

**S.A. ENGINEERING COLLEGE, CHENNAI -77.**  
**(An Autonomous Institution-Affiliated to Anna University)**  
**B.Tech. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**  
**REGULATION 2020**  
**CHOICE BASED CREDIT SYSTEM**  
**I&II SEMESTER CURRICULUM**

**SEMESTER-I**

| S.NO                    | SUBJECT CODE | COURSE TITLE                                      | CATEGORY | CONTACT PERIODS | L         | T        | P         | C         |
|-------------------------|--------------|---|----------|-----------------|-----------|----------|-----------|-----------|
| <b>THEORY</b>           |              |   |          |                 |           |          |           |           |
| 1                       | HS1101A      | Technical English                                 | HS       | 3               | 3         | 0        | 0         | 3         |
| 2                       | MA1101A      | Calculus and its application                      | BS       | 4               | 3         | 1        | 0         | 4         |
| 3                       | PH1101A      | Applied Physics                                   | BS       | 3               | 3         | 0        | 0         | 3         |
| 4                       | CY1101A      | Engineering Chemistry                             | BS       | 3               | 3         | 0        | 0         | 3         |
| 5                       | CS1101A      | Problem Solving and Python Programming            | ES       | 3               | 3         | 0        | 0         | 3         |
| 6                       | ME1101A      | Engineering Graphics                              | ES       | 4               | 2         | 0        | 2         | 3         |
| <b>PRACTICALS</b>       |              |   |          |                 |           |          |           |           |
| 7                       | BS1101A      | Physics and Chemistry Laboratory                  | BS       | 4               | 0         | 0        | 4         | 2         |
| 8                       | CS1102A      | Problem Solving and Python Programming Laboratory | ES       | 4               | 0         | 0        | 4         | 2         |
| <b>MANDATORY COURSE</b> |              |   |          |                 |           |          |           |           |
| 9                       | CI1101A      | Indian Constitution                               | MC       | 2               | 2         | 0        | 0         | 0         |
| 10                      | FL0001A      | French/Japanese                                   | MC       | 2               | 2         | 0        | 0         | 0         |
| <b>TOTAL</b>            |              |   |          | <b>32</b>       | <b>21</b> | <b>1</b> | <b>10</b> | <b>23</b> |

**Prerequisites:** Basic Language Proficiency.

**Objective:**

1. Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
2. Nurture their ability in technical writing like to prepare professional job applications and effective reports.
3. Develop their speaking skills by participating in various speaking activities.
4. Strengthen their listening skill to comprehend lectures and talks in their areas of specialization.
5. Improve their ability to explicit their excellence in all modes of technical communication.

**Course Outcomes:**

The Students will be able to

**CO1:** Read technical texts and write area- specific texts effortlessly.

**CO2:** Listen and comprehend lectures and talks in their area of specialization successfully.

**CO3:** Speak appropriately and effectively in varied formal and informal contexts.

**CO4:** Write correctly, clearly and concisely with coherence and cohesion.

**CO5:** Prepare job applications and resume in an inspiring manner.

**UNIT – 1**

**9 Periods**

**Reading-** Reading short texts **Listening-** Listening to different formal / informal conversations **Writing-** Instructions, Jumbled sentences **Speaking-** Self introduction **Language development-** Parts of speech, Prepositions **Vocabulary development-** Word formation- root words from foreign language and their use in English.

**UNIT – 2**

**9 Periods**

**Reading-** Skimming and Scanning to find specific information **Listening-** Listening to INK talks **Writing-** Job Application – cover letter, resume writing **Speaking-** Asking and Giving directions **Language development-** Conjunctions, Types of Nouns **Vocabulary development-** Prefixes and Suffixes.

**UNIT – 3**

**9 Periods**

**Reading-** Reading for predicting the content **Listening-** Listening to situational short talks **Writing-** Types of paragraphs- Descriptive/Analytical/ compare and contrast **Speaking-** Mini presentations, Expressing greeting and thanks **Language development-** Adjectives, Numerical Adjectives, Conditional Clauses **Vocabulary development-** Homophones, Homonyms.

**UNIT – 4**

**9 Periods**

**Reading-** Practice in speed reading **Listening-** Listening to short texts and fill the data **Writing-** Interpretation of Graphics / Information, Note making **Speaking-** Contributing for Group Discussion **Language development-** Active, Passive, Impersonal passive voice **Vocabulary development-** Definitions, Nominal Compounds.

## UNIT – 5

9 Periods

**Reading-** Reading short stories **Listening-** Listening for note taking **Writing-** Report writing, E-mail Writing **Speaking-** Picture descriptions, Speaking in familiar situations **Language development-** Tenses **Vocabulary development-** British and American Vocabulary.

**Total Periods : 45**

### Text Books

- Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.
- Board of editors. Fluency in English A Course book for Engineering and Technology. Orient Blackswan, Hyderabad: 2016.

### Extensive Reading

- Khera, Shiv. You can Win, Macmillan, 2000.

### Reference

- Bailey, Stephen. Academic Writing: A practical guide for students. New York:Rutledge,2011.
- Comfort, Jeremy, et al. Speaking Effectively : Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
- Darlene Smith-Worthington, Sue Jefferson, Technical writing for Success, South-Western Cengage Learning,USA-2011
- Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007
- Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice.Oxford University Press: New Delhi, 2014
- Swan Michael, Practical English Usage. Oxford University Press, Eighth impression 2002.

### Recommended Websites

[bbc.co.uk/1learning](http://bbc.co.uk/1learning) English  
[oxfordonlineenglish.com/](http://oxfordonlineenglish.com/)  
[cambridgeenglish.org](http://cambridgeenglish.org)  
[inktalks.com/talks/](http://inktalks.com/talks/)  
[manageyourwriting.com](http://manageyourwriting.com)

**OBJECTIVES:**

- To understand the concepts of limits, continuity, differentiation and use it to find maxima and minima of functions of one variable.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations of first and second order that model in various engineering problems.
- To familiarize the student with functions of several variables that is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

**UNIT I- DIFFERENTIAL CALCULUS****9+3**

Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules – Maxima and Minima of functions of one variable.

**UNIT II -ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER WITH APPLICATIONS:****9+3**

Basic concepts- Separable differential equations - Exact differential equations - Integrating factors - Linear differential equations - Bernoulli's equation - Geometric Applications- Orthogonal trajectories - Physical Applications - Simple electronic circuits-Newton law of cooling-Heat flow-Rate of decay of radioactive materials-Chemical reaction and solutions.

**UNIT III - DIFFERENTIAL EQUATIONS****9+3**

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.

**UNIT IV- FUNCTIONS OF SEVERAL VARIABLES****9+3**

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

**UNIT V- MULTIPLE INTEGRALS****9+3**

Double integrals – Change of order of integration – Double integrals in polar co-ordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

**TOTAL PERIODS: 60**

## **COURSE OUTCOMES:**

**After completing this course, students should demonstrate competency in the following skills:**

1. Use both the limit definition and rules of differentiation to differentiate functions. apply differentiation to solve maxima and minima problems.
2. The subject helps the students to develop the fundamentals and basic concepts in ODE
3. Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.

## **TEXTBOOKS:**

- Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2016.
- 2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., 2016.

## **REFERENCE BOOKS:**

- Bali,N.P.,Goyal,M.,Watkins,C.,Advanced Engineering Mathematics,Laxmi Publications Pvt. Limited, 2007.
- Boyce,W.E.,and DiPrima,R.C.,Elementary Differential Equationsand Boundary Value Problems, Wiley India, 2012.
- O'Neil. P. V., "Advanced Engineering Mathematics", 7th Edition, Cengage Learning India Pvt., Ltd, New Delhi, 2011.
- T.Veerarajan , Engineering Mathematics , Mc Grawhill Publications , New Delhi 2017.

**OBJECTIVES:**

To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

**UNIT-1 PROPERTIES OF MATTER****9**

Elasticity- plasticity – Different Types of Stress and Strain- concept of stress-strain diagram and its application - three types of modulus of elasticity- Poisson's Ratio – Bending of beams- Expression for bending moment – young's modulus uniform and Non uniform bending : Theory and Experiment – I Shape girders – **Torsional oscillation Theory and Experiment-** Application of Elastic Materials.

**UNIT-2 APPLIED OPTICS****9**

**Laser** : characteristics of laser - Principle of spontaneous emission and stimulated emission – Laser action – Einstein A & B coefficients - Population inversion - Pumping – Basic requirement of laser – Types of laser : Nd-YAG and CO<sub>2</sub> – Applications : Welding , Drilling & Cutting – Medical field

**Fiber optics: Introduction-** Principle and propagation of light – Numerical aperture and acceptance angle – classification of optical fibers – **Losses in optical fibers(Qualitative)** – Fiber optics communication system (Block Diagram) – Advantages with fiber optic communication system.

**UNIT-3 THERMAL PHYSICS****9**

Modes of heat transfer- thermal conduction, convection and radiation – Specific heat capacity- thermal conductivity- Newton's law of cooling - **Searle's** and Lee's disc methods: theory and experiment - conduction through compound media (series and parallel) – **thermal expansion of solids, liquids and gases** - Applications: heat exchangers, refrigerators and solar water heaters.

**UNIT-4 WAVE AND PARTICLE PHYSICS****9**

Inadequacy of Classical Mechanics - Development of quantum theory- **Planck's Black body radiation and Distribution Laws(Qualitative)** – **Compton Effect (Derivation)** - De Broglie wavelength – properties of matter waves – Experimental Verification (G.P Thomson experiment) – Heisenberg's uncertainty principle - Schrodinger's wave equation – time dependent – time independent wave equations – physical significance of Wave function – applications: particle in a one dimensional potential box.

**UNIT-5 CRYSTALLOGRAPHY****9**

Single crystalline, polycrystalline and amorphous materials Lattice - unit cell- Crystal systems-Bravais lattices- Lattice planes- Miller indices- Interplanar- d- Spacing in cubic Lattice- calculation of number of atoms per unit cell – atomic radius – packing factor for SC, BCC, FCC and HCP structures- **Crystal Defects – types.**

**OUTCOMES:**

At the end of this course,

1. The students will gain knowledge on the basics of properties of matter and its applications
2. Use the concepts of waves and optical devices and their applications in Laser and fiber optics
3. The students will understand the properties of thermal materials and its applications
4. The students will get knowledge on advanced physics concepts of quantum theory and its application in one dimensional box.
5. The students will understand the different types of crystals structures and different crystal growth techniques.

**TEXT BOOKS :**

1. Gupta S.L. and Sanjeev Gupta, Modern Engineering Physics , Dhanpat Rai Publishers, 2015.
2. R. K. Gaur and S.C. Gupta, Engineering Physics, Dhanpat Rai Publication (P) Ltd, New Delhi, 2014.
3. Bhattacharya, D.K. and Poonam, T. Engineering Physics, Oxford University Press, 2015.

**REFERENCES :**

1. C. Kittel ,Introduction to Solid State Physics 8<sup>th</sup> Edition , Wiley Eastern Ltd,2004.
2. Halliday, D., Resnick, R. and Walker, J. Principles of Physics. Wiley, 2015.
3. Tipler, P.A. and Mosca, G. Physics for Scientists and Engineers with Modern Physics, W.H.Freeman, 2007.
4. Einstein coefficient calculation,<https://youtu.be/TvfiZHXUtXg> (Video lecture)
5. Lattice structures, <https://youtu.be/Rm-i1c7zr6Q> (Video lecture)

**COURSE OBJECTIVES:**

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- It enables the students to gain information about Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells
- It deals with the information about the types of fuels, calorific value calculations and manufacture of solid, liquid and gaseous fuels.
- To impart knowledge about the nanomaterials synthesis, properties and applications

**UNIT I WATER TREATMENT AND TECHNOLOGY****(9)**

Introduction – characteristics, Water quality parameters -hardness– types, Determination-EDTA method, Alkalinity ,boiler feed water requirements-boiler troubles – scale & sludge -Caustic Embrittlement , boiler explosion -softening of hard water - external treatment process - demineralization and zeolite, internal treatment - boiler compounds (phosphate, calgon, carbonate and colloidal conditioning methods) – desalination of brackish water –reverse osmosis.

**UNIT II PHASE RULE AND ALLOYS****(9)**

Phase rule: Introduction, definition of terms with examples, One Component System- water system,Sulphur,CO<sub>2</sub> system,Thermal Analysis and cooling curves, Reduced phase rule - Two Component Systems- classification – lead-silver system-problems. Alloys: Introduction- Definition- Properties of alloys- Significance of alloying,Functions and effect of alloying elements- Ferrous alloys- Nichrome and Stainless steel – heattreatment of steel.

**UNIT III ENERGY SOURCES AND STORAGE DEVICES****(9)**

Energy – Types – Non-renewable energy - Nuclear energy -renewable energy - solar energy conversion - solar cells. Introduction to Electrochemistry, Nernst Equation-Electrochemical cells – reversible and irreversible cells –Cell construction and representation - Batteries -types of batteries – characteristics – construction and working of primary battery (dry cell) - secondary battery ( lithium-ion-battery) - fuel cells (H<sub>2</sub>-O<sub>2</sub>).

**UNIT IV FUELS AND COMBUSTION****(9)**

Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal- analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto Hoffmann method) – petroleum- manufacture of synthetic petrol (Bergius process)- knocking- octane number – diesel oil- cetane number – natural gas- compressed natural gas(CNG)- liquefied petroleum gases(LPG)- producer gas- water gas. Power alcohol and bio diesel. Combustion of fuels: introduction- theoretical calculation of calorific value- ignition temperature- explosive range – flue gas analysis (ORSAT Method).



## UNIT VNANOCHEMISTRY

(9)

Basics - distinction between nanoparticles and bulk materials; size-dependent properties. ,nano cluster, nano rod, nanotube(CNT)-Types of CNT and nanowire. Synthesis: precipitation, thermolysis, chemical vapour deposition, Properties, Characterisation and applications.

**TOTAL PERIODS: 45**

### **COURSE OUTCOMES:**

- The knowledge gained on water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.
- With the help of phase rule, they could understand the various phase diagrams and able to predict the low melting alloys.
- Students can get knowledge about various fuels and its applications based on its calorific value.
- It provides the students to understand about conventional and non-conventional energy sources and its applications
- Students gain an insight about the recent trends in nano materials.

### **TEXT BOOKS**

Jain P.C. and Monica Jain, "Engineering Chemistry", DhanpatRai Publishing Company (P) Ltd., New Delhi, 2010

### **REFERENCES**

1. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.
3. Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.

**OBJECTIVES:**

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures -- lists, tuples, dictionaries.
- To do input/output with files in Python.

**UNIT I ALGORITHMIC PROBLEMSOLVING****9**

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

**UNIT II DATA, EXPRESSIONS, STATEMENTS****9**

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

**UNIT III CONTROLFLOW, FUNCTIONS****9**

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

**UNIT IV LISTS, TUPLES, DICTIONARIES****9**

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

**UNIT V FILES, MODULES, PACKAGES & TURTLE****9**

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file- **Case study: Simple Graphics using Turtle:** Draw a Random Pattern of Circle, Square and Rectangle; Draw a Pattern of Straight Lines, **Plotting Graphs in Python:** Menu Driven Program to Create Mathematical 3D Objects.

**TOTAL PERIODS: 45**

## **OUTCOMES:**

### **Upon completion of the course, students will be able to**

- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs.

## **TEXT BOOKS:**

1. Allen B. Downey, 'Think Python: How to Think Like a Computer Scientist', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016(<http://greenteapress.com/wp/thinkpython/>)
2. Reema Thareja, Problem Solving and Programming with python, 2<sup>nd</sup> edition, Oxford University press, 2019.
3. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

## **REFERENCES:**

- Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem- Solving Focus, Wiley India Edition, 2013.
- John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press ,2013.
- Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
- Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
- Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
- Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.

**OBJECTIVES:**

- 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)****1**

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

**UNIT I PLANE CURVES AND ORTHOGRAPHIC PROJECTIONS****6+6**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization principles – Layout of views- Orthographic projection of multiple views (Free Hand Sketching) from pictorial views of objects-Principal planes-Projection of points-Demo using CAD software for above topics.

**UNIT II PROJECTION OF POINTS STRAIGHT LINES AND PLANE SURFACES****6+6**

Orthographic projections-principles-Principal planes-First angle projection-Projection of points- Projection of straight lines (only First angle projections) inclined to one of the principal planes - Determination of true lengths and true inclinations - Projection of planes (polygonal and circular surfaces) inclined to one of the principal planes - Demo using CAD software for above topics.

**UNIT III PROJECTION OF SOLIDS****6+6**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method-Demo using CAD software for above topics.

**UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES****6+6**

Sectioning of above solids in simple vertical position - the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones-Demo using CAD software for above topics.

**UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS****6+6**

Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions – Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method-Demo using CAD software for above topics.

**TOTAL: 61 PERIODS**

## **OUTCOMES:**

On successful completion of this course, the student will be able to

- familiarize with the fundamentals and standards of Engineering graphics
- perform freehand sketching of basic geometrical constructions and multiple views of objects.
- project orthographic projections of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- visualize and to project isometric and perspective sections of simple solids.

## **TEXT BOOK:**

1. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

## **REFERENCES:**

- Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50<sup>th</sup> Edition, 2010.
- Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
- Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
- Luzzader, Warren J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
- N S Parthasarathy and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
- Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2<sup>nd</sup> Edition, 2009.

## **Publication of Bureau of Indian Standards:**

- IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
- IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation–Lettering.
- IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
- IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
- 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.
4. The examination will be conducted in appropriate sessions on the same day

**PHYSICS LABORATORY****OBJECTIVES:**

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

**LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)**

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser  
(b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

**TOTAL: 30 PERIODS****OUTCOMES:**

- Upon completion of the course, the students will be able to apply principles of elasticity, optics and thermal properties for engineering applications.

## **CHEMISTRY LABORATORY**

### **OBJECTIVES:**

To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.

### **LIST OF EXPERIMENTS (Any seven experiments to be conducted)**

1. Estimation of HCl using  $\text{Na}_2\text{CO}_3$  as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of TDS of water sample.
5. Determination of strength of acids in a mixture of acids using conductivity meter.
6. Estimation of iron content of the given solution using potentiometer.
7. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
8. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Conductometric titration of strong acid vs strong base.

### **OUTCOMES:**

The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

**TOTAL PERIODS:30**

## **CS1102A PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY**

**L T P C**

**0 0 4 2**

### **Objectives:**

- To study python programs with conditionals and loops
- To use functions for python structured programs.
- Use strings for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- To read and write data from and to files in python.

### **LIST OF EXPERIMENTS:**

1. Write a program to display the largest number among three numbers.
2. Write a program to display the Fibonacci series by using looping constructs.
3. Write a function to compute the GCD of two numbers.
4. Explore String Functions
5. With the help of strings, array or list, display a simple calendar in python program without using the calendar module.
6. With the help of list perform Linear search and Binary search.
7. Write a program to perform Selection sort, Insertion sort, Merge sort
8. Create a text file using python file I/O. Read the content of the file and change them from lower to upper case characters.
9. Programs that take command line arguments (wordcount)
10. Find the most frequent words in a text read from a file
11. Simulate bouncing ball using Pygame

**TOTAL PERIODS: 60**

### **Course Outcomes:**

- Design simple programs using conditionals and loops.
- Write functions to solve mathematical problems
- Use strings for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Identify to read and write data from and to files in python.



**Prerequisites:** Basic law.

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

### **Course content**

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

**S.A. ENGINEERING COLLEGE, CHENNAI -77.**  
**(An Autonomous Institution-Affiliated to Anna University)**  
**B.Tech. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE**  
**REGULATION 2020**  
**CHOICE BASED CREDIT SYSTEM**  
**II SEMESTER CURRICULUM**

| S.NO                    | SUBJECT CODE | COURSE TITLE  | CATEGORY | CONTACT PERIODS | L         | T        | P         | C         |
|-------------------------|--------------|---|----------|-----------------|-----------|----------|-----------|-----------|
| <b>THEORY</b>           |              |   |          |                 |           |          |           |           |
| 1                       | HS1201A      | English for Communication                                 | HS       | 3               | 3         | 0        | 0         | 3         |
| 2                       | MA1303A      | Discrete Mathematics                                      | BS       | 4               | 3         | 1        | 0         | 4         |
| 3                       | PH1201A      | Material Science  | BS       | 3               | 3         | 0        | 0         | 3         |
| 4                       | EE1202A      | Basic Electrical, Electronics and Measurement Engineering | ES       | 3               | 3         | 0        | 0         | 3         |
| 5                       | CS1201A      | Programming in C  | PC       | 3               | 3         | 0        | 0         | 3         |
| 6                       | EC1306A      | Digital Principles and System Design                      | PC       | 3               | 3         | 0        | 0         | 3         |
| <b>PRACTICALS</b>       |              |   |          |                 |           |          |           |           |
| 7                       | GE1201A      | Engineering Practice Laboratory                           | ES       | 4               | 0         | 0        | 4         | 2         |
| 8                       | CS1203A      | Programming in C Laboratory                               | PC       | 4               | 0         | 0        | 4         | 2         |
| <b>MANDATORY COURSE</b> |              |   |          |                 |           |          |           |           |
| 9                       | CY1201A      | Environmental Science and Engineering                     | MC       | 2               | 2         | 0        | 0         | 0         |
|                         | <b>TOTAL</b> |   |          | <b>29</b>       | <b>20</b> | <b>1</b> | <b>08</b> | <b>23</b> |

**OBJECTIVES:**

The Course enables the second semester Engineering and Technology students to:

- Improve their language ability to improve the four basic skills of communication ( LSRW).
- Enhance the skills and methods to enrich their reading and comprehending ability.
- Strengthen their skills to listen to the lectures and talks related to their fields of studies.
- Foster their ability to write effectively in all contexts.
- Cultivate their oral presentation skills through technical presentations and contribution in group discussions.

**Course Outcomes:**

**At the end of the course the students will be able to:**

**CO1:**Read for comprehending and responding in general and professional settings.

**CO2:** Demonstrate the communication skills (LSRW) in academic, professional and social Environment.

**CO3:**Participate effectively in formal and informal conversations and express findings and opinions with proper language ability.

**CO4:**Comprehend conversations and short talks delivered in English.

**CO5:**Use the language effectively to write with clarity and accuracy in general and technical contexts.

**UNIT – 1****9 Periods**

**Reading-** Reading for detailed comparison**Listening-** Listening to interviews**Writing-** Developing hints, summarizing **Speaking-** Talk about future plans, arrangements intentions**Language development-** Sentence structures **Vocabulary development-** Synonyms, Antonyms, Adverbs

**UNIT – 2****9 Periods**

**Reading-**Extended reading **Listening-** Listening to telephonic conversations **Writing-** Formal Letter Writing - Letters for bona fide certificate - to the principal for permission for in plant training, industrial visit, paper presentations, inter college events, Letter to the Editor, Recommendations **Speaking-** Formal conversation **Language development-**Use of Punctuation, Modal verbs **Vocabulary development-** One word substitutes, Common Phrasal verbs

**UNIT – 3****9 Periods**

**Reading-** Identify topic sentences by reading a short story **Listening-** Listening to TED talks **Writing-** Process/product description **Speaking-** Formal Conversations **Language development-**Relative Clauses, Concord, Error correction **Vocabulary development-** Idioms & Phrases, Minimal pairs

**UNIT – 4****9 Periods**

**Reading-** Reading newspaper articles **Listening-** Listening to inspirational speeches **Writing-** Essays, Checklist **Speaking-** Technical Presentations **Language development-** Degrees of Comparison **Vocabulary development-** Articles, Cause and Effect Expressions

**UNIT – 5****9 Periods**

**Reading-** Close reading **Listening-** Listening for summarizing **Writing-** Dialogue conversations **Speaking-** Movie/ Book Review **Language development-** Wh Questions, Yes/ no Questions **Vocabulary development-** Foreign Expressions and its applications, Reference words

**TOTAL PERIODS: 45****Extensive Reading:**

- Kalam, Abdul Dr.A.P.J. - The Wings of Fire, Universities press: 1999

**Reference:**

- Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014
- Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
- Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
- Dutt P. Kiranmai and RajeevanGeeta. Basic Communication Skills, Foundation Books: 2013
- Means,L. Thomas and Elaine Langlois. English & Communication For Colleges.CengageLearning ,USA: 2007.

**Recommended websites:**

- TED.com
- learningenglish.voanews.com
- islcollective.com
- examenglish.com
- englishclass101.com

(Common to second semester AIDS and third semester CSE/IT)

**COURSE OBJECTIVES:**

- To extend student's logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.

**UNIT I LOGIC AND PROOFS 12**

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.

**UNIT II SET THEORY 12**

Basic concepts – Notations – Subset – Algebra of sets – The power set – Ordered pairs and Cartesian product – Relations on sets – Types of relations and their properties – Relational matrix and the graph of a relation – Partitions – Equivalence relations – Partial ordering – Poset – Hasse diagram – Lattices and their properties – Sub lattices – Boolean algebra – Homomorphism.

**UNIT III COMBINATORICS 12**

Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications

**UNIT IV GRAPHS 12**

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

**UNIT V ALGEBRAIC STRUCTURES 12**

Algebraic systems – Definitions-Examples-Properties-Semi groups and monoids– Homomorphism's- Groups – Subgroups – Normal subgroup and cosets – Lagrange's theorem – Codes and group codes – Basic notions of error correction-Error recovery in group codes.

**TOTAL: 60 PERIODS**

## **COURSE OUTCOMES:**

### **At the end of the course, students would:**

- Have knowledge of the concepts needed to test the logic of a program.
- Have an understanding in identifying structures on many levels.
- Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
- Be aware of the counting principles.
- Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

## **TEXTBOOKS:**

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7<sup>th</sup> Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar, R., "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30<sup>th</sup> Reprint, 2011.

## **REFERENCES:**

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4<sup>th</sup> Edition, Pearson Education Asia, Delhi, 2007.
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3<sup>rd</sup> Edition, 2010.
3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.

**OBJECTIVES:**

To enrich the understanding of various types of materials and their applications in engineering and technology.

**UNIT I CONDUCTING MATERIALS 9**

Conductors – classical free electron theory of metals – Electrical and thermal conductivity –Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory –Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states –carrier concentration in metals.

**UNIT II SEMICONDUCTING MATERIALS 9**

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination –Elemental and Compound Semiconductors – **N-type and P-type semiconductor (Qualitative)** – Hall effect –Determination of Hall coefficient – Applications.

**UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9**

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism –Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials –Ferrites and its applications. **Electro static Discharge (ESD)**-Superconductivity: properties – Type I and Type II superconductors–BCS theory of superconductivity (Qualitative) - High Tc superconductors – Electrical, medical, magnetic and computer application of superconductors.

**UNIT IV DIELECTRIC MATERIALS 9**

Electrical susceptibility – dielectric constant – electronic, ionic, orientation and space charge polarization – frequency and temperature dependence of polarisation – **Clausius mosotti relation** - dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer).

**UNIT V ADVANCED ENGINEERING MATERIALS 9**

Metallic glasses - melt spinning process, applications - shape memory alloys: Ni-Ti alloy, applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications- Bio materials – introduction- properties of bio materials-examples- medical applications- Ophthalmology- bio sensors- characteristics.

**Total Periods: 45**

## **OUTCOMES:**

At the end of this course,

- ❖ The students will gain knowledge of conducting materials and variation of its properties with temperature.
- ❖ Acquire knowledge on basics of semiconductor physics and its applications in various devices.
- ❖ Get knowledge on magnetic and superconducting materials properties and their various applications.
- ❖ The students will understand the basics of dielectric materials, properties and applications of dielectric materials.
- ❖ The students will get knowledge about new engineering materials and its applications in social applications.

## **TEXT BOOKS:**

1. S.Mohan, Principles of Materials Science, MJP Publishers, 2018.
2. Jasprit Singh, Semiconductor Devices, Basic Principles, Wiley 2012.
3. Umesh K Mishra and Jasprit Singh, Semiconductor Device Physics and Design, Springer, 2008.

## **REFERENCES:**

1. Wahab, M.A. Solid State Physics: Structure and Properties of Materials, Narosa Publishing House, 2009.
2. William D.Callister Jr, David G. Rethwisch, Materials Science and Engineering, An Introduction, Wiley India (P) Ltd., 8th Edition, 2009.
3. Pillai S.O., Solid State Physics, New Age International (P) Ltd., Publishers, 2009.
4. Semiconductor Introduction, <https://youtu.be/k6ZxP9Yr02E> (Video lecture)
5. Superconductivity, <https://youtu.be/D-9M3GWOBw> (Video lecture)



# **EE1202A BASIC ELECTRICAL, ELECTRONICS & MEASUREMENT ENGINEERING**

**L T P C**

**3 0 0 3**

## **OBJECTIVES:**

- To learn the fundamental laws, theorems of electrical circuits and also to analyze them
- To study the basic principles of electrical machines and their performance
- To study the different energy sources, protective devices and their field applications
- To understand the fundamentals of electronic circuit constructions
- To understand the principles and operation of measuring instruments and transducers

## **UNIT I ELECTRICAL CIRCUITS ANALYSIS**

**9**

Ohms Law, Kirchhoff's Law-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- network theorems –Thevenin's theorem, Norton theorem and superposition theorem, three phase supply-Instantaneous, Reactive and apparent power-star delta conversion.

## **UNIT II ELECTRICAL MACHINES**

**9**

DC and AC rotating machines: Types, Construction, principle, Emf and torque equation, application - Speed Control- Basics of Stepper Motor – Brushless DC motors- Transformers-Introduction- types and construction, working principle of Ideal transformer-Emf equation

## **UNIT III UTILIZATION OF ELECTRICAL POWER**

**9**

Overview of Renewable Energy Sources". ( Wind and Solar ), . Illumination by lamps- Energy Saving lamps(Compact Fluorescent Lamp, Cold Cathode Tube, LED bulbs). Domestic refrigerator and air conditioner-Electric circuit, construction and working principle. Li-Ion Battery's Operation & Maintenance. Protection-need for earthing, fuses and circuit breakers – MCB, RCB and ELCB. Energy Tariff calculation for domestic loads.

## **UNIT IV ELECTRONIC CIRCUITS**

**9**

Introduction to Electron Devices – PN Junction diode, Zener Diode, Transistor)-. Op-amps- Amplifiers, differentiator, integrator, ADC, DAC. Multi vibrator using 555 Timer IC . Voltage regulator IC using LM 723,LM 317.

## **UNIT V ELECTRICAL MEASUREMENT**

**9**

Characteristics of measurement-errors in measurement, torque in indicating instruments- moving coil and moving iron meters, Energy meter and watt meter. Transducers- classification-RTD, Strain gauge, LVDT, LDR and piezoelectric. functional Block diagram of DSO

**TOTAL PERIODS: 45**

## **OUTCOMES:**

**Upon completion of the course, the students will be able to:**

- Discuss the essentials of electric circuits and analysis
- Discuss the basic operation of electric machines and transformers
- Introduction of renewable sources and recent trends in illumination
- Discuss the basics of electronics components
- Introduction to measurement and metering for electric circuits

## **TEXT BOOKS:**

1. D.P. Kothari and I.J Nagrath, Basic Electrical and Electronics Engineering, McGraw Hill, 2016,Third Edition.
2. M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronic Engineering, Oxford, 2016.

## **REFERENCES:**

1. S.B. LalSeksena and KaustuvDasgupta, fundamentals of Electrical Engineering, Cambridge,2016.
2. B.L. Theraja, Fundamentals of Electrical Engineering and Electronics, Chand & Co, 2008.
3. S.K.Sahdev, Basic of Electrical Engineering, Pearson 2015.
4. John Bird,-Electrical and electronic principles and Technology, Fourth Edition, Elsevier, 2010.
5. Mittle, Mittal, Basic Electrical Engineering, 2<sup>nd</sup> edition, Tata McGraw-Hill Edition, 2016.
6. C.L.Wadhwa, “Generation, Distribution and utilization of Electrical Energy”, New Age international pvt ltd .2003.

**OBJECTIVE:**

- To develop C Programs using basic programming constructs.
- To develop C programs using arrays and strings.
- To develop applications in C using functions and pointers.
- To develop applications in C using structures.
- To do input/output and file handling in C.

**UNIT I BASICS OF C PROGRAMMING 9**

Introduction to programming paradigms - Structure of C program - C programming: Identifiers- Keywords-Data Types - Variables - Constants. Operators: Precedence and Associativity - Expressions- Input/ Output statements - Decision making statements - Switch statement - Looping statements - Pre-processor directives - Compilation process

**UNIT II ARRAYS AND STRINGS 8**

Introduction to Arrays: Declaration, Initialization - One dimensional array - Example Program: Computing Mean, Median and Mode - Two dimensional arrays - Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String- String operations – String Arrays.

**UNIT III FUNCTIONS AND POINTERS 10**

Introduction to functions: Function prototype,-function definition,- function call- Built-in functions (string functions, math functions) - Recursion-Types of Recursion - Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions-Storage Classes - Pointers - Pointer operators - Null Pointers- Pointer arithmetic - Arrays and pointers - Array of pointers - Example Program: Sorting of names - Parameter passing: Pass by value, Pass by reference- Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.

**UNIT IV STRUCTURES 9**

Structures-Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure – Passing structures to functions – Array of structures – Pointers to structures – Union - Programs using structures and Unions, Enumerated data type- Dynamic Memory Allocation.

**UNIT V FILE PROCESSING 9**

Files-Types of file processing: Sequential access, Random access- Sequential access file - Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Payroll System and Transaction processing using random access files - Command line arguments

## **OUTCOMES:**

**Upon completion of the course, the students will be able to**

- Develop simple applications in C using basic constructs
- Design and implement applications using arrays and strings
- Develop and implement applications in C using functions and pointers.
- Develop applications in C using structures.
- Design applications using sequential and random access file processing.

## **TEXTBOOKS:**

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education, 2006

## **REFERENCES:**

1. Paul Deitel and Harvey Deitel, "C How to Program", Seventh edition, Pearson Publication
2. Juneja, B.L and Anita Seth, "Programming in C", CENGAGE Learning India Pvt.Ltd., 2011
3. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt.Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.

**(Common to second semester AIDS and third semester CSE/IT)**

**COURSE OBJECTIVES:**

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

**UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 12**

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Arithmetic Operations – Binary Codes- Boolean Algebra and Logic Gates – Theorems and Properties of Boolean Algebra – Boolean Functions – Canonical and Standard Forms – Simplification of Boolean Functions using Karnaugh Map – Logic Gates – NAND and NOR Implementations.

**UNIT II COMBINATIONAL LOGIC 12**

Combinational Circuits – Analysis and Design Procedures, Design of Half and Full Adders, Half and Full Subtractors – Binary Adder-Subtractor – Decimal Adder – Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers – Introduction to HDL – HDL Models of Combinational circuits.

**UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 12**

Sequential Circuits – Storage Elements: Latches, Flip-Flops -SR, JK, T, D, – operation and excitation tables – Analysis of Clocked Sequential Circuits – Moore/Mealy models, State Reduction and Assignment – Design Procedure – Registers and Counters – HDL Models of Sequential Circuits.

**UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 12**

Analysis and Design of Asynchronous Sequential Circuits – cycles and races, Reduction of State and Flow Tables – Race-free State Assignment – Hazards, Essential Hazards, Design of Hazard free circuits

**UNIT V MEMORY AND PROGRAMMABLE LOGIC 12**

RAM – Memory Decoding – Error Detection and Correction – ROM – Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices. Field Programmable Gate Arrays (FPGA) – Implementation of combinational logic circuits using PLA, PAL

**TOTAL: 60 PERIODS**

**COURSE OUTCOMES:**

**At the end of the course, students would:**

- Simplify Boolean functions using KMap
- Design and Analyze Combinational and Sequential Circuits
- Implement designs using Programmable Logic Devices
- Write HDL code for combinational and Sequential Circuits

**TEXT BOOK:**

1. M. Morris R. Mano, Michael D. Ciletti, —Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, 6th Edition, Pearson Education, 2017.

**REFERENCES**

1. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
2. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013
4. Donald D. Givone, Digital Principles and Design, Tata Mc Graw Hill, 2003.

**Course Objectives:-**

- To develop programs in C using basic constructs.
- To develop programs in C using control statements.
- To develop applications in C using arrays, strings, pointers.
- To develop applications in C using functions, structures.
- To develop applications in C using file processing

**List of Experiments**

1. Input and Output statements
2. Control statements – Branching & Looping
  - a) Write a C program to generate Pascal's triangle.
  - b) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)
  - c) Write a C program to find the sum of individual digits of a positive integer.
  - d) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
  - e) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
  - f) Write a C program to swap Numbers Using Temporary Variables.
3. Arrays
  - a) Write a C program to search an array element using linear search.
  - b) Write a C program to find both the largest and smallest number in a list of integers.
  - c) Write a C program that uses functions to perform the following:
    - i) Addition of Two Matrices
    - ii) Multiplication of Two Matrices
  - d) Write a C program to implement Bubble sort.

4. Strings
  - a) Write a C program that uses functions to perform the following operations:
    - i) To insert a sub-string in to given main string from a given position.
    - ii) To delete n Characters from a given position in a given string.
  - b) Write a C program to determine if the given string is a palindrome or not
5. Functions & Pointers:

Write C programs that use recursive functions

  - i) To find factorial of given number
  - ii) To solve Towers of Hanoi Problem.
  - iii) To swap the variables using call by value and call by reference.
6. a. Generate mark sheet of students using structures.  
b. Compute salary slip for five employees using structures and functions.
7. Insert, Update, delete and append telephone details of an individual or a company into a telephone directory using random access file

**TOTAL PERIODS:- 60**

**Upon completion of the course, the students will be able to**

- Develop C programs for simple applications making use of basic constructs
- Develop C programs for control statements.
- Develop C programs involving arrays, strings and pointers.
- Develop C programs involving functions, and structures.
- Design applications using sequential and random access file processing.



**OBJECTIVES:**

To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

**GROUP A (CIVIL & MECHANICAL)****I CIVIL ENGINEERING PRACTICE****13****Buildings:**

- (a) Study of plumbing and carpentry components of residential and industrial buildings.

Safety aspects.

**Plumbing Works:**

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, Unions, reducers, elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works.
- (d) Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – pipe connections with different joining components.
- (e) Demonstration of plumbing requirements of high-rise buildings.

**Carpentry using Power Tools only:**

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

**II MECHANICAL ENGINEERING PRACTICE****18****Welding:**

- (a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
- (b) Gas welding practice

**Basic Machining:**

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

**Sheet Metal Work:**

- (a) Forming & Bending:

(b) Model making – Trays and funnels.

(c) Different type of joints.

Machine assembly practice:

(a) Study of centrifugal pump

(b) Study of air conditioner

Demonstration on:

(a) Smithy operations, upsetting, swaging, setting down and bending. Example –

Exercise – Production of hexagonal headed bolt.

(b) Foundry operations like mould preparation for gear and step cone pulley.

(c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

### **GROUP -B (ELECTRICAL & ELECTRONICS)**

#### **III ELECTRICAL ENGINEERING PRACTICE**

**13**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.

2. Fluorescent lamp wiring.

3. Stair case wiring

4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.

5. Measurement of energy using single phase energy meter.

6. Measurement of resistance to earth of electrical equipment.

#### **IV ELECTRONICS ENGINEERING PRACTICE**

**16**

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC Signal parameter (peak-peak, rms period, frequency) using CR.

2. Study of logic gates AND, OR, EX-OR and NOT.

3. Generation of Clock Signal.

4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.

5. Measurement of ripple factor of HWR and FWR.

**TOTAL PERIODS :60**

## **OUTCOMES:**

On successful completion of this course, the student will be able to

1. Fabricate carpentry components and pipe connections including plumbing works.
2. Use welding equipments to join the structures.
3. Carry out the basic machining operations
4. Make the models using sheet metal works
5. Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings
6. Carry out basic home electrical works and appliances
7. Measure the electrical quantities
8. Elaborate on the components, gates, soldering practices.

**COURSE OBJECTIVES**

- To understand nature and the facts about the environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management

**UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY****14**

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of major ecosystem – Introduction to biodiversity definition: genetic, species and ecosystem diversity – value of biodiversity – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

**UNIT II ENVIRONMENTAL POLLUTION****8**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

**UNIT III NATURAL RESOURCES****10**

Forest resources: Use and over-exploitation, deforestation, case studies- dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water – Mineral resources: environmental effects of extracting and using mineral resources, case studies – Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – 12 Principles of Green chemistry, role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

## **UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT**

**7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – central and state pollution control boards.

## **UNIT V HUMAN POPULATION AND THE ENVIRONMENT**

**6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health.

**TOTAL PERIODS:45**

### **OUTCOMES**

- Students will be able to understand the functions of ecosystems and appreciate the bio diversity.
- Students will be able to know the measures to control environmental pollution.
- Students will be able to understand the usage as well as the effects of over exploitation of natural resources.
- Students will have knowledge about finding technological, economic and political solutions to environmental problems with various Environmental Protection Act in mind.
- Students will be able to understand the interrelationship between population explosion and the environment and also role of IT in environment and human health.
- Students will be able to understand that Environmental problems can only be solved by Public participation in all aspects and cannot be solved by mere laws.

### **TEXT BOOKS**

Environmental Science and Engineering by AnubhaKaushik and C.P.Kaushik-New Age International Publishers. New Delhi, 2017.

### **REFERENCES**

1.Benny Joseph , Environmental Studies, Tata mcgraw-Hill Publishing Company, Ltd., New Delhi, 2006.

2. Dr.B.S.Chauhan,. Environmental Studies , University Science Press, New Delhi, 2011.