



B. Tech BIOTECHNOLOGY

Curriculum and Syllabus
(Based on Choice Based Credit System)
Effective from the Academic year
2018-2019

Department of Bio-Engineering
School of Engineering

Course Objective (Employability)

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels.

Unit I Atomic and molecular structure, Intermolecular forces and potential energy surfaces 14

Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H₃, H₂F and HCN.

Unit II Spectroscopic techniques and applications 12

Principles of spectroscopy and selection rules. Electronic spectroscopy. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Diffraction and scattering

Unit III Use of free energy in chemical equilibria 12

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.

Unit IV Periodic properties 12

Variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

Unit V Organic reactions and synthesis of a drug molecule 10

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Total : 60 hrs

Text Books

1. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane.
2. Fundamentals of Molecular Spectroscopy, by C. N. Banwell.
3. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan.

Reference Books

1. Physical Chemistry, by P. W. Atkins.
2. Organic Chemistry: Structure and Function by K. P. C. Vollhardt and N. E. Schore, 5th Edition
<http://bcs.whfreeman.com/vollhardtschore5e/default.asp>
3. University chemistry, by B. H. Mahan.

COURSE OUTCOME:

After successful completion of the course, the student will be able to

CO1: Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.

CO2: Develop knowledge on bulk properties and processes using thermodynamic considerations.

CO3: Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

CO4: Understand the Organic reactions and synthesis of drug molecule.

CO5: Understand the periodic properties.

Course Objective (Skill development)

The objective of this course is to familiarize the prospective engineers with techniques in calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Unit 1: Calculus **12**

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties.

Unit 2: Calculus **12**

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule.

Unit 3: Sequences and series **12**

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions.

Unit 4: Multivariable Calculus (Differentiation) **12**

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers.

Unit 5: Matrices **12**

Introduction to matrix and rank of a matrix-System of linear equations- Symmetric, skew-symmetric and orthogonal matrices- Eigenvalues and eigenvectors- Diagonalization of matrices-Cayley-Hamilton Theorem, and Orthogonal transformation.

Total: 60hrs

Text Books

- (i) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
- (ii) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Reference Books

- (iii) Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- (iv) Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
- (v) D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
- (vi) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
- (vii) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

COURSE OUTCOME:

After successful completion of the course, the student will be able to

CO1: To introduce the idea of applying differential and integral calculus to Notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.

CO2: To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.

CO3: To develop the tool of power series for learning advanced Engineering Mathematics.

CO4: To familiarize the student with functions of several variables that is essential in most branches of engineering.

CO5: To develop the essential tool of matrices in engineering.

Employability

Unit 1: Introduction to Programming

9

Introduction to Programming (Flow chart / pseudo code, compilation etc.), Variables (including data types) -Arithmetic expressions and precedence, Conditional Branching and Loops - Writing and evaluation of conditionals and consequent branching Iteration and loops

Unit 2: Arrays and Basic Algorithms

9

Arrays (1-D, 2-D), Character arrays and Strings, Searching, Basic Sorting Algorithms, Finding roots of equations, Notion of order of time complexity through example programs

Unit 3: Function and Pointers

9

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference, Recursion with example programs such as Finding Factorial, Fibonacci series, etc. **Pointers - Defining pointers, Use of Pointers in self-referential structures**

Unit 4: Structures and Unions

9

Structures - Defining structures and Array of Structures, Structures containing Pointers, Unions - Storage classes: auto, static, extern, register – Dynamic memory allocation

Unit 5: String Functions and Files

9

Strings - library string functions, pointers in strings, pointers and function arguments, Files - file Operations, processing a file, Preprocessor directives, use of typedef, Command line arguments, Enumerated data types.

Total: 45 hrs

Text Books

1. Byron Gottfried, "Schaum's Outline of Programming with C", McGraw-Hill
2. E. Balaguruswamy, "Programming in ANSI C", Tata McGraw-Hill

Reference books

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Prentice Hall of India
2. Yashavant Kanetkar, "Let Us C", BPB Publications
3. Ashok.N.Kamthane, "Computer Programming", Pearson Education (India).

COURSE OUTCOME:

After successful completion of the course, the student will be able to

CO1: Develop algorithmic solutions to simple computational problems.

CO2: Demonstrate programs using simple C statements and expressions.

CO3: Explain control flow and functions concept in C for solving problems.

CO4: Use C data structures – lists, tuples & dictionaries for representing compound data.

CO5: Explain files, exception, modules and packages in C for solving problems.

(BASIC PRINCIPLES AND FUNDAMENTAL RIGHTS)

Course Objective: Employability

The purpose of the course is to acquaint the students with **basic principles of the Constitution of India** and its working.

UNIT - I NATURE, OBJECT AND SCOPE OF THE CONSTITUTION

Nature, object and scope of Constitutional Law and Constitutionalism — Historical Perspective of the Constitution of India — Salient Features and Characteristics of Constitution Of India.

UNIT – II FUNDAMENTAL RIGHTS

Nature and scope of Fundamental Rights — **Scheme of Fundamental Rights — Right to Equality — Right to Freedom of Speech and Expression — Right to Life** — Right against Exploitation — Right to Religious Freedom — Minority Rights.

UNIT - III DIRECTIVE PRINCIPLES OF STATE POLICY AND FUNDAMENTAL DUTIES

Directive Principles Of State Policy — Importance and Implementation — Scheme of Fundamental Duties and its Legal Status.

UNIT - IV FEDERAL STRUCTURE

Federal Structure — Distribution of Legislative and Financial Powers between the union and the States — Parliamentary Form Of Government in India — Constituent Powers and Status of the President of India.

UNIT - V AMENDMENT AND EMERGENCY PROVISIONS

Amendment of the Constitution — Procedure — **Historical Perspective of the Constitutional Amendments in India** — Emergency Provisions — National Emergency — President Rule — Financial Emergency — Local Self Government — Constitutional Scheme in India.

Total : 30 h

REFERENCE BOOKS:

1. V.N. Shukla. Constitutional Law of India
2. D.D. Basu, Commentary on the Constitution of India
3. J.N. Pandey, Constitution of India
4. V.D. Mahajan, Constitutional Law of India
5. H.M. Seervai. Constitution of India

COURSE OUTCOME:

After successful completion of the course, the student will be able to
CO1: Understand history and philosophy of Indian Constitution
CO2: Understand the liberty and freedom from a civil rights perspective
CO3: Understand the principles of State policy and fundamental duties
CO4: Understand the powers and functions of Indian government
CO5: Understand about emergency rule

Skill Development**Course Objective**

- To acquire ability to speak effectively in real life situations.
- To write letters and reports effectively in formal and business situations.
- To develop listening skills for academic and professional purposes.
- To gain effective speaking and listening skills in communication.
- To develop the soft skills and interpersonal skills to excel in their career.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment procedures.

Unit I Vocabulary Building**10**

General Vocabulary –Nouns- Compound nouns, Word borrowing & Word making, Foreign machinery in English, Dictionary and Thesaurus usages, Synonyms, Antonyms, Prefixes and Suffixes, Homonyms, Homographs and Homophones, Changing words from one form to another, Acronyms and Abbreviations.

Unit II Basic Writing**10**

Sentences structures –Kinds of sentences, Types of sentences, Clauses and Phrases, Punctuations, Word Links and Connectives, Summarizing, Precise writing, Paragraph Writing.

Unit III Identifying Common Errors In English**10**

Articles, Prepositions, Subject-verb Agreement, Pronouns - Relative pronouns, Demonstrative pronouns, Misplaced Modifiers, Redundancies, Clichés, Infinitives & Gerund

Unit IV Nature And Style Of Sensible Writing**10**

Describing people, place and situations, Process description, Definitions, Numerical Expressions, Information Transfer- Flow chart Bar chart and Pie chart, Checklists, Writing introduction and conclusion.

Unit V Writing Practices**10**

Letter Writing- Formal & Informal Letters, Report Writing- Letter Report, Accident Report, Investigation Report and Survey, Essay writing, Comprehension Passages.

Text Books

1. **English for Scientists**, Prof. K.R.Lakshminarayanan, Former Head, Department of Humanities and Social sciences, Sri Venkateshwara College of Engineering, Pennalur, Sriperumbudur, Tamilnadu SCITECH PUBLICATIONS (INDIA PVT.LTD)2014
2. Department of English, Anna University, Mindscapes, ‘**English for Technologists and Engineers**’, Orient Longman Pvt. Ltd, Chennai: 2012.
3. Department of Humanities and Social Sciences, Anna University, ‘**English for Engineers and Technologists**’ Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
4. Department of English, Anna University, Mindscapes, ‘**English for Technologists and Engineers**’, Orient Longman Pvt. Ltd, Chennai: 2012.
5. Department of Humanities and Social Sciences, Anna University, ‘‘**English for Engineers and Technologists**’’ Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
6. M.Ashraf Rizvi, ‘‘**Effective Technical Communication**’’, Tata McGraw-Hill Publishing Company Limited, New Delhi.2009.

Suggested Readings

- (i) Practical English Usage. Michael Swan. OUP. 1995.
- (ii) Remedial English Grammar. F.T. Wood. Macmillan.2007
- (iii) On Writing Well. William Zinsser. Harper Resource Book. 2001
- (iv) Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
- (v) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
- (vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

COURSE OUTCOME:

After successful completion of the course, the student will be able to

CO1: Make use of suitable communicative strategies to express their point of views convincingly in any type of discussions and negotiation.

CO2: Construct different types of writings such as narrative, descriptive, creative, critical and analytical reports using appropriate vocabulary besides paying keen attention for presenting error free document.

CO3: Prepare letters to officials and to the Editor in formal and official contexts

CO4: Infer implied meanings of different genres of texts and critically analyze and evaluate them for ideas as well as for method of presentation.

CO5: Infer meanings of different flow charts and bar charts and develop constructive paragraphs deriving possible information to be obtained from them.

Employability**Unit I: Simple harmonic motion, damped and forced simple harmonic oscillator**

9

Harmonic oscillator – Differential equation and solution of simple harmonic oscillator – simple pendulum – damped harmonic oscillator: Equation of motion and its solution, qualitative description of heavy, critical and light damping – energy decay in a damped harmonic oscillator – Q factor – forced mechanical and electrical oscillators – power absorbed by oscillator.

Unit II: Non-dispersive transverse and longitudinal waves in one dimension and introduction to dispersion

9

Waves, travelling waves example of waves, characteristics of a waves - longitudinal and transverse waves–Examples- Transverse wave on a string, the wave equation on a string- longitudinal waves and the wave equation- acoustics waves and speed of sound- characteristics of musical sound, quality of tone, decibel- noise pollution- acoustics- of buildings - Reverberation - Reverberation time.

Unit III: The propagation of light and geometric optics

9

Fermat's principle of stationary time- laws of reflection and refraction- Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection - Dispersion, Dispersive power of prism-Defect of lenses- spherical aberration-coma-achromatic lenses.

Unit IV: Wave optics

9

Huygens' Principle, superposition of waves - Young's double slit experiment- Newton's rings-Michelson interferometer, Mach Zehnder interferometer - Fraunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision - Dispersion of a diffraction of grating and their resolving power.

Unit V: Lasers

9

Einstein's theory of matter radiation interaction and A and B coefficients- population inversion, different types of lasers: gas lasers (He-Ne, CO₂), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine

Total: 45 hrs**Suggested Reference Books**

- (i) Ian G. Main, Oscillations and waves in physics
- (ii) H.J. Pain, The physics of vibrations and waves (iii)E. Hecht, Optics
- (iv) A. Ghatak, Optics
- (v) O. Svelto, Principles of Lasers

COURSE OUTCOME:

After successful completion of the course, the student will be able to

- CO1: Understand the Harmonic oscillator and solution of simple harmonic oscillator
 CO2: Understand the different concepts of acoustics and can apply it for acoustic of building
 CO3: Understand the different types of aberration in lens.
 CO4: Understand the concept of diffraction and apply it to find the wavelength.
 CO5: Understand the different types of lasers and its uses

Skill Development**Course Objective**

The objective of this course is to familiarize the students with statistical techniques. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

Unit 1: Basic Probability 12

Probability spaces- conditional probability- Independence- Bayes' rule- Discrete random variables- Continuous random variables- Expectation of Discrete Random Variables-Continuous Random variables.

Unit 2: Continuous Probability Distributions 12

Discrete Distributions-Binomial, Poisson, Geometric-Continuous Distribution-Normal,Uniform, Exponential and gamma densities.

Unit 3: Bivariate Distributions: 12

Bivariate distributions and their properties-Covariance- Correlation and Regression Analysis

Unit 4: Basic Statistics 12

Measures of Central tendency:Mean, Median and Mode- Measure of Dispersion- Range, Standard Deviation and coefficient of variation- Moments Skewness and Kurtosis (Simple Problems)

Unit 5: Applied Statistics 12

Introduction to Large and small sample – t-test-Single mean, difference of means, and Paired t-test . Small samples: Test for single mean, difference of means-F-test- Chi-square test for goodness of fit and independence of attributes.

Total: 60hrs

Text Books

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
2. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
3. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

COURSE OUTCOME:

After successful completion of the course, the student will be able to

- CO1: The students will have a fundamental knowledge of the concepts of probability.
 CO2: Knowledge of standard distributions which can describe real life phenomenon.
 CO3: The notion of sampling distributions and statistical techniques used in engineering
 CO4: Use appropriate statistical methods in the analysis of simple datasets
 CO5: Develop skills in presenting quantitative data using appropriate diagrams, tabulations and summaries

Employability**Unit I DC Circuits 12**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, Mesh and Nodal analysis, Analysis of simple circuits with dc excitation, Wye \leftrightarrow Delta Transformation, Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

Unit II AC Circuits 12

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

Unit III Transformers 12

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Unit IV Electrical Machines & Power Converters 12

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Single phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. DC-DC buck and boost converters, duty ratio control. Single phase Bridge Rectifier, Single Phase voltage source inverters.

Unit V Electrical Installations 12

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Total: 60 hrs

Text / References

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

COURSE OUTCOME:

After successful completion of the course, the student will be able to

CO1: Analyze the behavior of DC circuits

CO2: Explain about the various AC circuits

CO3: Explain the requirement of Electrical Machine used for particular application

CO4: Identify the types of Electrical machines used for particular application

CO5: Demonstrate wiring, earthing to do power factor calculations

Course Objective Employability

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

Concepts and Conventions (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

Unit I Introduction To Engineering Drawing and Plane Curves

12

Curves used in engineering practices: Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid, Epicycloid, Hypocycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Scales – Plain, Diagonal and Vernier Scales.

Unit II Projection of Points, Lines and Plane Surfaces

12

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes - Auxiliary Planes

Unit III Projection of Solids

12

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method - Auxiliary Views

Unit IV Section of Solids and Development of Surfaces

12

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section - Auxiliary Views. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

Unit V Orthographic Projection and Isometric Projection

12

Free hand sketching: Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement - layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects. Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones.

Total: 60 hrs**Text Books**

1. N.D. Bhatt, “Engineering Drawing” Charotar Publishing House, 46 th Edition, (2003).

References

1. K. V. Natrajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai (2006).
2. M.S. Kumar, “Engineering Graphics”, D.D. Publications, (2007).
3. K. Venugopal & V. Prabhu Raja, “Engineering Graphics”, New Age International (P) Limited (2008).
4. M.B. Shah and B.C. Rana, “Engineering Drawing”, Pearson Education (2005).
5. K. R. Gopalakrishnana, “Engineering Drawing” (Vol.I&II), Subhas Publications (1998).
6. Dhananjay A. Jolhe, “Engineering Drawing with an introduction to AutoCAD” Tata McGraw Hill Publishing Company Limited (2008).
7. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, (2008).

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.

Course Outcome

After successful completion of the course, the student will be able to

CO1: Understand the various concepts like dimensioning, conventioning and standards related to working drawings in order to become professionally efficient.

CO2: Improve their visualization skills so that they can apply these skills in developing new products and able to prepare the simple layout of factory buildings.

CO3: Impart and inculcate a proper understanding of the theory of projection and improve the visualization skills.

CO4: Understand the theory of projection and able to know and understand the conventions and the methods of engineering drawing.

CO5: Impart the knowledge for understanding and drawing of simple residential/office buildings and ability to convert sketches into engineered drawings will increase.

Skill Development**Course Objective**

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.

Choice of 10-12 experiments from the following

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

Text Books

1. S. Sundaram and K. Raghavan "Practical Chemistry", S. Viswanathan. Co. 3rd edition **2011**.
2. Gnanaprakasam, Ramamurthy, "Organic Chemistry Lab Manual" S. Viswanathan Pvt. Ltd. 3rd edition **2011**

Reference Book

1. Vogel's – "Textbook of qualitative organic Analysis", Longmann, 12th edition, **2011**
2. J. N. Gurtu and R. Kapoor "Advanced experimental Chemistry", S. Chand and Co. 6th edition, **2010**.

COURSE OUTCOME:

After successful completion of the course, the student will be able to

- CO1: Understand the experiments to find the surface tension, viscosity and hardness of water.
CO2: Demonstrate thin layer chromatographic technique
CO3: Estimate the rate constants of reactions and partial coefficient of immiscible liquids.
CO4: Develop knowledge on synthesizing a drug molecule
CO5: Understand the electrochemical technique to find out the redox potential.

Skill Development

Experiments

1. Familiarization with programming environment
2. Simple computational problems using arithmetic expressions
3. Problems involving if-then-else structures
4. Iterative problems
5. 1D Array manipulation
6. Matrix problems
7. String operations
8. Simple functions
9. Solving Numerical methods problems
10. Recursive functions
11. Pointers and structures
12. File operations

COURSE OUTCOME:

After successful completion of the course, the student will be able to

- CO1: Formulate the algorithms for simple problems
- CO2: Identify and correct logical errors encountered at run time
- CO3: Write iterative as well as recursive programs
- CO4: Represent data in arrays, strings and structures and manipulate them through a program
- CO5: Declare pointers of different types and use them in defining self-referential structures.

Skill Development

Course Objective

- To study bench fitting drawings for making male and female fittings as per the given dimensions and Tolerances.
- To study Arc welding drawings for making common weld joints as per the given dimensions.
- To study sheet metal development drawings for making common metal parts/components as per the given dimensions.

(i) Workshop/Manufacturing Practices [L:1; T:0; P : 0 (1 credit)] Lectures & videos: (10 hours)

Detailed contents:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods (3 lectures)
2. CNC machining, Additive manufacturing (1 lecture)
3. Fitting operations & power tools (1 lecture)
4. Electrical & Electronics (1 lecture)
5. Carpentry (1 lecture)
6. Plastic moulding, glass cutting (1 lecture)
7. Metal casting (1 lecture)
8. Welding (arc welding & gas welding), brazing (1 lecture)

(ii) Workshop Practice:(60 hours)[L : 0; T:0 ; P : 4 C: 2]

1. Machine shop (10 hours)

To make Facing and plain turning, step turning, drilling in the lathe

2. Fitting shop (8 hours)

To make square, V joint in bench fitting as per the given dimension And Tolerances

3. Carpentry (6 hours)

To make half lap joint, dovetail, TEE Lap joint

4. Electrical & Electronics (8 hours)

(i) To make fluorescent lamp wiring.

(ii) To make stair case wiring.

(iii) To make residential wiring.

(iv) To measure Peak-peak, rms, period, frequency using CRO.

(v) To solder components devices and circuits by using general purpose PCB.

5. Welding shop (8 hours (Arc welding 4 hrs + gas welding 4 hrs)

To make single, butt, lap and T fillet joint by arc welding with the back hand and fore hand welding techniques as per the given dimensions.

6. Plumbing Works

Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

7. Sheet Metal Work

To make simple Dust pan, Rectangular trays in sheet metal with the jigs as per the given Dimensions.

COURSE OUTCOME:

After successful completion of the course, the student will be able to

CO1: Able to make various joints in the given object with the available work material and to know how much time a joint will take for completion of work.

CO2: Familiarity with different types of woods used and tools used in wood Working technology.

CO3: Developments of sheet metal jobs from GI sheets, knowledge of basic concepts of soldering and Familiarity with different types of tools used in forging technology.

CO4: Knowledge of different types of furnaces like coal-fired, electrical furnaces etc and Familiarity with different types of tools used in fitting technology.

CO5: Utilize the basic hands-on experience in various fields of engineering Practices in Civil, Mechanical, Electrical and Electronics Engineering.

Skill Development

Any 8 Experiments

1. Spectrometer –Dispersive Power of prism
2. Spectrometer – Grating
3. Semiconductor Laser – To find Wavelength and particle size.
4. Ultrasonic Interferometer
5. Torsional Pendulum
6. Hooke's Law
7. Compound pendulum- To determine 'g'
8. Newton's Ring
9. Air wedge
10. Bifilar Pendulum

COURSE OUTCOME:

After successful completion of the course, the student will be able to

- CO1: Demonstrate about spectrophotometer
- CO2: Perform experiments in semiconductor
- CO3: Understand about pendulum and its types
- CO4: Conduct experiments in Hooke's law
- CO5: Demonstrate about Air wedge

Skill Development

List of Laboratory Experiments/Demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification.
3. Resonance in R-L-C circuits.
4. Loading of a transformer: measurement of primary and secondary voltages and currents, and power
5. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line- line voltage, phase-to-neutral voltage, line and phase currents).
6. Load Characteristics of a DC Motor
7. Torque-Slip Characteristic of an Induction motor
8. Three phase induction motors - Direction reversal by change of phase-sequence of connections.
9. Demonstration of dc-dc converter.
10. Demonstration of dc-ac converter.
11. Demonstration of ac-dc converter.

COURSE OUTCOME:

After successful completion of the course, the student will be able to

- CO1: Gain knowledge in R-L-C circuits
- CO2: Perform experiments in the transformer
- CO3: Conduct experiments in induction motor
- CO4: Demonstrate about dc-dc converter
- CO5: Demonstrate about ac-dc converter

Course Objective (Skill Development)

- To acquire ability to speak effectively in real life situations.
- To write letters and reports effectively in formal and business situations.
- To develop **listening skills** for academic and professional purposes.
- To gain effective **speaking and listening skills** in communication.
- To develop the **soft skills and interpersonal skills** to excel in their career.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment procedures.

Oral Communication skills

10

(This unit involves interactive practice sessions in Language Lab)

Listening comprehensions skills, Pronunciation, Phonology, Intonation, Stress and Rhythm, Situational Dialogues, Communication in workplace, Interviews, Seminar, Formal Presentations, Group Discussions, Debates, JAM sessions

Text Books

1. **English for Scientists**, Prof. K.R.Lakshminarayanan, Former Head, Department of Humanities and Social sciences, Sri Venkateshwara College of Engineering, Pennalur , Sriperumbudur, Tamilnadu SCITECH PUBLICATIONS (INDIA PVT.LTD)2014
2. Department of English, Anna University, Mindscapes, '**English for Technologists and Engineers**', Orient Longman Pvt. Ltd, Chennai: 2012.
3. Department of Humanities and Social Sciences, Anna University, '**English for Engineers and Technologists**' Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
4. Department of English, Anna University, Mindscapes, '**English for Technologists and Engineers**', Orient Longman Pvt. Ltd, Chennai: 2012.
5. Department of Humanities and Social Sciences, Anna University, '**English for Engineers and Technologists**' Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
6. M.Ashraf Rizvi, '**Effective Technical Communication**', Tata McGraw-Hill Publishing Company Limited, New Delhi.2009.

Suggested Readings

- (i) Practical English Usage. Michael Swan. OUP. 1995.
- (ii) Remedial English Grammar. F.T. Wood. Macmillan.2007
- (iii) On Writing Well. William Zinsser. Harper Resource Book. 2001
- (iv) Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
- (v) Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
- (vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press