

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
CHEMICAL ENGINEERING
B. Tech I – Year

I - Semester

THEORY						
S.No	Code	Subject	L	T	P/D	Credits
1	EG 111	English - I	2	0	0	2
2	MT 111	Mathematics – I	3	1	0	3
3	PY 112	Physics - I	3	0	0	3
4	CY 112	Inorganic Chemistry	4	1	0	3
5	CS 113	Programming and MATLAB Computing	3	1	0	3
6	CE 112	Environmental Studies	3	1	0	3
PRACTICALS						
7	EG 112	English Language Laboratory – I	0	0	2	1
8	PY 115	Engineering Physics Lab	0	0	3	2
9	CY 115	Inorganic Chemistry Lab	0	0	3	2
10	CS 115	Programming & MATLAB Computing Lab	0	0	3	2
11	ME 115	Workshop Practice	0	0	3	2
TOTAL			18	04	14	26

II – Semester

THEORY						
S.No	Code	Subject	L	T	P/D	Credits
1	EG 121	English – II	2	0	0	2
2	MT 121	Mathematics – II	3	1	0	3
3	PY 123	Physics – II	3	0	0	3
4	CY 122	Organic Chemistry	4	1	0	3
5	CS 121	Object Oriented Programming through C++	3	1	0	3
6	CH 121	Introduction to Chemical Engineering	4	0	0	3
PRACTICALS						
7	EG 122	English Language Laboratory – II	0	0	2	1
8	CY 124	Organic Chemistry Lab	0	0	3	2
9	CS 122	Programming Lab – II	0	0	3	2
10	ME 122N	Engineering Drawing	0	0	3	2
TOTAL			19	03	11	24

ENGLISH – II
(common to all branches)

Instruction	2L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:

- To understand the difference between oral and written communication, interpersonal and intrapersonal communication
- To acquaint the students with the process of technical writing through different types of reports and information transfer.
- To enhance the different sub- skills of reading through skimming and scanning.
- To enhance imaginative, creative and critical thinking through literary texts.
- To help students develop their Presentation skills through AV aids and different aspects of body language.

UNIT- I

Effective communication: Intrapersonal communication, Interpersonal communication, Dyadic Communication, One way versus two way communication and Johari Window.

UNIT- II

Grammar Practice: Common errors in English ad, Punctuation.

Vocabulary Enhancement:

Indian and American usage, Words often misspelt, Prefixes & Suffixes, technical vocabulary

Prose: Muthyala Raju Revu: An Engineer Turned IAS Officer

UNIT- III

Writing Skills: Reports, Technical Report Writing, Information transfer: Flow charts, piecharts, graphs and scientific papers

UNIT- IV

Reading comprehension – Unknown passages, Skimming and Scanning, intensive reading and critical analysis

Prose: R. Madhavan : Engineering to Farming

UNIT- V

Soft Skills: Presentation skills – Rubrics, use of AV aids and making of a Power Point Presentation, Body Language. Leadership skills and Team Building

Text Books:

1. “Essential English”- E Suresh Kumar et al. (Orient Black Swan PVT Ltd.)
2. “Communication Skills and Soft Skills: An Integrated Approach”- E Suresh Kumar et al. (Pearson Publications)

Suggested Reading:

1. ” High School English Grammar & Composition” – Wren and Martin (S.Chand)
2. “ABC of Common Grammatical Errors” – Nigel D Turton (Macmillan)
3. “Communication Skills & Soft Skills” – An Integrated approach – E Suresh Kumar (Pearson)
4. “Examine your English” – Margaret M Maison (Orient Longman)
5. “Professional Presentation” – Malcolm Goodale (Cambridge University Press)
6. “English Grammar at a glance” – M. Gnanamurali (S. Chand)
7. “Business Communication & Soft skills” (Lab Manual) – D. Sudha Rani (Pearson)
8. “A Course Book in English” – K.R. Lakshminarayan (SciTech Publication)
9. “Effective Technical Communication” – M. Ashraf Rizvi (Tata- McGraw Hill)

MATHEMATICS – II
(common to all branches except Bio-Tech)

Instruction	3L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

UNIT- I

Ordinary differential Equations: Exact Differential equations (integrating Factors) Applications differential equations-Orthogonal trajectories-Problems on oscillatory electrical circuits (LC and LCR circuits). Linear Differential equations of higher order with constant coefficients, complementary function and particular integrals when RHS is of the forms e^{ax} , $\sin ax$, $\cos ax$, x^m , $e^{ax}(v)$, $x^m(v)$, where v -is a function of ' x ', Legendre's and Cauchy's form of Homogeneous equations.

UNIT- II

Laplace Transforms: Definition of integral transform, domain of the function and kernel of the Laplace transforms. Existence of Laplace transforms. Properties- Laplace transforms of standard functions, Laplace transforms of piecewise continuous functions, first and second shifting theorems, multiplication by ' t ', division by ' t '. Laplace transforms of derivatives and integrals of functions-Unit step function- Periodic functions (without proofs). Inverse Laplace transforms-by partial fractions (Heaviside method), Residue method-Convolution Theorem. Solving Ordinary differential equations by Laplace Transforms

UNIT- III

Series solution of Differential equations: Introduction-ordinary and singular points of an equation-power series solution- Solution of Legendre equation (without proof)- Legendre polynomials-Rodrigue's formula-Generating function of Legendre polynomials-Recurrence relations- orthogonal property.

UNIT- IV

Vector Differentiation: Scalar and vector fields- directional derivative- Gradient of a scalar-Divergence and Curl of a vector point function. Properties of divergence, curl - vector identities. Solenoidal and Irrotational vectors.

UNIT-V

Vector Integration: Vector Line integrals, surface integrals and volume integrals Greens Theorem, Gauss divergence Theorem and Stokes theorem (without proofs) Applications of Integration-problems based on verification and evaluation using the above theorems (for cube, rectangular parallelepiped, sphere, cylinder)

Text Books:

1. Advanced Engineering by Kreyszig, John Wiley & Sons -Publishers.
2. Mathematical Methods of Science & Engg. Aided with MATLAB, Kanti.B.Datta. Cengage Learning India Pvt.Ltd.
3. Mathematics for Engineers and Scientists by Alen Jaffery , 6th ed 2013 CRC press,Taylor & Francis Group. (Elsevier)
4. Advanced Engineering Mathematics by Michael Greenburg, Second Edition –Pearson Education.

Suggested Reading: (for further reading and examples on applications)

1. Mathematics for Engineers-a modern interactive approach by A.Craft and Robert Davison-Wiley
2. Applied Mathematics and physicists by Loius Pipes-Mc Graw Hill publishers.
3. Advanced Engineering Mathematics by R.K.Jain & S.R.K.Iyenger, 3rd edition, Narosa Publications
4. Matrices for Engineering Dynamics by AR Collar and A. Simpson-John Willey & sons
5. Essential Mathematics for Engineers by W.Bolton-Betterworth and Heineman
6. Mathematical for Physicists and Engineers- L F Landoviz, Publishers- Rienfold Book Corporation.
7. Higher Engineering Mathematics by B.S.Grewal, Khanna Publishers.
8. Engineering Mathematics by B.V.Ramana
9. Calculus by Smith and Minton
10. Applications of Linear Algebra by David.C Lay

PHYSICS – II
(Chemical Engg)

Instruction	3L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

UNIT – I**Elements of Quantum Mechanics:**

Introduction – Dual nature of light – de Broglie's hypothesis – Expression for de Broglie's wave length – Heisenberg's uncertainty principle and its illustration (diffraction of a beam of electron at a slit) – Schrödinger time independent and time dependent wave equations – Interpretation of wave function – Infinite square well potential (particle in a box) – Potential step – Potential barrier (qualitative) – Tunneling effect.

UNIT – II

Crystallography: Space lattice – Unit cell – Crystal systems – Bravais lattices – Number of atoms per unit cell – Coordination number – Atomic radius – Packing fraction (for SC, BCC, FCC) – Lattice planes – Miller indices – Bragg's law – Experimental determination of lattice constant of cubic crystals by powder diffraction method.

Crystal Imperfections: Classification of defects – Point defects – Concentration of Schottky and Frenkel defects.

UNIT – III

Magnetic Materials: Classification of magnetic materials: dia, para, ferro, anti-ferro and ferrimagnetic materials – Weiss molecular field theory – Domain theory – Hysteresis curve – Soft and hard magnetic materials.

Dielectric Materials: Introduction – 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.

UNIT – IV

Superconductors: Introduction – General properties of superconductors – Meissner's effect – Type I and Type II superconductors – BCS theory (qualitative) – Applications.

Thin Films: Distinction between bulk, thin and nanofilms – Thin film preparation techniques – Physical vapor deposition (PVD) techniques – Thermal evaporation – Electron beam evaporation – Pulsed laser deposition – Applications of thin films – Solar cell – Gas sensor.

UNIT – V

Nanomaterials: Zero dimensional materials – Properties of materials at reduced size – Surface to volume ratio – Quantum confinement – Preparation of nanomaterials – Bottom-up methods: Sol-gel, Sputtering and Chemical vapor deposition (CVD) – Top-down methods: Ball milling – Elementary ideas of carbon nanotubes – Applications.

Techniques for Characterization of Materials: Principles of X-ray fluorescence – Auger (OJ) process – Atomic force microscopy – Electron microscopy (SEM and TEM).

Text Books:

1. M.N. Avadhanulu and P.G. Kshirsagar, *A Text Book Engineering Physics*, S. Chand Publications, 2014
2. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, DhanpatRai Publications, 2011
3. V. Rajendran, *Engineering Physics*, McGahill Education Publications, 2013

Suggested Reading:

1. R. Murugesan and KiruthigaSivaprasath, *Modern Physics*, S. Chand Publications, 2005
2. M. Arumugam, *Materials Science*, Anuradha Publications, 2002.
3. Satyaprakash and Agarwal, *Statistical mechanics*, Kedannath Publications
4. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012
5. Hitendra K Malik and A.K. Singh, *Engineering Physics*, Tata McGahill Education Publications, 2011

ORGANIC CHEMISTRY
(Chemical Engg)

Instruction	4L + 1T Periods per week
Duration of University Examination	4 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives: The main objective of the course is to impart knowledge of organic chemistry to chemical engineering students and enable them to solve contemporary problems and develop new technological solutions.

UNIT- I**NOMENCLATURE AND FUNCTIONAL GROUPS**

Introduction to nomenclature of organic molecules IUPAC system.

General methods of preparation and properties of various functional groups (alcohols, carboxylic acids, amines, aldehydes and ketones, ethers), classification of solvents.

UNIT- II**ISOMERISM AND STEREOCHEMISTRY**

Isomerism – Structural isomerism with examples.

Stereoisomerism – Types of stereoisomers (geometrical and optical).

Optical isomerism: Introduction to optical activity, plane polarized light, causes of optical activity, optical activity in compounds containing one asymmetric centre (lactic acid) and two similar (tartaric acid) and two dissimilar (dibromo cinnamic acid) asymmetric centres. Relative and absolute configuration (DL and RS) of simple molecules like glyceraldehydes, glyceric acid, sec-butyl alcohol, sec-butyl chloride and phenylalanine – sequence rules.

UNIT- III**NAME REACTIONS AND REAGENTS**

Named reactions: Aldol condensation, Beckmann rearrangement, Hoffmann degradation, Mannich reaction and Perkin reaction – their mechanism with application.

Reagents: Oxidising reagents (potassium permanganate, potassium dichromate and lead tetraacetate), reducing reagents (metals, metal hydrides and sodium borohydride) – applications with examples.

UNIT- IV**CARBOHYDRATES AND PROTEINS**

Carbohydrates : Nomenclature and classification, ring structure, size and preparation of glucose, mutarotation, structural determination of glucose, evidences for open chain and cyclic structure of (D) + glucose, anomers, epimers and osazone formation

Proteins: Definition, classification and structure of amino acids; synthesis (Gabriel phthalimide, Malonic ester and Strecker synthesis) of amino acids and their chemical properties, zwitter ion and isoelectric point, peptide linkage - formation and synthesis of peptides, determination of structure of peptides, formation of protein.

UNIT –V**INSTRUMENTAL METHODS OF ANALYSIS**

Spectroscopy – Introduction, electromagnetic spectrum, absorption spectrum.

Infrared spectroscopy – basic principles, types of vibrations, IR absorption to various functional groups. Application to simple organic molecules like methanol, acetaldehyde, acetone and methyl amine.

UV spectroscopy – Basic principles, types of excitation, applications to simple organic molecules (1,3-butadiene and its derivatives and benzene derivatives).

Suggested Reading:

1. Organic chemistry by R.T. Morrison and R.N. Boyd
2. Text book of organic chemistry by Lloyd N.Ferguson
3. The fundamental principles of organic chemistry by I L Finar
4. Organic reaction mechanism by Peter S.Sykes
5. Organic spectroscopy by Silverstein and Basseler
6. Organic spectroscopy by Y R Sharma

OBJECT ORIENTED PROGRAMMING THROUGH C++
(common to all branches)

Instruction	3L + 1T Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

UNIT - I

Principles of Object Oriented Programming: Procedure Vs Object Oriented, Paradigm, Basic concepts, benefits, Applications and Object Oriented Languages.

Introduction: Program structure, Creating, Compiling and Linking of C++ program.

Token, Expression and Control Structures: Tokens, Keywords, Identifiers and Constants, Data Types, Operators, Precedence, Type Compatibility, Control Structures, New Features of C++.

Functions: Function Prototype and Parameter Passing, Inline Functions, Default, Constant Arguments, Recursion, Function Overloading, Function Template.

UNIT - II

Classes and Objects: Defining classes and Member functions, Arrays, Static Members, Friend Functions.

Constructors and Destructors: Type of Constructors, Dynamic Initialization of Objects, Destructors.

UNIT - III

C++ operator overloading: Fundamentals, restrictions, overloading unary / binary operators, overloading ++ and --, Manipulation of Strings.

C++ Inheritance: Defining derived classes, Types of Inheritance, Virtual Base class Abstract Class, Nesting of classes.

UNIT - IV

Pointers and Polymorphism: Pointers and Generic pointer, Pointer to Objects and Derived Classes, this pointer, Virtual Functions, Virtual Destructors.

C++ Stream Input/Output: Streams, Stream classes, Formatted and Unformatted operations, Manipulators.

Files: Classes for file Stream operations, Sequential and Random access operations, Command line Arguments

UNIT - V

C++ Templates: Introduction, class templates, member function template, overloading template functions.

C++ Exception Handling: Try, throw, catch

Suggested Reading:

1. E. Balagurusamy "Object Oriented Programming with C++", McGraw-Hill Education (India), 6 th Edition 2013
2. Bjarne Stroustrup "The C++ Programming Language", Pearson Education, 5th Edition (2013)
3. Robert Lafore "Object-Oriented Programming in C++ " Fourth Edition Sams Publishing,2002

**INTRODUCTION TO CHEMICAL ENGINEERING
(Chemical Engg)**

Instruction	4L Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessionals	25 Marks
Credits	3

Course Objectives:

1. To introduce history, importance and components of chemical engineering, concepts of unit operations and unit processes, and current scenario of chemical and allied process industries.

Course Outcomes:

1. Awareness of career options, potential job functions, contemporary and professional issues
2. Ability to list chemical processes, units, and the corresponding equipment
3. Understanding of chemical engineering and its relation to other disciplines

UNIT-I

Introduction: Introduction to chemical engineering; history of chemical engineering and chemical technology; Scope of chemical engineering, nature of industries and applications, Flow diagram, Flow sheet, with examples.

UNIT-II

Basic Chemical Calculations: Laws of conservation of mass and energy (enthalpies) for solids, liquid and gases and applications of laws.

Separation Processes: Introduction & concepts of Distillation, Absorption, Adsorption and Membrane processes

UNIT-III

Reactors: Batch and continuous processes, types of reactors like batch, Mixed Flow Reactor, Plug Flow Reactor, basic material balances for reactors and applications.

Materials: Introduction, types of engineering materials for piping and equipment used in chemical process industries.

UNIT-IV

Fluid Flow And Heat Transfer: Fluids, types of fluid, Viscosity, equation of continuity, Bernoulli's principle with examples. Types of Pipes and fittings. Modes of heat transfer, example: double pipe heat exchangers.

UNIT-V

Process Instruments: Big four process parameters measurement like temperature, pressure, level and flow used in process industries

Text Books:

1. Introduction to Chemical Engineering, S Pushpavanam.PHI Learning Pvt. Ltd
2. Introduction to Chemical Engineering, Salil K. Ghoshal, Tata McGraw Hill.
3. Fundamentals of Chemical Engineering, S N Saha, Dhanpatrai Publishers.

Suggested Reading:

1. Unit operations in chemical engineering by W.L. McCabe and J.C. Smith and Peter Harriott, McGraw Hill 5th ed. 1993
2. Coulson J M and Richardson J F, Chemical Engineering, Vol. I and II, Pergamon Press
3. Industrial Instrumentation, Donald P Eckman, Wiley-Eastern Ltd.

ENGLISH LANGUAGE LABORATORY – II
(common to all branches)

Instruction	2 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	1

COMPUTER ASSISTED LANGUAGE LEARNING LAB (CALL)

Introduction:

The language lab focuses on the practice of connected speech and word stress. They are also introduced to the process of Listening. The following are the **objectives** of the course:

1. To recognize and be familiar with word stress and identify stress patterns.
2. To develop awareness of rhythm and notion of stress time.
3. Listen effectively in a variety of situations for a variety of purposes; practice the behavior of effective, active listeners.
4. Assess strengths in listening and set goals for the future.

SYLLABUS:

1. Word stress: Primary stress, secondary stress, functional stress, rules of word stress.
2. Rhythm & Intonation: Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
3. Aspects of connected speech: Strong forms, weak forms, contracted forms, elision.
4. Listening skills.

INTERACTIVE COMMUNICATION SKILLS LAB (ICS LAB)

Introduction:

The objective of the course is to introduce them to the art of making effective presentations. They also learn do debate, the interview process and interview skills.

The following are the **objectives** of the course:

1. To enable students to express themselves fluently and appropriately in social and professional contexts.
2. To provide techniques for preparing and delivering a presentation.
3. Practicing interview skills via an interpersonal encounter similar to real life situation.
4. To understand and communicate various forms of argument effectively, to develop the ability to analyze, evaluate, construct and refute arguments.

SYLLABUS:

1. Debate: Differences between a debate and a group discussion. Essentials of a debate, conducting a debate.
2. Presentation Skills: Making effective presentations, expressions which can be used in presentation, use of non-verbal communication, coping with stage fright , handling question and answer session; use of audio- visual aids , Power point presentations.
3. Interview skills: Planning and preparing for interviews, facing interviews confidently, use of suitable expressions during interview.

Suggested Reading:

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

ORGANIC CHEMISTRY LAB
(Chemical Engg)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

Course Objectives:

1. To impart fundamental knowledge in handling the equipment/glassware and chemicals in the chemistry laboratory.
2. To offer hands on experience on the basic equipment related to organic chemistry
3. For practical understanding of theoretical concepts of chemistry.

I. Identification of organic functional groups (aliphatic and aromatic) and preparation of their derivatives.

- i) Aldehyde
- ii) Ketone
- iii) Carboxylic acid
- iv) Phenol
- v) Carbohydrate
- vi) Amine

II. Preparation of TLC plates and its application to separation of organic compounds.

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.

PROGRAMMING LAB - II
(common to all branches)

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessionals	25 Marks
Credits	2

1. Program to implement function overloading
2. Program to implement function template
3. Program to implement types of constructors and destructor
4. Program to implement new and delete operators (Dynamic memory allocation).
5. Program to implement unary and binary operator overloading
6. Creation of inheritance hierarchy for graphic shapes.
7. Implementation of runtime polymorphism
8. Classes for Bank Account, Student information, Library catalog
9. Implementation of Streams.
10. Implementation of Template Classes.

ENGINEERING DRAWING
(common to Chemical & Bio-Tech)

Instruction	3D Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Credits	2

Course Objectives:

1. To provide an exposure in understanding the drawings during a multidisciplinary 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: Instruments and their uses, Lettering and dimensioning.

Engineering curves - ellipse, parabola, hyperbola, cycloid, epicycloids and hypocycloid

UNIT- II

Projection of points and straight lines: projection of points placed in different quadrants. Projection of straight lines inclined to one of the reference planes.

UNIT- III

Projection of planes: projection of perpendicular planes inclined to one reference plane.

UNIT- IV

Projection of planes: projection of planes inclined to both the reference planes. Traces of planes.

UNIT- V

Projection of solids: polyhedral, solids of revolution, projection of solids with axis inclined to one plane and parallel to another reference plane.

Text Books:

1. N.D.Bhatt, "Elementary Engineering Drawing", Charotar Publishers, 2012.
2. Basanth Agrawal and C M Agrawal "Engineering Drawing 2e", McGraw-Hill Education(India) Pvt. Ltd.

Suggested Reading:

1. K.L.Narayana and P.K.Kannaiah, "Text Book of Engineering Drawing", Scitech Publications, 2011.
2. P.S.Gill' "Engineering Graphics", Kataria Publications, 2011.
3. K.Veenugopal, "Engineering Drawing and Graphics + Autocad", New Age International Pvt.Ltd, 2011.
4. Shaw M.B and Rana B.C., "Engineering drawing", Pearson, 2nd edition, 2009
5. P I Varghees, "Engineering Graphics", Tata McGraw-Hill publications, 2013
6. Bhattacharya. B, "Engineering Graphics", I. K. International Pvt.Ltd, 2009
7. Dhawan R.K., "Principles of Engineering Graphics and Drawing", S. Chand 2011