will be able to

1. Apply the laboratory safety and standard operating procedures and prepare the solutions and biological buffers
2. Estimate and analyze carbohydrate by different methods
3. Estimate and analyze amino acids and proteins by different methods
4. Estimate and analyze lipids and compare the acid value, Saponification value and iodine valve of various lipids.
5. Estimate and analyze nucleic acids

List of Experiments:

1. Introduction to Biochemistry Lab: Units, Volume / Weight measurements, concentration units
2. Preparation of Solutions – percentage solutions, molar solutions, normal solutions and dilution of stock solution
3. Measurement of pH
4. Preparation of buffers and reagents
5. Titration curve of amino acid and calculation of pK and pI values
6. Estimation of Carbohydrates by Anthrone method
7. Estimation of Amino acids by Ninhydrin method
8. Estimation of Proteins by Biuret method
9. Estimation of Proteins by Lowry method
10. Determination of Acid value, Saponification value and Iodine Number of Fat
11. Estimation of Cholesterol by Liebermann Burchard method
12. Estimation of DNA by Diphenyl amine method
13. Estimation of RNA by Orcinol method

Suggested Reading:

1. David, T. Plummer, “An introduction to Practical Biochemistry”, 3rd edition, Tata McGraw Hill, 1988.
2. Beedu Sashidhar Rao, Vijay Deshpande, “Experimental Biochemistry – A student companion”, Anshan Pub, 2006.

18BT C09

MICROBIOLOGY LAB

Instruction	2 P Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:
Students are made to understand the following experiments during their course of time:

1. Proper handling and focusing of Bright Field microscope
2. Physical and chemical sterilization methods for control of microorganisms
3. Preparation of culture media
4. Techniques for the isolation of pure cultures
5. Simple and Gram staining techniques

Course Outcomes: At the end of the course students will be able to

1. Outline of Magnification, Resolution, Refractive index of Microscope
2. Operate the physical sterilization equipments
3. Prepare the basic culture media for the growth of microorganisms
4. Perform streak plate, spread plate and pour plate techniques.
5. Identify type of bacteria (Gram positive or Gram negative)

List of Experiments:

1. Calibration of Microscope and Measurement of Microorganisms-Microtome.
2. Staining and Identification of microorganism: (a) Simple and Differential staining techniques.
3. Sterilization techniques (Autoclaving, Hot Air Oven, Radiation and Filtration).
4. Preparation of culture media (a) broth type of media (b) Agar.
5. Culturing of microorganism (a) broth (b) pure culture techniques-Streak plate, Pour plate.
6. Antibiotic tests- Disc diffusion method, minimum inhibitory concentration.
7. Biochemical tests- IMIVC test, Catalase, Coagulase test, Gelatinase test, Oxidase.
8. Factors affecting the bacterial growth and study of growth curve.
9. Measurement of Microbial Growth by Turbidometry and enumeration of bacterial numbers by serial dilution.
10. Measurement of Microbial Growth by Viable Count.
11. Production of Beer and Wine
12. Coliform test

Suggested Reading:

1. Gopal Reddy M, M.N. Reddy, D.V.R. Sai Gopal and K.V. Mallaiah , "Laboratory Experiments in Microbiology",3rd edition, Himalaya Publishing House Pvt Ltd, 2008,
2. Gunasekaran P., "Laboratory manual in Microbiology", 3rd edition, New Age International Publ., New Delhi, 2007.
3. Kannan N., "Laboratory manual in General Microbiology", 1st edition, Panima Publishing Corp., New Delhi, 2002.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
Department of Bio-Technology
B.Tech (Bio-Technology)

SEMESTER IV

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours Per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P		CIE	SEE	
	THEORY								
1	18CS C05	Basics of Data Structures	2	-	-	2	20	50	2
2	18BT C10	Immunology	4	-	-	3	30	70	4
3	18BT C11	Instrumental Methods in Biotechnology	4	-	-	3	30	70	4
4	18BT C12	Chemical and Biochemical Thermodynamics	3	-	-	3	30	70	3
5	18ME C09	Principles of Management	3	-	-	3	30	70	3
6	18CE M01	Environmental Science	2	-	-	2	-	50	Non-Credit
	PRACTICALS								
7	18CS C06	Basics of Data Structures	-	-	2	2	15	35	1
	18BT C13	Immunology Lab	-	-	2	2	15	35	1
8	18BT C14	Instrumentation Lab	-	-	2	2	15	35	1
9	18EG C03	Soft Skills Lab	-	-	2	2	15	35	1
Total			**18**	**-**	**8**	**-**	**200**	**520**	**20**
Clock Hours Per Week -26									

L: Lecture T: Tutorial P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18CS C05

BASICS OF DATA STRUCTURES
(Common for other Programmes)

Instruction	2 L Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	20 Marks
Credits	2

Pre-requisites: Basic knowledge of programming language such as C or C++ is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives:
To introduce
1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different sorting and searching techniques and their complexities.

Course Outcomes: At the end of the course students will be able to
1. Understand the basic concepts of data structures.
2. Understand the notations used to analyze the performance of algorithms.
3. Choose and apply an appropriate data structure for a specified application.
4. Understand the concepts of recursion and its applications in problem solving.
5. Demonstrate a thorough understanding of searching and sorting algorithms.

UNIT - I
Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms, Complexity, Time- space tradeoff.
Recursion: Introduction, format of recursive functions, recursion Vs. Iteration, examples.

UNIT - II
Linked Lists: Introduction, Linked lists and types, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays.

UNIT - III

Stacks and Queues: Introduction to stacks, applications of stacks, implementation and comparison of stack implementations. Introduction to queues, applications of queues and implementations, Priority Queues and applications.

UNIT - IV

Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Representations of Trees, Tree Traversals, Binary search Tree.

UNIT - V

Graphs: Introduction, Applications of graphs, Graph representations, graph traversals, Minimal Spanning Trees.

Searching and Sorting: Linear searching, binary Searching, sorting algorithms-bubble sort, selection sort, quick sort, heap sort.

Text Books:

1. Narasimhaarumanchi, Data Structures and Algorithms Made Easy, CareerMonk Publications, 2017
2. S. Sahni and Susan Anderson-Freed, Fundamentals of Data structures in C,E.Horowitz, Universities Press, 2nd Edition.
3. ReemaThareja, Data Structures using C, Oxford University Press.

Suggested Reading:

1. D.S.Kushwaha and A.K.Misra, Data structures A Programming Approach with C, PHI.
2. Seymour Lipschutz, Data Structures with C, Schaums Outlines, Kindle Edition

Online Resources:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data-structures-1#DS

18BT C10

IMMUNOLOGY

Instruction	4 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

1. Students learn about the basic components and responses of Immune system
2. Knowledge of Antigen and antibody and the application of Antigen and antibody reaction
3. Importance of Antigen Processing and Presentation is emphasized.
4. Students understand significance of complement system and hypersensitivity
5. The immunological basics for diseases is taught to the students

Course Outcomes: At the end of the course students will be able to

1. Identify Immune system components and how they work in a coordinated way.
2. Apply the application of antigen-antibody interactions in development of medical diagnostic kits.
3. Analyze the Immune system related underlying causes in Allergies, Asthma and other hypersensitive reactions.
4. Acquainted with the diseases caused due to Immune system malfunctioning.
5. Explain the Immune system related medical complications in transplantation and Cancers.

UNIT-I

Immune System: Introduction to immunity, types of immunity – innate and adaptive immunity, humoral and cell mediated immune response, hematopoiesis, cells of the immune system, organs of immune system – primary (bone marrow and thymus) and secondary (lymph node, spleen, MALT, GALT), molecules of immune system (cytokines, interleukins, interferons, chemokines).

UNIT-II

Antigen, Antibody and its Interaction: Antigen – immunogenicity and antigenicity, factors influencing immunogenicity, haptens and adjuvants,

epitopes; Immunoglobulin – structure, classes and function, antigenic determinants of immunoglobulin – isotype, allotype, idiotype, generation of antibody diversity, production of monoclonal antibodies by hybridoma technology and its applications. Strength of antigen antibody interaction, affinity, avidity, cross reactivity, precipitation, agglutination, immunoelectrophoresis, RIA, ELISA, western blotting, immunofluorescence, FACS.

UNIT-III

Antigen Processing and Presentation: Major histocompatibility complex (MHC) – organization, classes and function; Antigen processing and presentation – role of antigen presenting cells, endogenous antigens (cytosolic pathway), exogenous antigens (endocytic pathway), presentation of nonpeptide antigen.

UNIT-IV

The Complement System and Hypersensitivity: Complement system – components, function, activation (classical and alternative pathway); Hypersensitive reactions – Type I (IgE mediated hypersensitivity), type II (antibody mediated cytotoxic hypersensitivity), type III (Immune complex mediated hypersensitivity), type IV (delayed type hypersensitivity).

UNIT-V

Medical Applications Of Immunology: Autoimmunity – organ specific (insulin dependent diabetes mellitus, Graves' disease, myasthenia gravis) and systemic (systemic lupus erythematosus, multiple sclerosis, rheumatoid arthritis) autoimmune diseases, treatment of autoimmune diseases; Transplantation – immunological basis of graft rejection, immunosuppressive therapy (general and specific), immunoprophylaxis (attenuated, inactivated and DNA vaccines), immunology of cancer- tumour antigens, immune response to tumour, cancer immunotherapy

Text Books:

1. Judith A. Owen, Jenni Punt, Sharon A.Stranford, "Kuby Immunology", 7th edition, W.H. Freeman, 2013.
2. Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt, "Roitt's Essential Immunology", 12th edition,John Wiley & Sons, 2011.

Suggested Reading:

1. Kenneth Murphy, "Janeway's Immunobiology", 8th edition, Garland Science, 2011.
2. Abdul K. Abbas, Andrew H. Lichtman, Shiv Pillai, "Cellular and Molecular Immunology 7th edition", Elsevier Health Sciences, 2011.
3. Sunil Kumar Mohanty and K. Sai Leela, "Text book of Immunology", 2nd edition, JP Medical Ltd, 2014.

18BT C11

INSTRUMENTAL METHODS IN BIOTECHNOLOGY

Instruction	4 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

Students are made to understand the following concepts during their course of time:

1. Types of Analytical methods and Instruments used for Analysis, Importance of microscopy
2. Types of Instruments used for isolation of Biomolecules and Sub cellular organelles
3. Types of centrifuges like low speed, high speed, ultra centrifuges
4. Types of Chromatographic Techniques
5. Charge based separation Techniques

Course Outcomes: At the end of the course students will be able to

1. Solve the Analytical problems in instruments by Detection & sensitivity limits.
2. Assess the merits and demerits of instruments
3. Discuss Principle, procedure and applications of different types of centrifugation
4. Summarize Principle, Procedure and applications of chromatography's like TLC, paper
5. Explain Principle procedure and applications of different electrophoresis like SDS, Agarose

UNIT-I

Analytical Methods And Microscopy: Types of Analytical Methods - Instruments for Analysis (Types)- Uncertainties in Instrumental measurements - Sensitivity and detection limit for instruments; principle, procedure, and applications of Bright field. Dark field, fluorescent and electron microscopy.

UNIT-II

Instruments For Isolation Techniques: Cell disruption by French press, Sonification, freeze thaw technique; use of liquid N2 and chemical approaches involved in cell disruption; Isolation of Biomolecules and cell organelles: centrifugation; basic principles of sedimentation, sedimentation coefficient, Svedberg Unit; various types of centrifuges, their uses, rotors, fixed angle, vertical, swing out, zonal rotors; preparative centrifugation, differential density gradient centrifugation, analytical ultra centrifugation; Materials used in preparation of density gradient- sucrose & cesium chloride; Isolation of sub cellular organelles and Biomolecules. Determination of molecular weight and purity of Biomolecules by analytical ultra centrifugation.

UNIT-III

Separation Techniques: Partition coefficient, partition chromatography, counter current distribution, adsorption chromatography,Paper, TLC& GLC, adsorption media, solvent, continuous and gradient elution, fraction collection and detection of pure molecules. Methods based on size: Gel permeation chromatography, principle application- Molecular weight determination. Dialysis and its significance. Affinity chromatography, application & technique for purification of proteins and nucleic acids.

UNIT-IV

Charge Based Separation Techniques: Principle and application of Ion exchange chromatography, use of ion exchange- cation & anion exchangers, pH and salt gradients for elution of proteins, amino acids and nucleotides. Electrophoresis: Migration of charged molecules in electric field-moving boundary, paper, cellulose acetate, starch gel electrophoresis, SDS PAGE, Determination molecular weight, iso-electric focusing and its significance. Identification of specific proteins by western blotting. Agarose gel electrophoresis-separation of DNA & RNA, by agarose gel electrophoresis, recovery of DNA fragments from agarose gels, southern & northern blot techniques and their significance, pulse field gel electrophoresis.

UNIT-V

Spectrometric Identification Techniques: Basic concepts of spectroscopy, Visible & UV spectroscopy & Explain Beer lamberts law; Principles and application of Colorimetry & Flame photometry, Nephlometry; Principles and applications of Atomic absorption Spectrophotometry; Principles & applications of IR, ESR NMR & Mass spectroscopy; Explains the laws of photometry.

Text Books:

1. Keith Wilson and John Walker, Principles and Techniques of Biochemistry and Molecular Biology, 6th edition, Cambridge University Press, 2005.
2. Sivasankar, Instrumental Methods of Analysis, Oxford higher education, OUP, India, 2012.

Suggested Reading:

1. GW Ewing, Instrumental Methods of Chemical Analysis, 4th edition, Mc Graw Hill, 1985.
2. Hobert H Willard D.L.Merritt and J.R.J.A.Dean, Instrumental Methods of Analysis, CBS publishers & Distributors, 1992.
3. Skoog DA, Fundamentals of Analytical Chemistry, Thomson Brooks/ Cole, 2004.

18BT C12

CHEMICAL AND BIOCHEMICAL THERMODYNAMICS

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Course aims at developing to reason so that students can apply thermodynamic principles in the solution of practical problems.
2. The aim of the course is also to give students an understanding of equilibrium conditions of chemical and biochemical extractions.
3. The course aims to give students the concepts of the transfer of chemical species between phases.
4. The course aims to facilitate students to apply I and II law of thermodynamics to open and closed systems to turbines and heat engines.
5. The course aims to give students the knowledge to calculate oxygen consumption and heat evolution in aerobic cultures.

Course Outcomes: At the end of the course students will be able to

1. Measure heat and work increments for closed systems and cyclic processes.
2. Evaluate nozzle, turbine and compressors based on the principles of I-law of thermodynamics.
3. Calculate the coefficient of performance of heat engines and heat pump
4. Predict the extent of various reactions by Gibbs and Duhem equation.
5. Calculate separation processes like distillation based on vapour liquid equilibrium for binary systems and calculate equilibrium conversions.

UNIT-I

Introduction To Thermodynamics: System Definition and Classification of system – closed and open system based on number of components, exchange of mass and heat. State and Path Functions, equilibrium, Phase rule. Thermodynamic Properties of fluids. Forms of energy, classification of properties. I-Law of Thermodynamics, application of I-law to closed.

Volumetric Properties of Fluids: PVT behavior of pure fluids. Real and Ideal Gas. Equations of state – Ideal gas law, Virial equations of state (restricted to first two terms). Cubic equations of state – Vander Waals and Redlich kwong. Processes involving ideal gases (isochoric, isobaric, isothermal, adiabatic, polytropic – simple applications)

UNIT-II

The Second Law Of Thermodynamics: Limitations to I-law, qualitative statement of Kelvin Plank and Clausius versions of II-law, entropy – definition, entropy and heat calculations for ideal gases. Maxwell relations – problems not included, Residual properties – definition (VR, HR, SR , GR – basic property relations for ideal gases, problems not included)

UNIT-III

Solution Thermodynamics: Partial molar properties – definition and simple applications involving calculation of partial molar properties for binary systems using analytical methods (no graphical method). Concepts of Chemical potential and fugacity (for pure species and species in solution). Lewis Randall rule, Raoult's law, Henry's law – Definition and simple applications. Excess properties – definition and fundamental relation for excess Gibbs free energy, (problems not included). Activity and activity coefficients, correlations to calculate activity coefficients – Margules, Van Laar and applications involving binary systems.

UNIT-IV

Topics In Phase Equilibria And Chemical Reaction Equilibria: Vapor-liquid equilibrium calculations for binary systems – P-x-y ,T-x-y diagrams, using simple Raoult's law to binary mixture. Chemical Reaction Equilibria: Equilibrium criteria for homogenous chemical reactions. Standard Gibbs energy change of reaction, **Reaction co-ordinate** –definition. Evaluation of equilibrium constant – numerical problems not included. Effect of pressure and temperature on equilibrium constant – qualitative treatment, simple problems involving temperature dependence of equilibrium constant. Calculation of equilibrium conversions and yields for single reactions.

UNIT-V

Bioenergetics: Energetics of Metabolic Pathways, Energy coupling (ATP & NADH). Stoichiometry and energetic analysis of Cell Growth and Product Formation. Thermodynamics of microbial growth. Oxygen consumption and heat evolution in aerobic cultures. Energy balance equation for cell culture

Text Books:

1. J.M.Smith, H.C.Van Ness and M.M.Abbott, "Introduction to Chemical Engineering Thermodynamics", 6th ed, TMH, 2003.
2. J.A.Roels, "Energetics and kinetics in biotechnology" , Elsevier, 1983.
3. Y.V.C.Rao , Revised edition , "An introduction to thermodynamics", Universities Press, 2004.

Suggested Reading:

1. Robert A.Alberty, "Biochemical Thermodynamics: Applications of Mathematica", John Wiley and Sons, 2006.
2. Stanley I. Sandler, "Chemical and Engineering Thermodynamics", 3rd Edition, Wiley, 1999.
3. K.V.Narayanan, "A Textbook of Chemical Engineering Thermodynamics", PHI Learning Pvt. Ltd, 2004.

18ME C09

PRINCIPLES OF MANAGEMENT

Instruction	3 L Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

To make the students to

1. Understand basic fundamentals and insides of management
2. Understand the nature and purpose of planning
3. Gain the knowledge about the frame work organizing
4. Understand the essence and significance of directing
5. Recognize the importance of controlling and its outcomes

.

Course Outcomes: At the end of the course students will be able to

1. Identify and evaluate the principles of management
2. Demonstrate the ability to have an effective and realistic planning
3. Identify the nature and the type of organization
4. Apply the tools and techniques of directing
5. Explain and evaluate the necessity for controlling and further refinement of an organization.

UNIT-I

Management: Definition of management**,** science or art, manager vs entrepreneur; managerial roles and skills; Evolution of management, Basic management theories by FW Taylor, Henry Fayol, Types of Business Organizations, sole proprietorship, partnership, company, public and private enterprises; Organization culture and environment; Current trends and issues in management

UNIT-II

Planning: Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Planning plant location and layout, Decision making steps & processes.

UNIT-III

Organizing: Nature and purpose of Organizing, formal and informal organization, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human

resource management, HR planning, Recruitment selection, Training & Development, Performance Management, Career planning and Management

UNIT-IV

Directing: Individual and group behavior, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication.

UNIT-V

Controlling: system and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting.

Text Books:

1. S.P. Robins and M. Couiter, "Management", 10/e., Prentice Hall India, 2009.
2. JAF Stoner, RE Freeman and DR Gilbert, "Management", 6/e., Pearson Education, 2004.

Suggested Reading:

1. P.C. Tripathy & P.N. Reddy, "Principles of Management", Tata McGraw Hill, 1999
2. Harold Koontz and Cyril O'Donnell "Principles of Management'', Tata McGraw Hill, 2017.

18CE M01

ENVIRONMENTAL SCIENCE

(MANDATORY COURSE)

Instruction	2 L Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Course Objectives: To enable the student:

1. Identify environmental problems arising due to engineering and technological activities and the science behind those problems.
2. Become aware about the importance of eco system and biodiversity for maintaining ecological balance
3. To identify the importance of interlinking of food chain
4. Learn about various attributes of pollution management and waste management practices.
5. To make the students contribute for capacity building of nation for arresting and/or managing environmental disasters.

Course Outcomes: At the end of the course, the student should have learnt

1. To define environment, identify the natural resources and ecosystems and contribute for the conservation of bio-diversity.
2. To suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
3. To relate the social issues and the environment and contribute for the sustainable development.
4. To follow the environmental ethics.
5. To contribute for the mitigation and management of environmental disasters.

UNIT – I:

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT – II:

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem, food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

UNIT – III:

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT – IV:

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

UNIT – V:

Social issues and the environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu, *"Introduction to Environmental Science"*, B S Publications, **2004**.
2. Suresh K. Dhameja, "*Environmental Studies"*, S. K. Kataria& Sons, **2009**.

Suggested Reading:

1. C. S. Rao," *Environmental Pollution Control Engineering"*, Wiley, **1991**.
2. S. S. Dara, *"A Text Book of Environmental Chemistry &Pollution Control"*, S. Chand Limited, 2006

18CS C06

BASICS OF DATA STRUCTURES LAB
(Common for other Programmes)

Instruction	2 L Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Pre-requisites: Any Programming Language(C)

Course Objectives:

1. Design and construct simple programs by using the concepts of Data structures as abstract data type.
2. To have a broad idea about how efficiently pointers can be used in the implement of data structures.
3. To enhance programming skills while improving their practical knowledge in data structures.
4. To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcomes: At the end of the course students will be able to

1. Implement the abstract data type.
2. Implement linear data structures such as stacks, queues using array and linked list.
3. Understand and implement non-linear data structures such as trees, graphs and its traversal techniques.
4. Implement various kinds of searching, sorting techniques.
5. Develop the suitable data structure for real world problem.

List of Experiments

1. Implementation of operations on arrays.
2. Implementation of Stack.
3. Implementation of Queue.
4. Implementation of basic operations on Single Linked List.
5. Implementation of Searching techniques.
6. Implementation of Sorting techniques.
7. Case study like Banking System, Students Marks Management, Canteen Management etc.

Text Books:

1. Brian W Kernighan, Dennis Ritchie, C Programming Language, PH PTR, 2nd Edition.
2. Richard M Reese, Understanding and Using C Pointers, O'Reily , 2013.

WebLinks:

https://nptel.ac.in/courses/106102064/

18BT C13

IMMUNOLOGY LAB

Instruction	2 P Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

Students identifies significance of blood grouping

1. The applications of Antigen antibody agglutination are demonstrated.
2. The applications of Antigen antibody Precipitation are demonstrated.
3. Students learn about diagnostic kits based on immunology
4. Students learn to interpret results

Course Outcomes: At the end of the course students will be able to

1. Demonstrate how Antigens and Antibody interact.
2. Identify agglutination and precipitation reactions.
3. Interprets the results based on the results of the antigen-antibody interaction.
4. Analyze the importance of different Immunological techniques developed.
5. Outline the importance of blood group matching in blood transfusions and other cases are practically demonstrated.

List of Experiments:

1. ABO Blood Grouping and Identification of Rh typing
2. Rocket immuno electrophoresis
3. Ouchterlony Double Diffusion for Antigen Antibody Patterns (ODD)
4. Immuno-electrophoresis (IEP)
5. Radial Immune Diffusion test (RID)
6. Widal test
7. VDRL tests
8. Total and Differential count of RBC & WBC by Micropipette method
9. Erythrocyte sedimentation rate
10. Enzyme Linked Immunosorbent Assay (ELISA) for Antigen capture and Antibody capture.
11. Estimation of Immunoglobullins by Precipitation with Saturated Ammonium Sulphate.

Suggested Reading:

1. Arti Nigam and Archana Ayyagari, Lab Manual in Biochemistry, "Immunology and Biotechnology", Tata McGraw Hill Education, 2007.
2. S. Ramakrishna and K.N. Sulochana, "Manual of Medical Laboratory Techniques", 1st edition, J.P. Medical Ltd, 2013.
3. Kanai L. Mukherjee and Swarajith Ghosh, "medical Laboratory Techniques, (Vol-I): Procedure Manual for Routine Diagnostic tests", 2nd edition, Tata McGraw Hill education.

18BT C14

INSTRUMENTATION LAB

Instruction	2 P Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

With help of this course Students are expected to

1. Understand the basic concepts for the operation of Ph and spectrophotometer.
2. Estimate the micro and macro molecules by using chromatography techniques.
3. Separate the biomolecules with the application of different methods of electrophoresis.

Course Outcomes: At the end of the course students will be able to

1. Relate the instrumentation techniques to their real life applications.
2. Demonstrate their knowledge on different Spectrophotometers.
3. Identify and solve the problems associated with determination of molecular weights by chromatography and electrophoresis techniques.
4. Compare and analyze different biomolecules by using flame photometry and fluorometry.
5. Justify their results on separation of biomolecules by differential centrifugation methods.

List of Experiments:

1. The calibration of pH meter and measurement of pH for different solutions
2. Estimation of Ascorbic acid by colorimetric assay
3. Estimation of unknown samples by using conductivity meter
4. Estimation of different macromolecules by visible spectrophotometer
5. Verification of Lambert - Beers law by UV -VIS spectrophotometer
6. Estimation of proteins and nucleic acids by U.V method

7. Estimation of turbidity using Nephlometer
8. The separation of different macromolecules by Paper, Thin layer chromatography
9. The separation of different macromolecules by Paper, PAGE, SDS-PAGE
10. Estimation of minerals by Flame photometry
11. Estimation of Thiamine and Riboflavin by Fluorimetry
12. Preparation of Standard curve using UV-VIS & Flame Photometry
13. Fractionation of Plasma Proteins by Electrophoresis
14. Sub-cellular fractionation studies by differential centrifugation

Suggested Reading:

1. Sivasankar, Instrumental Methods of Analysis, Oxford higher education, OUP, India, 2012.

18EG C03

SOFT SKILLS LAB

Instruction	2 P Hours per week
Duration of SEE	2 Hours
SEE	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: The course will introduce the students to:

1. Imbibe an impressive personality, etiquette, professional ethics & values, effective time management & goal setting.
2. Understand the elements of professional update & upgrade through industry exposure in a mini-live project. Understand confidence building strategies and thereby to make effective presentations through PPTs.
3. Learn what constitutes proper grooming and etiquette in a professional environment. Acquire the necessary skills to make a smooth transition from campus to corporate.

Course Outcomes: At the end of the course students will be able to

1. Be assertive and set short term and long term goals. Also learn to manage time effectively and deal with stress.
2. Win in professional communication situations and participate in group discussions with confidence. Write abstracts.
3. Write effective resumes. Plan, prepare and face interviews confidently.
4. Adapt to corporate culture by being sensitive - personally and sensible - professionally. Draft an SOP.
5. Apply the soft skills learnt in the mini-live project, by collecting and analyzing data and making oral and written presentations on the same.

Exercise-1

Main Topics: Thinking Skills, Personality Development – Effective Time Management, setting realistic goals, self confidence and assertiveness, stress management, moral values.

Flipped Sessions: Personal Sensitivity & Professional Sensibility (Reading & Discussion)

Writing Input: Writing to Express - Drafting & Delivering a Speech (Free Writing Exercise)

Exercise-2

Main Topics: Advanced Group Discussion with Case studies : Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.

Flipped Sessions: Importance of Professional Updating & Upgrading (Reading & Discussions)
Writing Input: Writing with Precision - Writing Abstracts

Exercise-3
Main Topics: Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, mock interviews. Resume' writing – structure and presentation, planning, defining the career objective, projecting ones strengths and skills.
Flipped Sessions: Mock Interviews (Video Sessions & Practice)
Writing Input: Writing to Reflect - Resume Writing

Exercise-4
Main Topic: Corporate Culture – Grooming and etiquette, communication media, academic ethics and integrity
Flipped Sessions: Corporate Culture, Etiquette & Grooming (Video Sessions & Practice through Role-play)
Writing Input: Writing to Define - Writing an effective SOP.

Exercise-5
Main Topic: Mini Project – General/Technical. Research, developing a questionnaire, data collection, analysis, written report and project seminar. Elements & Structure of effective presentation. Presentation tools – Body language, Eye-contact, Props & PPT.
Flipped Sessions: Effective Presentations (Video & Writing Sessions, Practice through Emulation)
Writing Input: Writing to Record - Writing minutes of meeting.

Suggested Reading:

1. Madhavi Apte , "A Course in English communication", Prentice-Hall of India, 2007
2. Dr. Shalini Verma, "Body Language- Your Success Mantra", S Chand, 2006
3. Ramesh, Gopalswamy, and Mahadevan Ramesh, "The ACE of Soft Skills", New Delhi: Pearson, 2010
4. Van Emden, Joan, and Lucinda Becker, "Presentation Skills for Students", New York: Palgrave Macmillan, 2004

* Flipped Class-room: Students explore the concept first and then trainer explains it, students work on their own.

Web Resources:

1. https://www.goskills.com/Soft-Skills
2. https://www.trainerbubble.com
3. https://www.skillsconverged.com