



Choice Based Credit System (CBCS)

Name of the Programme (UG): B.Tech

Syllabus for I - Semester and II - Semester

(With effect from 2016 - 2017)

Specialization /Branch: Bio-Technology

Chaitanya Bharathi Institute of Technology (A)

Chaitanya Bharathi (P.O), Gandipet
Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
Choice Based Credit System (with effect from 2016-17)
B.Tech (Bio-Technology)

SEMESTER - I

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/D		CIE	SEE	
THEORY								
1	16MT C02/ 16BT C01	Mathematics - I / Basics of Biology - I	3/1	-	3	30	70	4
2	16PY C01	Engineering Physics	3	-	3	30	70	3
3	16CY C01	Engineering Chemistry	3	-	3	30	70	3
4	16FE C01	Elements of Electrical Engineering	3	-	3	30	70	3
5	16BT C02	Elements of Bio-Technology	3	-	3	30	70	3
6	16EG C01	Professional Communication in English	3	-	3	30	70	3
PRACTICALS								
7	16ME C02	Engineering Graphics	1	3	3	30	70	3
8	16PY C03	Engineering Physics Laboratory	-	2	2	15	35	1
9	16CY C03	Engineering Chemistry Laboratory	-	2	2	15	35	1
10	16EG C02	Professional Communication Laboratory	-	2	2	15	35	1
TOTAL			20	9	-	255	595	25

L: Lecture T: Tutorial D: Drawing
CIE - Continuous Internal Evaluation

P: Practical
SEE - Semester End Examination

Assessment Procedures for Awarding Marks

The distribution of marks is based on internal assessment (Sessional) by concerned teacher and the Semester end examination shall be as follows:

Course (in terms of credits)	CIE	Semester end Examination (Marks)	Remarks	Duration of Semester End Examination
Three(3) Credits/ Four(4) Credits	30*	70**	Theory Course/ Engg . Graphics	3 Hours
Two(2) Credits	20*	50***	Theory	2 Hours
Two(2) Credits	25	50	Lab Course/Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
Two(2) Credits	50	—	Project Seminar/Seminar	----
Six(6) Credits	50	100	Project	Viva
One(1) Credit	—	50***	Environmental Studies, Professional Ethics and Human values	2 Hours
One(1) Credit	50		Mini Project	-----

CIE: Continuous Internal Evaluation

* Out of 30/20 sessional marks(CIE), 10/5 marks are allotted for slip-tests(Three slips test will be conducted, each of 10/5 marks, best two average is considered) and the remaining 20/15 marks are based on the average of two tests, weightage for each test is 20/15 marks.

** The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

***The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 15 marks. Part-B carries 35 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

Note: A course that has CIE(sessional marks) but no semester end examination as per scheme, is treated as Pass/Fail for which pass marks are 50% of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/ grade as prescribed. Minimum pass marks for theory course is 40% of total marks i.e., CIE plus semester end examinations where as for the lab course/project is 50%.

MATHEMATICS- I (forBiPC Stream)

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

1. The purpose of E.T is to learn simple steps and its derivatives.
2. It is also essential to learn how to calculate steps, Evaluations and height of High tower buildings.
3. Limits, continuity and differentiability is very essential to function any system or organization.
4. To learn matrices is very important on day to day life in the form of Minimization or Maximization of price etc.
5. To assess the system of Thing for period of short time or long time the curve fitting is very useful.
6. These elementary operations very important to grow further and achieve results in the form of Research and Development.

Course Out Comes: On successful completion of this course the students shall be able to

1. Basics of elementary trigonometry is very essential to solve Engineering problems.
2. Very useful to find out Slopes, Heights and Distances.
3. Basics of limits, continuity and differentiability are must to develop the mathematical modeling.
4. Applications of matrices are abundantly used in Industry as well as Research and Development.
5. It is very useful to find constant co-efficient of straight line and curved equations by curve fitting methods and it uses are plenty at surveying agricultural fields.
6. It is a live wire for Research and Development.

UNIT-I

Trigonometry: Trigonometric ratios and compound angles, trigonometric ratios of multiple and sub multiple angles. Transformations-sum and product rules. Hyperbolic and Inverse Hyperbolic functions.

UNIT-II

Limits, Continuity: Intervals and neighbourhoods, limits and concept of a limit. Standard limits and related problems.

UNIT-III

Differentiation: Derivatives of a function, Elementary properties. Derivatives of Trigonometric, Inverse Trigonometric, Hyperbolic and inverse Hyperbolic functions. Methods of differentiation, second and higher order derivatives.

UNIT-IV

Matrices: Types of matrices, multiplication of matrices, scalar multiplication. Inverse of matrix-determinant, singular, non-singular, minor, cofactors, adjoint, Rank-Echelon form, consistency, inconsistency Solutions of simultaneous linear equations.

UNIT-V

Curve Fitting: Residues, Principle of Least squares and Curve fitting by the method of least squares, Fitting of a straight line, parabola, Fitting of the curves of the form $Y = ab^x$, $Y = ae^{bx}$.

Text Books:

1. Narayan Shanti and Mittal P.K., "Differential Calculus", 30th edition, S Chand publishers, 2005.
2. A.R.Vasistha, "Matrices", 43rd edition, Krishna Prakashan Media (P) Ltd. 2014.
3. B.S.Grewal, "Numerical Methods for scientists and engineers", 43rd Edition, Khanna Publishers, 2015.

Suggested Reading:

1. N P Bali and Manish Goyal, "A Text Book of Engineering Mathematics", 9th Edition, Laxmi publishers, 2016.
2. Joseph Edwards, "Differential Calculus For Beginners", arihant publishers, 2016.
3. Kanti B.Datta, "Mathematical Methods of Science and Engineering", CENGAGE Learning publishers, 2014.
4. S.S.Shastry, "Introductory Methods of Numerical Analysis", 5th Edition, EEE publishers, 2014.

BASICS OF BIOLOGY- I **(for MPC Stream)**

Instruction	3L + 1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

1. To provide knowledge on basic concepts of Biology to mathematic background students.
2. To give understanding fundamentals of origin of life onwards and various theories of evolution.
3. To provide an insight into classification of plants and their propagation mode.
4. To give the students an understanding of knowledge on microbes and their economic importance.
5. To impart theoretical knowledge on various physiological aspects of plants.

Course Outcomes: At the end of the course student should

1. Be able to understand the theories behind the origin of life and evolution studies.
2. Be able to classify plants based on the habit and habitat of plants.
3. The study can understand the mechanism of reproduction and development of seed in plants.
4. Be able to understand the basic structure and function of various organelles of plant cell.
5. Be able to have a basic knowledge of various microbes and their economic importance.
6. Be able to follow basic physiological aspects in plants.

UNIT-I

HISTORY OF LIFE AND EVOLUTION

History of earth, evolutionary concepts of origin of life. Experimental verification of chemical origin of life - Miller's Experiment. Darwinism, Natural selection, Sexual selection, Artificial selection, Mendelism, Hugo de Vries mutation theory, neo-darwinism.

UNIT-II

PLANT SYSTEMATIC AND REPRODUCTION

Plant kingdom, salient features of classification. Alternation of generation

of the plants. Type studies of Algae (Spirogyra), Fungi (Rhizopus), Bryophytes (Pteris), Gymnosperms (Cycas) and general characteristics and life cycle of Angiosperms. Overview of modes of reproduction-Asexual: vegetative propagation, budding, sporulation, binary fission; Sexual reproduction: pollination, fertilization, development of embryo, endosperm, fruit and seed formation. Apomixes, pathenocarpy, polyembryony type of reproduction.

UNIT-III

CELL STRUCTURE AND INTERNAL ORGANIZATION OF PLANTS

Cell as basic unit of life, overview of the plant cell, cell cycle, cell division, mitosis and meiosis. Concept of Growth, meristems (apical, intercalary and lateral) their functions. Simple tissue (parenchyma, collenchyma and sclerenchyma), complex tissues (xylem and phloem). Tissue systems (epidermal, ground and vascular).

UNIT-IV

MICROBIOLOGY

Introduction and importance of classification - five kingdoms. General account of prokaryotes, bacterial viruses - T4, plant viruses - TMV, animal viruses - HIV, Protista, Fungi, Plantae and Animalia. Reproduction in bacteria (asexual - binary fission and sexual - conjugation) and viruses (lytic and lysogenic). Economic importance of beneficial bacteria (agriculture, industry, medicine and biotechnology).

UNIT-V

PLANT PHYSIOLOGY AND CONCEPTS IN PLANT BIOTECHNOLOGY

Absorption of water - soil water, water potential, diffusion, imbibitions, osmosis, plasmolysis, absorption of water, ascent of sap, transportation. Crop improvement - Heterosis and mutation breeding. Plant tissue culture techniques and their applications. Plant growth regulators.

Tex Books:

1. Text book of Botany I and II year, Vignan Publishers .
2. Text book of Botany, I and II year, Telugu Akademi, Hyderabad 2012.
3. Biology. Raven, Johnson, Losos, Mason, Singer. Tata McGraw Hill Publishing Co. Pvt. Ltd 9th edition, 2010.

Suggested Reading:

1. Beginning Science: Biology. B.S. Beckett. Oxford University Press. 1st edition, 1983.
2. Campbell, N.A. and Reece, J. B. (2008) Biology 8th edition, Pearson Benjamin Cummings, San Francisco.

3. Raven, P.H et al Biology 7th edition Tata McGraw-Hill Publications, New Delhi, 2006.
4. Griffiths, A.J.F et al Introduction to Genetic Analysis, 9th edition, W.H. Freeman & Co. NY, 2008.
5. Botany for Degree students. A.C. Dutta, Oxford University Press. 6th Edition, 1998.

ENGINEERING PHYSICS

Instruction	3Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objective of the course is to make the student

1. Understand the general concepts of physics.
2. Acquire knowledge of different kinds of waves and their behavior.
3. Familiar with crystal physics and materials.
4. To introduce the general concepts of physics.

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

1. Describe the types of oscillations and analyze them.
2. Demonstrate the wave nature of the light.
3. Develop the concepts related to electromagnetic behavior.
4. Identify the various crystal systems and defects.
5. Explain the origin of magnetism and dielectric polarization and applications of these materials in the field of engineering & technology.

UNIT - I

Waves and Oscillations: Review of free oscillations - Superposition of two mutually perpendicular linear SHMs of same frequency and 1:2 ratio frequency - Lissajous figures - Damped vibrations - Differential equation and its solution - Logarithmic decrement - Relaxation time - Quality factor - Forced vibrations - Differential equation and its solution - Amplitude resonance- Torsional pendulum.

Ultrasonics: Production of ultrasonics by piezoelectric and magnetostriction methods - Detection of ultrasonics- Determination of ultrasonic velocity in liquids - Applications.

UNIT - II

Interference: Division of amplitude - Interference in thin films (reflected light) - Newton's rings - & division of wavefront - Fresnel's biprism.

Diffraction: Distinction between Fresnel and Fraunhofer diffraction - Diffraction at single slit - Diffraction grating (N Slits) - Resolving power of grating.

UNIT - III

Polarization: Malus's law - Double refraction - Nicol's prism - Quarter & Half wave plates - Optical activity - Laurent's half shade polarimeter.

Electromagnetic Theory: Review of steady and varying fields - Conduction and displacement current - Maxwell's equations in differential and integral forms - Electromagnetic wave propagation in free space, dielectric and conducting media - Poynting theorem.

UNIT - IV

Crystallography: Space lattice - Crystal systems and Bravais lattices - Crystal planes and directions (Miller indices) - Interplanar spacing - Bragg's law - Lattice constant of cubic crystals by powder diffraction method.

Crystal Imperfections: Classification of defects - Point defects - Concentration of Schottky and Frenkel defects - Line defects - Edge dislocation - Screw dislocation - Burger's vector.

UNIT - V

Magnetic Materials: Classification of magnetic materials - Langevin theory of paramagnetism - Weiss molecular field theory - Domain theory - Hysteresis curve - Structure of ferrites (spinel & Inverse spinel) - Soft and hard magnetic materials.

Dielectric Materials: Dielectric polarization - Types of dielectric polarization: electronic, ionic, orientation and space-charge polarization (Qualitative) - Frequency and temperature dependence of dielectric polarization - Determination of dielectric constant (Schering bridge method) - Ferroelectricity - Barium titanate - Applications of ferroelectrics.

Text Books:

1. B.K. Pandey and S. Chaturvedi, "Engineering Physics", Cengage Publications, 2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, "A Text Book Engineering Physics", S. Chand Publications, 2014.
3. M. Arumugam, "Materials Science", Anuradha Publications, 2015.
4. S.L. Gupta and Sanjeev Gupta, Modern Engineering Physics, Dhanpat Rai Publications, 2011.

Suggested Reading:

1. R. Murugesan and Kiruthiga Sivaprasath, "Modern Physics", S. Chand Publications, 2014.
2. V. Rajendran, "Engineering Physics", McGraw-hill Education Publications, 2013.
3. P.K. Palanisamy, "Engineering Physics", Scitech Publications, 2012
4. V. Raghavan, "Materials Science and Engineering", Prentice Hall India Learning Private Ltd., 6th Revised edition, 2015.

ENGINEERING CHEMISTRY

Instruction	3Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives

The syllabus has sought to fulfill the objective of making the student of engineering and technology realize that chemistry is the real base of his profession and that therefore he must have a good understanding of chemistry before he can use it in his profession.

"The study of chemistry is profitable not only in as much as it promotes the material interest of mankind, but also because it furnishes us with insight into the wonders of creation, which immediately surround us and with which our existence, life and development are most closely connected."-----
Justus Von Leibig (German Chemist).

The various units of the syllabus is so designed to fulfill the following objectives.

1. This syllabus helps at providing the necessary introduction of the chemical principles involved and devices in a comprehensive manner understandable to the students aspiring to become practicing engineers.
2. The aim of framing the syllabus is to impart intensive and extensive knowledge of the subject so that students can understand the role of chemistry in the field of engineering.
3. Thermodynamics and Electrochemistry units give conceptual knowledge about spontaneous processes and how can they be harnessed for producing electrical energy and efficiency of systems.
4. Fuels have been taught with a view to give awareness to materials which can be used as sources of energy.
5. To understand importance of analytical instrumentation for different chemical analysis.

Course Outcome

1. This syllabus gives necessary theoretical aspects required for understanding intricacies of the subject and also gives sufficient exposure to the chemistry aspects in different disciplines of engineering.
2. The above knowledge also helps students to carry out inter disciplinary research such that the findings benefit the common man.

3. This syllabus imparts a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

UNIT - I

Chemical Thermodynamics : Introduction and definition of the terms, the concept of reversible and irreversible processes, Work done in isothermal and adiabatic processes, Success and limitations of First law of thermodynamics, need for second law of thermodynamics, statements of second law of thermodynamics, Carnot cycle, heat engine and its efficiency, Carnot theorem, concept of Entropy - Entropy changes in reversible and irreversible processes, physical significance of entropy criteria of spontaneity in terms of entropy and Gibb's free energy function , Gibb's-Helmholtz equation and applications, Numericals.

UNIT - II

Phase rule & Chemical Equilibria

Phase rule: Statement, definition of the terms - phases, components, degrees of freedom with examples, Phase diagram - one component system (water system), two component system (silver-lead system), desilverisation of lead.

Chemical Equilibria - Homogenous and Heterogenous Equilibria - applications.

UNIT - III

Fuels: Classification, requirements of a good fuel, calorific value, types of calorific value, calculation of CV using Dulong's formula, Combustion - calculation of air quantities by weight and volume, Numericals.

Solid fuels: coal - analysis of coal - proximate and ultimate analysis - importance.

Liquid fuels: crude oil - fractional distillation, cracking - Fixed bed catalytic cracking, knocking, antiknocking agents (TEL, MTBE), octane number, cetane number, unleaded petrol.

Gaseous fuels: LPG, CNG - composition and uses.

UNIT - IV

Electrochemistry Introduction, construction of electrochemical cell, sign convention, cell notation, cell emf, SOP and SRP, electrochemical series and its applications, Nernst equation and applications, Types of Electrodes - Standard Hydrogen Electrode, Saturated Calomel Electrode, Quinhydrone electrode and Ion selective electrode (Glass electrode), construction, Numericals.

UNIT -V

Instrumental Techniques in Chemical Analysis: Principle, method and applications of Conductometry (acid-base titration), Potentiometry (acid-base, redox titration), pH- metry (acid - base titration), Colorimetry (Beer Lambert's law)

Green Chemistry - outlines and Principles

Text Books:

1. P.C.Jain and Monica Jain, "Engineering Chemistry", DhanpatRai Pub Co., New Delhi (2002)
2. B.R. Puri, L.R. Sharma & M.S. Pathania, "Principles of Physical Chemistry", Vishal Publishing Company, 2013.

Suggested Reading:

1. P.W. Atkin de Paul, "Principles of Physical Chemistry", Oxford University Press, 2010.
2. S. Glasstone, "Text book of Physical Chemistry", Macmillam and Co., London, 2010.

ELEMENTS OF ELECTRICAL ENGINEERING

Instruction	3Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To understand the basic concepts of electrical circuits.
2. To understand the principles of electromagnetic induction.
3. To know about different types of batteries, charging and discharging of batteries and types of fuel cells etc.
4. To know about different types of electrical wires and cables, domestic and industrial wiring.
5. To understand safety rules and methods of earthing.

Course Outcomes: After completion of the course, the student will be able to:

1. Acquire the knowledge of basic concepts of electrical circuits such as Ohm's law, Kirchhoff's laws etc.
2. Acquire the knowledge of basic Faraday's laws of electromagnetic induction.
3. Acquire the knowledge to solve the problem of AC circuits.
4. Acquire the knowledge of specifications of batteries, types of cells and sources of renewable energy.
5. Acquire the knowledge of electrical wiring and cables and their types and electrical equipment and their specification.
6. Acquire the knowledge of safety precautions in handling electrical appliances, importance of grounding and methods of earthing.

UNIT-I**DC Circuits**

Current, voltage, power and energy, sources of electrical energy, independent and dependent sources, source conversion, circuit elements, Resistor, Inductor, Capacitor Ohm's law, Kirchhoff's laws, analysis of series, parallel and series-parallel circuits, star-delta conversion, Node and Mesh analysis (with independent sources only).

UNIT-II :

Electromagnetism & AC Circuits Electric charge, electric field, lines of force, electric field intensity, electric flux and flux density, Faraday's laws of electromagnetic induction, static and dynamically induced EMF.

A.C. Circuits: Generation of alternating voltage and current, equation of

alternating voltage and current, average and rms values of sinusoidal quantities, form and peak factors, phasor representation of sinusoidal quantities, AC through pure resistance pure Inductance, pure capacitance, RL, RC, RLC circuits.

UNIT-III:

Batteries and Fuel Cell

Introduction to batteries, simple cell, EMF and internal resistance of a cell, primary and secondary cells, cell capacity, types and specifications of batteries, charging and discharging of battery, safe disposal of batteries; fuel cell, principle and types of fuel cell, different sources of renewable energy.

UNIT-IV:

Electrical Wiring

Types of wires and cables, types of connectors and switches, system of wiring, domestic and industrial wiring, simple control circuit in domestic installation, electrical equipment and their specifications.

UNIT-V:

Safety & Protection

Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, other electrical hazards, safety rules, importance of grounding and earthing of electrical equipment, methods of earthing, circuit protection devices: Fuses, MCB, ELCB and Relays.

Text Books:

1. Edward Hughes, "Electrical and Electronics Technology", 10th Edition, Peasson Publishers 2010.
2. V.K. Mehta & Rohit Mehta, "Principles of Electrical Engineering", S.Chand Company Limited 2008.
3. B.L. Theraja & A.K. Theraja, "Electrical Technology", Vol.I, S.Chand Company Limited 2008.

Suggested Reading:

1. P.V.Prasad & S. Siva Nagraju, "Electrical Engineering: Concepts & Applications", Cengage Learning, 2012.
2. S. Rao, "Electrical Safety, fire safety engineering & Safety Management", Khanna publications, 1998.
3. Surjit Singh & Ravi Deep Singh, "Electrical Estimating and Costing", Dhanapath Rai & Co., 1997.

ELEMENTS OF BIOTECHNOLOGY

Instruction	3Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. Define biotechnology and identify some basic applications.
2. Structure and functions of the basic biomolecules of life.
3. Learns the emerging potential of bioinformatics.
4. Understand the role of biotechnology in production of recombinant products.
5. Introduce the medical applications of biotechnology.
6. Basic understanding of biotechnology and industry.

Course Outcomes:

1. Cite examples of current applications of biotechnology and advances in the different areas like medical, microbial, environmental etc.
2. Familiarize with the use of computers in applied biotechnology.
3. Define terms associated with downstream processing and the process.
4. Understanding of the ethical issues related to biotech products.
5. Familiarize with the medical applications of Biotechnology.
6. Get a broad insight into the multidisciplinary field of biotechnology.

UNIT-I**INTRODUCTION TO BIOTECHNOLOGY**

Historical perspectives, Classical vs Modern Biotechnology. Applications of Biotechnology in different fields. Introduction to prokaryotic cell and eukaryotic cell and its differences. The beneficial and harmful role of microorganisms.

UNIT-II**INTRODUCTION TO BIOMOLECULES AND BIOINFORMATICS**

Structure and functions of nucleic acids, lipids, carbohydrates, amino acids in brief. Introduction to Bioinformatics, role of bioinformatics in biotechnology, types of biological databases and their applications, Human Genome project.

UNIT -III**MOLECULAR BASIS OF BIOTECHNOLOGY**

Identification of genetic material- classical experiments, structure of DNA and chromosome and its functions, Central dogma of molecular biology- from genes to proteins, a brief view on transcription and translation. Basics of rDNA technology- basic steps in rDNA technology (Case study of Insulin production). Bioethical issues in biotechnology.

UNIT -IV**MEDICAL BIOTECHNOLOGY.**

Elements of Immunology - Types of immunity (Acquired and Innate), structure and functions of antigen, types of antibodies, monoclonal antibodies - hybridoma technology, Etiology of cancer. Introduction to stem cells -types, characteristics and applications.

UNIT -V**PROCESS BIOTECHNOLOGY**

Upstream process - basic structure of fermenter, types of fermentation processes, aerobic and anaerobic process, Batch and Continuous fermentation. Downstream process - overview and importance. Characteristics of bioproducts (intracellular and extracellular).

Text Books:

1. Cell Biology. C.B. Powar. Himalaya publication. 2nd edition, 1981.
2. Principles of Genetics. John Gardner, Simmons and Snustad. John Wiley and sons. 8th edition, 2006.
3. Bioinformatics: Methods and Applications. SC Rastogi, N Mendiratta & P Rastogi. PHI, New Delhi. 4th edition, 2005.
4. Kuby Immunology. Richard A. Goldsby, Thomas J. Kindt, Barbara A. Osborne. WH freeman company. 6th edition, 2006.

Suggested Reading:

1. "The Cell: A Molecular approach", Geoffrey M Cooper and Robert E. Hausman. Sinauer associates incorporated. 5th ed, 2009.
2. "Industrial Microbiology", L.E. Casida, New age international, 2000.
3. "Cell and Molecular biology eighth edition", Derobertis & Derobertis LippincoH Williams and Willins (2010).
4. "Riott's essential immunology", Peter J. Delves, Seamus J. Martin, Dennis R. Burton and Ivan M. Riott. Wiley - Blackwell. 12th edition, 2011.

16EGC01

PROFESSIONAL COMMUNICATION IN ENGLISH

Instruction	3Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To enable the students to understand the role and importance of communication and to develop their basic communication skills in English.
2. To strengthen the students' usage of grammar and to develop their vocabulary.
3. To improve the students' listening skills and introduce them to different reading strategies.
4. To equip the students with appropriate writing skills.
5. To enhance imaginative and critical thinking through literary texts and book review.

Course Outcomes: The students will

1. Understand the nature, process and types of communication and will communicate effectively without barriers.
2. Understand the nuances of listening and will learn to make notes.
3. Read different texts, comprehend, draw inferences and conclusions.
4. Write effective paragraphs, letters and reports.
5. Critically analyze texts and write book reviews.

UNIT-I

Understanding Communication in English: Introduction, Nature and importance of communication. Process of communication. Basic types of communication - Verbal and Non - Verbal. One way vs. Two way communication. Barriers to communication. Intrapersonal and interpersonal communication. Johari Window.

Grammar & Vocabulary: Parts of speech, Figures of speech - Euphemism, Hyperbole, Irony, Metaphor, Onomatopoeia, Oxymoron, Paradox, Personification, Pun & Simile.

UNIT-II

Developing Listening Skills: Exposure to recorded and structured talks, class room lectures- problems in comprehension and retention. Types of listening, barriers to listening, effective listening strategies. Note-taking.

Grammar & Vocabulary: Articles, Prepositions, Phrasal verbs, Idioms.

UNIT- III:

Developing Writing Skills: Sentence structure, Brevity and clarity in writing, Cohesion and Coherence, Paragraph writing, Letter writing - form and structure, style and tone. Kinds of Letters -Apology and Request letters. Email etiquette, Report writing.

Grammar & Vocabulary: Tenses, Conditionals, Homonyms, Homophones.

UNIT - IV:

Developing Reading Skills: The Reading process, purpose, different kinds of texts.

Reading comprehension: Techniques of comprehension - skimming, scanning, drawing inferences and conclusions. Note-making.

Grammar & Vocabulary: Concord, Connectives, Active and Passive voice, Words often confused.

UNIT-V: Reading for Enrichment

- | | |
|---------------------------------------|----------------|
| 1. The Road Not Taken | Robert Frost |
| 2. Goodbye Party For Miss Pushpa T. S | Nissim Ezekiel |
| 3. The Open Window | Saki |
| 4. The Romance Of A Busy Broker | O. Henry |

Book reviews -Oral and written review of a chosen / novel/ play - a brief written analysis including summary and appreciation. Oral presentation of the novel/play.

Grammar & Vocabulary: Indianisms, Common errors, Parallelisms.

Text Books:

1. Vibrant English, Orient Blackswan Ltd.

Suggested Reading:

1. M .Ashraf Rizvi, Effective Technical Communication, Tata McGraw- Hill, New Delhi.
2. Meenakshi Raman and Sangeetha Sharma, Technical Communication - Principles and Practice, Oxford Univ. Press, New Delhi.
3. Sunil Solomon, English for Success, Oxford University Press, 2015.
4. Krishna Mohan, Meera Banerji, Developing Communication Skills, McMillan India Ltd.
5. Michael McCarthy, English Vocabulary in Use.
6. Brikram K Das, Kalyani Samantray, An Introduction to Professional English and Soft Skills Cambridge University Press, New Delhi.

ENGINEERING GRAPHICS

Instruction	1L + 3D Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. To provide an exposure in understanding the drawings during a multi disciplinary approach towards a problem.
2. To train up in perception and imagination of a three dimensional scenario.

Course Outcomes:

1. To understand theory of projections.
2. Ability to improve visualization skills.
3. Ability to sketch Engineering Objects.

UNIT - I

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

Conic Sections: Ellipse, Parabola, Hyperbola including the Rectangular Hyperbola (General method only).

Cycloidal curves: Construction of cycloid, epi-cycloid, hypo-cycloid & involutes.

UNIT - II

Orthographic Projections: Principles of Orthographic Projections - Conventions, Projection of Points, Projection of Lines - inclined to both planes.

UNIT - III

Projections of Planes: Projections of regular Planes - Perpendicular planes and Oblique planes.

UNIT - IV

Projections of Solids: Projections of Regular Solids - Regular Polyhedra, solids of revolution, (Simple position only).

Sections of Solids: Types of cutting planes - their representation - sections of solids in simple position.

UNIT - V

Introduction to Graphic packages: Getting started, Basic drawing and editing commands, creating lines, planes and solids.

Note: Syllabus for external examination will be from unit 1 to unit 4 only & unit-5 is exempted from external examination. Unit 5 is for internal examination only.

Text Books:

1. N.D.Bhatt," Elementary Engineering Drawing", Charotar Publishers, 2014.
2. Basanth Agrawal and C M Agrawal "Engineering Drawing 2e ", McGraw-Hill Education(India) Pvt. Ltd.
3. K.Venugopal, "Engineering Drawing and Graphics + Autocad", New Age International Pvt. Ltd, 2011.

Suggested Reading:

1. Shaw M.B and Rana B.C., "Engineering drawing", Pearson, 2nd edition, 2009.
2. P I Varghees, " Engineering Graphics ",Tata McGraw-Hill publications, 2013.
3. Bhattacharya. B, "Engineering Graphics", I. K. International Pvt. Ltd, 2009.
4. Dhawan R.K., "Principles of Engineering Graphics and Drawing", S. Chand, 2011.

ENGINEERING PHYSICS LABORATORY

Instruction	2Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: The objectives of the course is to make the student.

1. Apply theoretical physics knowledge in doing experiments.
2. Understand the behavior of the light experimentally.
3. Analyze the behavior of magnetic and dielectric materials.

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

1. Understand the concept of errors and find the ways to minimize the errors.
2. Demonstrate interference and diffraction phenomena experimentally.
3. Distinguish between polarized and unpolarized light.
4. Determine the loss of energy of a ferromagnetic material and its uses in electrical engineering.
5. Understand the suitability of dielectric materials in engineering applications.

List of Experiments:

1. Error Analysis - Estimation of errors in the determination of time period of a torsional pendulum.
2. Newton's Rings - Determination of wavelength of given monochromatic source.
3. Single Slit Diffraction - Determination of wavelength of given monochromatic source.
4. Diffraction Grating - Determination of wavelengths of two yellow lines of mercury light.
5. Malus's Law - Verification of Malus's law.
6. Double Refraction - Determination of refractive indices of O-ray and E-ray of given calcite crystal.
7. Polarimeter - Determination of specific rotation of glucose.
8. B-H Curve - Determination of hysteresis loss of given specimen.
9. Dielectric Constant - Determination of dielectric constant of given PZT sample.
10. Ultrasonic Interferometer - Determination of velocity of ultrasonics in given liquid.

Note: A student must perform a minimum of eight experiments.

Suggested Reading:

1. "Engineering Physics" - Manual by Department of Physics, CBIT, 2016.
2. S.K. Gupta, "Engineering Physics Practical", Krishna's Educational Publishers, 2014.
3. O.P. Singh, V. Kumar and R.P. Singh, "Engineering Physics Practical Manual", Ram Prasad & Sons Publications, 2009.

ENGINEERING CHEMISTRY LABORATORY

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. For practical understanding of theoretical concept of chemistry.

Course Outcomes:

1. This syllabus helps the student to understand importance of analytical instrumentation for different chemical analysis.
2. The above knowledge also helps students to carry out inter disciplinary research such that the findings benefit the common man.

List of Experiments:

1. Introduction to chemical analysis.
2. Preparation of standard solution of oxalic acid and Standardization of NaOH.
3. Estimation of amount of Fe^{+2} in the given solution using Mohr's salt and KMnO_4 .
4. Estimation of amount of Fe^{+2} in the given solution using Mohr's salt and $\text{K}_2\text{Cr}_2\text{O}_7$.
5. Estimation of amount of copper in the given solution using hypo solution.
6. Estimation of amount of HCl pH metrically using NaOH solution.
7. Estimation of amount of CH_3COOH pH metrically using NaOH solution.
8. Determination of concentration of given KMnO_4 solution Colorimetrically.
9. Determination of concentration of given $\text{K}_2\text{Cr}_2\text{O}_7$ solution Colorimetrically.
10. Distribution of acetic acid between n-butanol and water.
11. Distribution of benzoic acid between benzene and water.
12. Preparation of urea - formaldehyde / phenol- formaldehyde resin.

Suggested Reading:

1. Vogel' S text book of quantitative chemical analysis by J. Mendham and Thomas, Person education Pvt. Ltd. New Delhi, 6th ed. 2002.
2. Laboratory Manual on Engineering Chemistry by Dr. Subdharani (Dhanpat Rai Publishing), 2012.
3. A Textbook on experiment and calculation in engineering Chemistry by S.S. Dara, S. Chand & Company, 9th revised edition, 2015.

PROFESSIONAL COMMUNICATION LABORATORY

Instruction	2 Periods per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

1. To introduce students to phonetics and the different sounds in English.
2. To familiarize the students with the language learning software and give them sufficient practice in correct pronunciation.
3. To enable students to speak English correctly with focus on stress, rhythm and intonation.
4. To help students overcome their inhibitions while speaking in English and to build their confidence. The focus shall be on fluency rather than accuracy.
5. To understand team work, role behavior and to develop the ability to analyze, evaluate, construct and refute arguments.

Course Outcomes:

1. The students will understand the speech sounds in English and the nuances of pronunciation.
2. The students will understand tone, intonation and rhythm and apply stress correctly.
3. The students will be able to participate in group discussions with clarity and confidence.
4. The students will speak confidently on stage with appropriate body language.
5. The students will debate on various issues and learn to work in teams.

Exercises

1. **Introduction to English Phonetics:** Introduction to Auditory, Acoustic and Articulatory Phonetics. Organs of speech: Respiratory, Articulatory and Phonatory systems.
2. **Sound System of English:** Phonetic sounds and phonemic sounds, introduction to International Phonetic Alphabet, classification and description of English phonemic sounds, minimal pairs. The syllable: types of syllables, consonant clusters.
3. **Aspects of connected speech:** Strong forms, weak forms, contracted forms, elision.

4. **Word stress:** Primary stress, secondary stress, functional stress, rules of word stress.
5. **Rhythm & Intonation:** Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
6. **Listening skills:** Practice with IELTS and TOEFL material.
7. **Situational dialogues and Role play.**
8. **Public speaking** is to be shown by incorporating narrative examples and extracts from speeches.
9. **Group Discussions:** Videos sessions and practice sessions.
10. **Poster making:** Preparation and presentation.
11. **Debate:** Differences between debate and group discussion. Essentials of a debate, conducting a debate.

Suggested Reading:

1. E Suresh kumar et al, . English for Success (with CD), Cambridge University Press India Pvt Ltd. 2010.
2. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016.
3. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
4. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India, 2005.
5. Edgar Thorpe. Winning at Interviews, Pearson Education, 2006.
6. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt. Ltd. 2011.



CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
Choice Based Credit System (with effect from 2016-17)
B.Tech (Bio-Technology)

SEMESTER - II

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/D		CIE	SEE	
THEORY								
1	16MT C04/ 16BT C03	Mathematics - II / Basics of Biology - II	3	-	3	30	70	3
2	16CY C05	Bio Organic Chemistry	3	-	3	30	70	3
3	16PY C05	Bio Physics	3	-	3	30	70	3
4	16CS C01	Programming and Problem Solving	3/1	-	3	30	70	4
5	16BT C04	Introduction to Anatomy and Physiology of Humans	4	-	3	30	70	4
6	16CE C03	Professional Ethics and Human Values	1	-	2	-	50	1
7	16CE C02	Environmental Studies	1	-	2	-	50	1
PRACTICALS								
8	16ME C02	Programming Laboratory	-	2	2	15	35	1
9	16PY C03	Mechanical and IT Workshop	-	3	2	25	50	2
10	16CY C04	Bio Physics Laboratory	-	2	2	15	35	1
11	16EG C02	Bio Organic Chemistry Laboratory	-	2	2	15	35	1
TOTAL			19	9	-	220	605	24

One extra hour may be permitted in the timetable for Mathematics - II / Basics of Biology - II

L: Lecture T: Tutorial D: Drawing
CIE - Continuous Internal Evaluation

P: Practical
SEE - Semester End Examination

Assessment Procedures for Awarding Marks

The distribution of marks is based on internal assessment (Sessional) by concerned teacher and the Semester end examination shall be as follows:

Course (in terms of credits)	CIE	Semester end Examination (Marks)	Remarks	Duration of Semester End Examination
Three(3) Credits/ Four(4) Credits	30*	70**	Theory Course/ Engg . Graphics	3 Hours
Two(2) Credits	20*	50***	Theory	2 Hours
Two(2) Credits	25	50	Lab Course/Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
Two(2) Credits	50	—	Project Seminar/Seminar	----
Six(6) Credits	50	100	Project	Viva
One(1) Credit	—	50***	Environmental Studies, Professional Ethics and Human values	2 Hours
One(1) Credit	50		Mini Project	-----

CIE: Continuous Internal Evaluation

* Out of 30/20 sessional marks(CIE), 10/5 marks are allotted for slip-tests(Three slips test will be conducted, each of 10/5 marks, best two average is considered) and the remaining 20/15 marks are based on the average of two tests, weightage for each test is 20/15 marks.

** The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

***The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 15 marks. Part-B carries 35 marks and covers all the units of the syllabus (student has to answer five out of seven questions).

Note:A course that has CIE(sessional marks) but no semester end examination as per scheme, is treated as Pass/Fail for which pass marks are 50% of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/ grade as prescribed. Minimum pass marks for theory course is 40% of total marks i.e., CIE plus semester end examinations where as for the lab course/project is 50%.

MATHEMATICS- II (for Bi.P.C Stream)

Instruction	3 Hours per week+ 1 (extra hour)
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. The student is expected to know the behaviour of single valued functions of partial fractions and Rational functions.
2. Master the methods and techniques of integration and definite integrals.
3. Expected to know learn the basics of formation of First Order Differential equations and identifying the Nature of equations.
4. Expected to learn Higher Order Linear Differential Equations and its solutions by various methods.
5. Expected to learn system of Linear Equations and its solutions by various methods.
6. Students enable to learn formation of Differential Equations and modelling of Algebraic Equations and its solutions.

Course Outcomes: On successful completion of this course the students shall be able to

1. To find out Areas, Surface Areas, Volumes can be obtained by definite integrals.
2. Any complicated fraction can be decomposed by using partial fractions, then it makes integrable.
3. Model the First-Order Differential Equations and solve it for various Engineering Branches ECE, EEE, etc. (Such as L-R, L-R-C, Newton's laws of delay and growth problems).
4. Model the Higher Order Linear Differential Equations and solve it for various Engineering branches Mech, Civil, ECE, EEE and etc.
5. To learn how to find out approximate values of Multivariable Algebraic Equations by various methods.
6. All above serial numbers are live wire of Research and Development.

UNIT-I

Partial Fractions: Resolving $f(x)/g(x)$ in to partial fractions, $g(x)$ contains non repeated linear factors, $g(x)$ contains repeated and non repeated linear factors, $g(x)$ contains non repeated irreducible factors, $g(x)$ contains repeated and not repeated irreducible factors.

UNIT - II

Integration: Integration considered as converse of differentiation, simple integrations of algebraic, trigonometric and exponential etc. Methods of integration, integration by parts, integration of rational, irrational and Trigonometric functions, definite integrals.

UNIT-III

Differential Equations: Differential equations of First order and first degree, Variable separable, Homogeneous, linear, Bernoulli's equations, Exact differential Equations.

UNIT-IV

Differential Equations of Higher Order: Differential equations of higher order with constant coefficients, Complimentary functions and particular Integrals, Particular Integrals of e^{ax} , $\sin ax$, $\cos ax$, x^m , $e^{ax} \sin bx$, $e^{ax} \cos bx$. Differential equations of higher order with variable coefficients Cauchy linear equations.

UNIT-V

Linear Algebra: Solution of system of Linear equations by Inverse, Gauss Jordan and Cramer's Rule. Cayley Hamilton Theorem (without proof).

Text Books:

1. Narayan Shanti and Mittal P.K. , " Differential Calculus", 30th edition, S.Chand publishers, 2005.
2. A.R.Vasistha , "Matrices" , 43rd edition, Krishna Prakashan Media (P) Ltd. 2014.
3. B.S.Grewal, "Higher Engineering Mathematics", 43rd edition, Khanna Publishers, 2014.

Suggested Reading:

1. William E.Boyce /Richard C.Dip, "Elementary differential equations", 9th Edition, wiley publishers, 2008.
2. N P Bali, "A Text Book of Engineering Mathematics", 9th Edition, laxmi publishers, 2016.
3. Joseph Edwards, "Differential Calculus For Beginners", arihant publishers, 2016.
4. KantiB.Datta, "Mathematical Methods of Science and Engineering", CENGAGE Learning publishers, 2014.

BASICS OF BIOLOGY- II (for MPC Stream)

Instruction	3 Hours per week+ 1 (extra hour)
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

1. This course aims at providing knowledge on basic concepts of Biology to mathematic background students.
2. The course is designed to give understanding salient features of animal kingdom classification.
3. This course aims at providing an insight into animal tissues and their types.
4. To provide knowledge on various parasites, lifecycle and diseases caused by them.
5. The course aims at imparting theoretical knowledge on various biotic interactions in nature.

Course Outcomes:

By the end of the course students be able to

1. Explain the criteria for classification of various organisms in animal kingdom.
2. Identify the basic structure and function of various organelles of animal cell.
3. Discuss the organization symmetry and tissue types in animal system.
4. Outline various biotic interactions in nature.
5. Demonstrate the basic information on gene, alleles and its inheritance.
6. Compare the gene regulation system in prokaryotes and eukaryotes.

UNIT-I**ANIMAL KINGDOM CLASSIFICATION**

Classification of animal kingdom. Phylogeny of invertebrate and vertebrate phyla. Salient features of nonchordates up to phyla, and chordates up to class level. Binomial and trinomial nomenclature. Concept of species and genus.

UNIT- II**CELL AND TISSUES: STRUCTURE AND FUNCTIONS**

Structure of animal cell and its organelles. Differences between plant and

animal cell. Level of organization, multicellularity, diploblastic and triploblastic conditions. Asymmetry, symmetry: radial symmetry and bilateral symmetry. Acoelomates, pseudocoelomates and eucoelomates in brief. Animal tissues structure and functions. Different types of animal tissues and their functions. Epithelial, Connective, Muscular and Nervous tissues in brief.

UNIT- III

PARASITOLOGY: PARASITISM AND PARASITIC ADAPTATION

Health and disease: introduction, life cycle, pathogenicity, treatment and prevention; *Entamoeba histolytica*, *Plasmodium vivax*, *Ascaris lumbricoides* and *Wuchereria bancrofti*. Brief account of pathogenicity, treatment and prevention of typhoid, pneumonia, common cold and ring worm.

UNIT - IV

ECOLOGY AND ENVIRONMENT

Organism and environment, habitat and niche. Population and ecological adaptations, population interactions. Abiotic environmental factors - light, temperature, water and radiation.

Biotic environmental factors - neutralism, competition, mutualism, commensalism, parasitism, predation. Attributes, growth, birth rate and death rate, age distributions.

UNIT - V

GENETICS

Structure and Functions of chromosome. Concept of gene and alleles, multiple alleles, ABO blood groups. Sex chromosomes, sex linked inheritance, gene expression and regulation in prokaryotes and eukaryotes.

Text Books:

1. Text book of Zoology, I and II year, Vignan publisher, Guntur.
2. Biology. Raven, Johnson, Losos, Mason, Singer. Tata McGraw Hill Publishing Co. Pvt. Ltd 9th edition, 2010.

Suggested Reading:

1. Beginning Science: Biology. B.S. Beckett. Oxford University Press. 1st edition, 1983.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. & J.I., Spicer (2002) *The Invertebrates: A New Synthesis*. III Edition, Blackwell Science.
3. Introduction to Applied biology and Biotechnology, K Vaidyanath, K Pratap Reddy and K Sathya Prasad, BS Publications, India, 2004.

BIO ORGANIC CHEMISTRY

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

Biotechnology students should have a fundamental knowledge in chemistry from which they develop core expertise in organic chemistry like structure of compounds, reactivity and functions of various bio-molecules.

1. Student is made to understand the basics of Bio-Organic chemistry, i.e. an understanding of the importance and reason for course.
2. To understand the structure and function of the basic molecules found in living cells.
3. To understand carbohydrates, lipids structures and functions.
4. Student is able to understand the structure, Preparation and classification of amino acids and protein synthesis.
5. To understand DNA and RNA structure and function.
6. To understand the characterization of Bio-products.

Course Outcomes:

1. To prepare graduates for employments as chemists and have mastered a broad range of basic lab skills applicable to biochemistry and biotechnology.
2. Bio-Organic Chemistry majors will have a firm foundation in chemical principles as well as higher level of understanding in each of the chemistry sub disciplines: analytical, biochemistry, organic etc.
3. Understand the mechanism involved in various chemical reactions.
4. Understand the structure and functions of bio-molecules like carbohydrates, lipids, amino acids etc.
5. Understand a broad range of basic Bio-Organic and biological concepts, and can apply and analyze these in at least one specialty area.
6. Be aware of the role of bio-molecules in Biotechnology.

UNIT - I

Introduction to Organic Chemistry: Nomenclature of organic compounds, Hybridization; Functional Group properties- Carbonyl, carboxylic acid, Ester, Hydroxyl and Amine Functional Groups;

Isomerism- structural (keto-enol-tautomerism) and Stereoisomerism-I, geometrical and conformational isomerism, Optical isomerism-enantiomers, diastereomers, meso compounds, Racemic mixture. Sequence rules for R, S-configuration and Fisher projections of Lactic acid.

UNIT-II

Structure Reactivity Correlations of Organic Molecules: Electron displacements in a molecule-Inductive and mesomeric effect, resonance, hyper conjugation and electromeric effects; rules and effects of Organic reactions - Saytzeff's Rule and Markonikoff's Rule, Kharash effect, Orientation Effect and Functional Group effect and steric effect.

UNIT-III

Types of Organic Reactions and Some Name Reactions: Types of Organic reactions - Nucleophilic Substitution reactions (SN1 & SN2), Electrophilic substitution, free radical Substitution, Addition reactions, Elimination (E1 & E2) and Rearrangement (Oxime rearrangement) reactions. Concepts of Aromaticity-Huckel's Rule. Name Reactions - Aldol Condensation, Hoffman bromamide degradation, Perkin reaction.

UNIT-IV

Biomolecules - Chemistry of Carbohydrates : Classification and Structure of Carbohydrates- glucose, fructose, maltose, cellulose and starch; determination of Open chain structure of glucose and fructose, Haworth (cyclic) structure of glucose and fructose, General reactions of glucose and fructose, and their inter conversions-mutarotation.

Chemistry of Lipids - Fatty Acids-saturated and unsaturated fatty acids, Oils- Properties of oils, Tests to check the purity of oils - acid value, saponification value, Iodine Value, Reichert-Meisel value.

UNIT-V

Biomolecules -Amino acids: Chemistry of Amino acids-Classification, structure and reactivity. Synthesis of amino acids- amination of α -halogen acids, Gabriel phthalimide synthesis, strecker synthesis.

Chemistry of Nucleic Acids: Proteins-Introduction, structure of proteins, peptide bond. Nucleic acids-Structure of DNA and RNA.

Text Books:

1. Organic chemistry. Robert. T. Morrison and Robert N. Boyd, Prentice Hall India, Delhi. 6th edition, 2002.
2. Fundamentals of Biochemistry-JL Jain, S.Chand, 2004.
3. Text Book of Organic Chemistry-Vol-I,ILFINAR, Longman Publishing Group, 2010.

Suggested Reading:

1. Principles of Organic Chemistry- M. K. Jain 9th edition-S. Nagh & Co.
2. T.W. Graham Solomons, "Organic Chemistry", Wiley Publishers, 1995.
3. O.P. Agarwal, "Natural Products", Vol. 1 & Vol. II Krishna Prakashan Media, 2006.

BIOPHYSICS

Instruction	3Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

The objective of the course is to make the student:

1. Understand basic electrical properties of cell, light and electron microscopy techniques.
2. Learn Physical phenomenon involved in the functioning of eye and ear sensory systems.
3. Get knowledge of the nature of ionizing radiation and its action on biomolecules.
4. Understand of some biomedical instrumentation techniques.
5. Gain the knowledge of measurement of viscosity and surface tension.

Course outcomes:

At the end of the course, the student will be able to

1. Make use of appropriate microscope for the analysis of bio sample based on their nature. They also understand electrical properties of cell.
2. Understand Biophysics of sound and light in ear and eye.
3. Understand damages by ionizing radiation to different bio molecules such as proteins, nucleic acids, chromosomes, cells and tissues and to measure radiation.
4. Apply different imaging and diagnostic techniques of human body.
5. Describe transport phenomenon osmosis and its effect in blood.

UNIT - I Introduction: Definition of Biophysics- Cell theory and Atomic theory - Electrical properties of cell and tissues-Electrical oscillatory phenomenon associated with cell division(Cellular spin resonance).

Microscopes: Structure, construction and functions of a compound microscope- Types and functions of different Microscopes: Phase Contrast Microscope, Interference Microscope, Polarizing Microscope and Electron Microscope - High Resolution Optical Imaging.

UNIT - II Human Eye: Structure of retina and its biometrics- Optics of the Eye- Camera principle & its application to the Eye- Mechanism of accommodation-Visual acuity- Colors and its recognition - Defects of

vision and their correction: Myopia, Hyperopia, Presbyopia and Astigmatism.

Human Ear: Structure and mechanics of hearing-Auditory receptors and Genesis of different potential charges in the Ear- Determination of pitch, Loudness and quality of sound.

UNIT - III Radiation and Light Action: Nature of Ionizing Radiation - Target theory- Inactivation of proteins and nucleic acids through radiation effects - Radiation Effects on cells and tissues - Action of ionizing radiation on Chromosomes- GM counter and dosimetry of radiation - Photosynthesis.

UNIT - IV Biomedical Instrumentation: Principle, working and biological applications of ultrasonic imaging-Endoscopy - Computational Tomography (CT)- Nuclear Magnetic Resonance (NMR) - Magnetic Resonance Imaging (MRI)- Positron Emission Tomography (PET) - Electrocardiograph (ECG) Electroencephalograph (EEG)-Determination of Blood pressure.

UNIT - V Osmosis Phenomenon: Osmosis - Osmotic fragility of red blood cells - Transport through membrane - Solute Transport: Artificial kidney. Methods of Determination of Viscosity and Surface Tension of Bioliquids: Viscosity Specific and intrinsic viscosities and their determination by Ostwald's method - Experimental determination of viscosity and surface tension of bioliquids by capillary flow method.

Text Books:

1. Text Book of Medical Physiology by Guyton and Hall, Elsevier Publications, 2013.
2. Fundamentals of Polymer Physics and Molecular Biophysics by Himadri B. Bohidar, Cambridge University Press, 2015.
3. Physics for Diagnostic Radiology by P.P. Dendy and B. Heaton, CRC Press, 2011.
4. A Text of Biophysics by Dr. R. N. Roy New Central Book Agency (P) Ltd., 2009.

Suggested Reading:

1. Intermediate Physics for Medicine and Biology by Russel K. Hebby, Springer Publications, 2007.
2. Biomedical Electronics and Instrumentation by Omkar N. Pandey and Rakesh Kumar, S.K. kataria& Sons Publications, 2009.
3. Biophysics by Glaser R., Springer Publications, 2012.
4. Essentials of Biophysics by Narayanan P., New Age International Publications, 2008.

PROGRAMMING AND PROBLEM SOLVING

Instruction	3L + 1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

1. To acquire problem solving Skills.
2. To be able to write Algorithms.
3. To understand structured programming Approach.
4. To understand Memory structure.
5. To implement I/O Programming.
6. To be able to write program in C Language.

Course Outcomes: Student will be able to:

1. Develop algorithms for scientific problems.
2. Explore algorithmic approaches to problem solving.
3. Understand the components of computing systems.
4. Choose data types and structure to solve mathematical problem.
5. Develop modular programs using control structure, arrays and structures.
6. Write programs to solve real world problems using structured features.

UNIT - I

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts.

Introduction to C Language: Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements.

Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

UNIT-II

Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples.

Loop Control Statements: For, While, Do-While and Examples. Continue, Break and goto statements.

Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Parameter Passing: Call-by-value, Call-by-reference, Recursion.

UNIT - III

Storage Classes: Auto, Register, Static, Extern, Scope Rules and Type Qualifiers.

Arrays: Concepts, Using Arrays in C, Array Applications, Two-Dimensional Arrays, Multidimensional Arrays.

Searching and Sorting: Linear and Binary Search, Selection Sort and Bubble Sort.

UNIT-IV

Pointers: Introduction, Pointers to Pointers, Compatibility, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments.

Strings: Concepts, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.

UNIT - V

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Unions, Type Definition (typedef), Enumerated Types.

Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Preprocessors: Preprocessor Commands.

Text Books:

1. PradipDey and ManasGhosh, "Programming in C 2/e", Oxford University Press, 2nd Edition, 2011.
2. B. W. Kernighan and D.M. Ritchie, "The 'C' Programming Language", Prentice Hall India, 2nd Edition, 1990.
3. B.A. Forouzan and R.F. Gilberg, "A Structured Programming Approach in C", Cengage Learning, 2007.

Suggested Reading:

1. Rajaraman V., "The Fundamentals of Computers", 4th Edition, Prentice Hall of India, 2006.
2. R S Bichker., "Programming in C", University Press, 2012.

16 BT C04**INTRODUCTION TO ANATOMY AND PHYSIOLOGY OF HUMANS**

Instruction	4Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70Marks
CIE	30 Marks
Credits	4

Course Objectives:

1. Student gets an overview of the human body tissues and endocrine system.
2. The various organs associated with digestion and excretion is taught.
3. Heart structure and functioning is detailed, including the gaseous exchange occurring through the respiratory system.
4. Knowledge of Spinal cord, the associated nerves and the different sense organs are imparted.
5. Reproductive physiology is explained.
6. Importance of blood pressure is emphasized.

Course Outcomes:

By the end of the course students be able to

1. Outline the structure of Human body.
2. Explain the appropriate terminology related to anatomy and physiology.
3. Discuss the anatomical structures and the physiological functions of body's main systems.
4. Apply the interrelationships within and between anatomical and physiological systems of the human body.
5. Identify the importance of homeostasis and the use of feedback loops to control physiological systems in the human body.
6. Apply the knowledge of monitoring vital parameters for proper body functioning.

UNIT - I**INTRODUCTION TO ANATOMICAL TERMS AND ENDOCRINE GLANDS**

Definition of Anatomy and Physiology; Major types of human tissues. Various systems of human body and their general roles. Homeostasis. Types of endocrine glands- anatomy and physiological of pituitary, thyroid, pancreas.

UNIT- II**ANATOMY OF SKELETAL, DIGESTIVE AND EXCRETORY SYSTEMS**

Structure and function of bones and muscles Digestive system- organs and functions; role of liver and pancreas, Excretory system- kidney and urinary bladder; physiology of excretory system- urine formation.

UNIT- III**ANATOMY OF CIRCULATORY AND RESPIRATORY SYSTEMS**

Circulatory system- anatomy of heart, heart beat, blood circulation Anatomy of blood vessels- arteries and veins. Respiratory system- anatomy of lungs and mechanism of respiration.

UNIT- IV**ANATOMY OF NERVOUS SYSTEM AND OTHER SENSORY SYSTEMS**

Nervous system- peripheral and autonomous nervous system; Spinal nerves and Cranial nerves, transmission of nerve impulse, reflex arc. Special senses- eye, ear, tongue and nose.

UNIT- V**REPRODUCTIVE SYSTEM AND BLOOD PHYSIOLOGY**

Mechanism of blood oxygenation, Blood pressure recording and regulating techniques, Reproductive system- male and female reproductive organs and physiology. Menstrual cycle.

Text Books:

1. Charles E. Tobin, Basic Human Anatomy, McGraw Hill, 1980.
2. An Introduction to Human Physiology. Third Edition. By J. H. Green. Oxford University Press, New York, 1972.

Suggested Reading:

1. Human Physiology- the Mechanism of body functions, McGraw-Hill Science/Engineering/Math; 11th edition 2007.
2. Essentials of Human Anatomy and Physiology by Elaine. N. Marieb, 8th Ed, Pearson Education, New Delhi.

PROFESSIONAL ETHICS AND HUMAN VALUES

Instruction	1 Hour per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	-
Credits	1

Course Objectives:

1. To develop the critical ability among students to distinguish between what is of value and what is superficial in life.
2. To enable the students, understand the values, the need for value adoption and prepare them meet the challenges.
3. To enable the students, develop the potential to adopt values, develop a good character and personality and lead a happy life.
4. To motivate the students, practice the values in life and contribute for the society around them and for the development of the institutions /organisation around they are in.
5. To make the students understand the professional ethics and their applications to engineering profession.

Course Outcomes:

1. Students develop the capability of shaping themselves into outstanding personalities, through a value based life.
2. Students turn themselves into champions of their lives.
3. Students take things positively, convert everything into happiness and contribute for the happiness of others.
4. Students become potential sources for contributing to the development of the society around them and institutions/ organisations they work in.
5. Students shape themselves into valuable professionals, follow professional ethics and are able to solve their ethical dilemmas.

UNIT-I

Concepts and Classification of Values -Need and challenges for value Adoption -Definition of Values - Concept of Values - Classification of Values - Hierarchy of Values - Types of Values - Interdependence of Values
Need for value education - Lack of education in values - Benefits of value education- Challenges for Value adoption - Cultural, Social, Religious, Intellectual and Personal challenges.

UNIT - II: Personal Development and Values in Life

Personal Development: - Accountability and responsibility - Desires and

weaknesses - Character development - Good relationships, self-restraint, Spirituality and Purity - Integrating values in everyday life.

UNIT - III: Practicing Values for the development of Society

Resentment Management and Self-analysis - Positive Thinking and Emotional Maturity - The importance of Women , Children and Taking care of them - Helping the poor and needy - Fighting against addictions and atrocities - Working for the Sustainable development of the society.

Principles of Integrity-Institutional Development - Vision for better India.

UNIT - IV: Basic Concepts of Professional Ethics

Ethics, Morals and Human life , Types of Ethics, Personal Ethics, Professional Ethics, Ethical dilemmas, Science - Religion - Ethics, Case Studies on Professional Ethics, Exemplary life sketches of prominent Indian personalities like Sri.M.Visweshwarayya, Dr.APJ Abdul Kalam and JRD Tata.

UNIT-V: Ethics in Engineering Profession

Engineering Profession-Technology and Society- Ethical obligations of Engineering Professionals-Role and responsibility of Engineers - A few Case Studies on Risk management safety and Risk Management.

Plagiarism-Self plagiarism- -Ethics Standards and Bench Marking.

Text Books:

1. Subramanian R, " Professional Ethics " , Oxford University Press , 2013.
2. Nagarajan R S, " A Text Book on Human Values and Professional Ethics " New Age Publications , 2007.
3. Dinesh Babu S, "Professional Ethics and Human Values", Laxmi Publications , 2007.

Suggested Reading:

1. SantoshAjmera and Nanda Kishore Reddy , "Ethics , Integrity and Aptitude", McGrawhill Education Private Limited, 2014.
2. GovindaRajan M, Natarajan S, Senthil Kumar V S, "Professional Ethics and Human Values", Prentice Hall India, Private Limited, 2012.
3. Course Material for Post Graduate Diploma In "Value Education & Spirituality" Prepared by Annamalai University in Collaboration with Brahma Kumaris, 2010.

ENVIRONMENTAL STUDIES

Instruction	1Hour per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	-
Credits	1

Course Objectives:

1. To equip the students with inputs on the environment, natural resources and their conservation.
2. To study the interrelationship between the living organisms and the natural environment and also to enable the students to understand the structure and functioning of the ecosystems.
3. To understand the importance of biodiversity and create awareness on its threats and conservation strategies.
4. To enable the students become aware of pollution of various environmental segments including their causes, effects and control measures.
5. To create awareness about environmental legislations in the context of national conventions.

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

1. To understand the scope and importance of environmental studies, identify the natural resources and ecosystems and contribute for their conservation.
2. To understand the ecological services of biodiversity and contribute for their conservation.
3. To develop skills to solve the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
4. To relate the social issues and the environment and contribute for the sustainable development.
5. To understand the essence of the ethical values of the environment for conserving depletable resources and pollution control.

UNIT - I

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

Natural resources: Water resources- hydrological cycle, use and over utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Food resources- Changes caused by modern agriculture, fertilizers-pesticide problems, water logging and

salinity. Forest resources- use and over exploitation, deforestation. Mineral resources- Use and exploitation, effects of mining. Energy resources- Growing energy needs, various renewable and non-renewable energy sources. Land resources- land as a resource, land degradation- causes and effects, Role of individuals in conservation of natural resources.

UNIT - II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, concept of food chains, food webs, ecological pyramids.

UNIT - III

Biodiversity: Types/classification of biodiversity, India as a mega diversity nation, values of biodiversity, threats to biodiversity, Conservation of biodiversity.

UNIT - IV

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, Soil pollution, Noise pollution and Thermal pollution.

Environmental Legislations: Environment protection act, Air, Water, Forest & Wild life acts.

UNIT - V

Social issues and the environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development, Population explosion and Climate change: Global warming, Acid rain, Ozone layer depletion.

Text Books:

1. P. D. Sharma, "Ecology & Environment", Ashish publications, 1994.
2. Y. Anjaneyulu, "Introduction to Environmental Science", B S Publications, 2004.

Suggested Reading:

1. Dr. Suresh K. Dhameja, "Environmental Studies", S. K. Kataria & Sons, 2009.
2. C. S. Rao, "Environmental Pollution Control Engineering", Wiley, 1991.
3. S. S. Dara, "A Text Book of Environmental Chemistry & Pollution Control", S. Chand Limited, 2006.

PROGRAMMING LABORATORY

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

1. Demonstration of control structures.
2. Demonstration of switch case (menu driven).
3. Demonstration of Parameter passing Methods.
4. Demonstration of Functions using Recursion.
5. Demonstration of Array Operations on Matrix.
6. Implementation of Bubble sort.
7. Implementation of Selection sort.
8. Implementation of Linear and Binary Search.
9. Implementation of String manipulation operations with and without library function.
10. Demonstration using Pointers.
11. Demonstration of Array of Structures.
12. Sequential file operations.

Text Books:

1. PradipDey and ManasGhosh., "Programming in C 2/e", Oxford University Press, 2nd Edition, 2011.
2. B. W. Kernighan and D.M. Ritchie., "The 'C' Programming Language", Prentice Hall India, 2nd Edition, 1990.

MECHANICAL AND IT WORKSHOP

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

MECHANICAL WORKSHOP**Trades for Practice 1.Fitting 2.Tin Smithy 3.Carpentry 4.House Wiring Exercises in Fitting**

1. To make a perfect rectangular MS flat.
2. To do parallel cuts using Hack saw.
3. To drill a hole and tap it.
4. To make male and female fitting using MS flats-Assembly1.
5. To make male and female fitting using MS flats-Assembly2.

Exercises in Tin smithy

1. To make a square tray from the given sheet metal.
2. To make a rectangular box from the given sheet metal with base and top open. Solder the corners.
3. To make a scoop.
4. To make a dust pan from the given sheet metal.
5. To make a pamphlet box.

Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a cross lap joint on the given wooden piece according to the given dimensions.
3. To make a Tee lap joint on the given wooden piece according to the given dimensions.
4. To make a dove tail-joint on the given wooden piece according to the given dimensions.
5. To make a bridle joint on the given wooden piece according to the given dimensions.

Exercises in House Wiring

1. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bell push.
2. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs.

3. Wiring of two light points connected in parallel from two single pole switches and a three pin socket.
4. Stair case wiring-wiring of one light point controlled from two different places independently using two 2-way switches.
5. Go-down wiring.

Demonstration of plumbing and welding trades

Note: *A minimum of 12 exercises from the above need to be done*

Suggested Reading:

1. Workshop Practice Manual, K. Venkata Reddy, Sixth Edition, B.S. Publications, 2008.

IT WORKSHOP

List of Tasks:

Task 1: MS Word: Formatting text, inserting images, tables, equations and hyperlinks.

Document Management: Page layout techniques and printing.

Task 2: MS Excel: Functions and formulas and graph plotting.

Task 3: MS Power point presentation: Guidelines for effective presentation, inserting objects, charts, hyperlinks and navigation between slides.

Task 4: Essentials Search Engines & Net etiquette, Plagiarism, Open source tools and other utility tools.

Suggested Reading:

1. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson, 2008.
2. The Complete Computer upgrade and repair book, 3/e, Cheryl A Schmidt, Dreamtech.

16PY C06

BIO PHYSICS LABORATORY

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

The objectives of the course is to make the student

1. Understand physical techniques for studying the physical properties of biomaterials.
2. Know the interaction of radiation with biomaterials.
3. Develop the knowledge of measurement of viscosity and surface tension of biomaterials.

Course Outcomes:

At the end of the course, the student will be able to

1. Apply the techniques for the measurement of some physical properties of biomaterials.
2. Measure radiation absorption measurements.
3. Study physical properties of blood.
4. Measure absorption wavelengths in photosynthesis.
5. Assess BP and physical state of the lungs.

List of Experiments:

1. Determination of Blood Pressure at different postures using sphygmomanometer.
2. Estimation of chlorophyll in the given leaves.
3. Determination of mass absorption coefficient of the given biomaterial using GM counter.
4. Determination of molecular weight of given polymer using Ostwald Viscometer.
5. Study of osmotic fragility of blood.
6. Determination of specific gravity of blood.
7. Determination of size and shape of blood cells using laser diffraction technique.
8. Determination of viscosity and dynamic surface tension of bio-liquid using capillary flow technique.
9. Determination of peak flow rate using peak flow meter.
10. Determination of inspired volume using sustained maximal inspiration technique.
11. Determination of auto catalytic ion efflux constant for the process of germination of seeds using conductivity meter.

Note: *A student must perform a minimum of eight experiments.*

Suggested Reading:

1. Biophysics Manual by Department of Physics, CBIT, 2016.
2. S.K. Gupta, Engineering Physics Practical, Krishna's Educational Publishers, 2014.
3. O.P. Singh, V. Kumar and R.P. Singh, Engineering Physics Practical Manual, Ram Prasad & Sons Publications, 2009.

16CY C06

BIO ORGANIC CHEMISTRY LABORATORY

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives:

1. Understand the basic practical issues involved in the analysis of organic molecules.
2. To prepare a organic compounds and their derivatives.
3. Chemistry majors will have a working knowledge of chemical instrumentation and laboratory techniques and be able to use those skills to design and conduct independent work.
4. To find the structure and characterization of the basic organic functional groups.

Course Outcomes

1. An ability to think critically and to analyze chemical analysis.
2. An ability to work effectively in a laboratory environment and to use modern chemical / biochemical instrumentation and procedures.
3. Understand the basics of laboratory safety.

I. Identification of Organic Functional Groups and Preparation of their Derivatives

1. Aldehyde functional group.
2. Ketone functional group.
3. Amine functional group.
4. Monosaccharides.
5. Carboxylic acid functional group.
6. Phenol.

II. Preparation of Organic Compounds

1. Preparation of nitro Benzene.
2. Preparation of m-di nitro Benzene.
3. Preparation of Acetanilide.
4. Preparation of Aspirin.
5. Preparation of soap.
6. Preparation of phenol formaldehyde resin.

Suggested Reading:

1. "Vogel's text book of quantitative chemical analysis", J.Mendham and Thomas, Person education. Pvt. Ltd. New Delhi, 6th ed, 2002.
2. Senior practical physical chemistry by B.D.Khosla, A.Ghulati, V.C.Garg, R.Chand and CD New Delhi.