B.E. / B.TECH. DEGREE PROGRAMMES

FIRST YEAR COURSES

(Regulations 2021)

SEMESTER II

Sl.No	Course Code	Course Name	Credits			
			L	T	P	C
Theory						
1	SH2151	Professional English	3	0	0	3
2	MA2151	Vector Calculus, Complex Integration and Laplace Transforms	3	1	0	4
3	PH2151	Physics of Non-Conventional Energy Sources	3	0	0	3
4	GE2151	Engineering Graphics	2	0	3	3
5	GE2152	Environmental Science and Engineering	3	0	0	3
6	EM2151	Coding Techniques - II	3	0	0	3
Practical						
7	CY2151	Chemistry Laboratory	0	0	3	1
8	EM2152	Coding Techniques – II Laboratory	0	0	3	1
9	GE2153	Engineering Practices Laboratory	0	0	4	2
Total Credits			**17**	**1**	**13**	**23**

Course Code	Course Name	L	T	P	C
SH2151	Professional English	3	0	0	3

Category: Foundation Courses (Basic Science Courses)

a. Preamble

This course engage learners in meaningful language activities to improve their LSRW skills by

- To enhance learners' awareness of general rules of writing for specific audiences
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

b. Course Outcomes

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

CO. No.	Course Outcome	Knowledge Level
CO1	Compare and contrast products and ideas in technical texts.	K3
CO2	Identify cause and effects in events, industrial processes through technical texts	K3
CO3	Analyze problems in order to arrive at feasible solutions and communicate them orally and in the written format.	K3
CO4	Report events and the processes of technical and industrial nature.	K3
CO5	Present their opinions in a planned and logical manner, and draft effective resumes in context of job search.	K3

c. Course Syllabus   **Total: 45 Periods**

MAKING COMPARISONS   9

Listening: Evaluative Listening: Advertisements, Product Descriptions, Audio / video; Listening and filling a Graphic Organiser (Choosing a product or service by comparison). Speaking: Marketing a product, Persuasive Speech Techniques. Reading: Reading advertisements, user manuals, brochures; Writing: Definitions, Extended Definitions, Recommendations, Checklists,
Grammar: Prepositional phrases. Vocabulary: Contextual meaning of words, Homonyms and Homophones

EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING   9

Listening: Listening to longer technical talks and completing – gap filling exercises. Listening technical information from podcasts – Listening to process/event descriptions to identify cause & effects. Speaking: Describing and discussing the reasons of accidents or disasters based on news reports. Reading: Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint. Writing: Writing responses to complaints. Grammar: Modals
Vocabulary: Collocations, fixed and semi fixed expressions

PROBLEM SOLVING   9

Listening: Listening to / Watching movie scenes/ documentaries depicting a technical problem and suggesting solutions. Speaking: Group Discussion (based on case studies) - techniques and Strategies. Reading: Case Studies, excerpts from literary texts, news reports etc., writing: Professional emails, Problem solution essay / Argumentative Essay Compare and Contrast Essay
Grammar: Error correction. Vocabulary: One word substitutes, Sentence Completion and phrasal verbs.

REPORTING OF EVENTS AND RESEARCH 9

Listening: Listening Comprehension based on news reports – and documentaries – Precis writing, Summarising. Speaking: Interviewing, Presenting an oral report, Mini presentations on select topics. Reading: Newspaper articles; editorials & opinion blogs. Writing: Recommendations, Transcoding, Accident Report, Survey Report. Grammar: Reported Speech
Vocabulary: Conjunctions- use of prepositions.

THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY 9

Listening: Listening to TED Talks, Presentations, Formal job interviews, (analysis of the interview performance). Speaking: Participating in a Role play, (interview/telephone interview), virtual interviews, Making presentations with visual aids. Reading: Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals. Writing: Job / Internship application – Cover letter & Resume. Grammar: Numerical adjectives, Relative Clauses
Vocabulary: Idioms.

d. Learning Resources
i. Text Books:
1. Department of English, Anna University (2020). *English for Engineers &Technologists* Orient Blackswan Private Ltd..
2. Selvam. Veena, Priyadarshini. Sujatha, Mary. Francis Deepa, Shoba.K N & Joevani. Lourdes (2021). *English for Science & Technology*. Cambridge University Press.
ii. References:
1. Raman. Meenakshi, Sharma. Sangeeta (2019). *Professional English*. Oxford University press. New Delhi.
2. Ed. Arora. V.N. & Chandra. Laxmi (2001) *Improve Your Writing* Oxford Univ. Press, NewDelhi.

3. Chellammal. V (2003) *Learning to Communicate* Allied Publishers, New Delhi.

4. SharmaR.C. & MohanKrishna.*Business Correspondence and Report Writing* Tata McGraw Hill & Co. Ltd., 2001, New Delhi.

5. Mohan. Krishna & Bannerji Meera (1990) *Developing Communication Skills* Macmillan India Ltd., Delhi.

Course Code	Course Name	L	T	P	C
MA2151	**Vector Calculus, Complex Integration and Laplace Transform**	3	1	0	4

Category: Foundation Courses (Basic Science Courses)

a. Preamble

An Engineer should know the transformations of the integrals, as transformation of line integral to surface and then to volume integrals. Vector calculus is a form of mathematics that is focused on the integration of vector fields. Complex Integration approach is very useful to evaluate many improper integrals of a real variable. The Laplace transform method is a powerful method for solving linear ordinary differential equations and corresponding initial value problems as well as systems of ordinary differential equations arising in Engineering.

b.Course Outcomes
After successful completion of the course, the students will be able to

CO.No.	Course Outcome	Knowledge Level
CO1	Apply multiple integral techniques to calculate area and volume.	K3
CO2	Solve engineering problems using the concepts of vector calculus.	K3
CO3	Construct an analytic function, when its real or imaginary part is known.	K3
CO4	Evaluate integrals using Cauchy's integral formula and residue theorem.	K3
CO5	Apply Laplace transform techniques in solving ordinary differential equations.	K3

MULTIPLE INTEGRALS AND ITS APPLICATIONS   12

Double integrals - Change of order of integration - Double integrals in polar coordinates - Area enclosed by plane curves - Triple integrals - Volume of solids in Cartesian coordinates.

VECTOR CALCULUS   12

Gradient and directional derivative - Divergence and curl - Irrotational and solenoidal vector fields - Vector integration - Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem - Applications.

ANALYTIC FUNCTIONS   12

Analytic functions - Necessary and sufficient conditions for analyticity in cartesian and polar coordinates - Properties - Harmonic conjugate - Construction of analytic functions - Conformal mapping: w = z+c, cz and 1/z - Bilinear transformation.

COMPLEX INTEGRATION   12

Complex integration - Cauchy's integral theorem - Cauchy's integral formula - Taylor's and Laurent's series expansion - Singularities - Residues - Cauchy's residue theorem - Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (poles on the real axis excluded).

LAPLACE TRANSFORMS   12

Sufficient condition for existence of Laplace transform - Transforms of elementary functions - Transform of unit step function and unit impulse function - Basic properties - Shifting theorems - Transforms of derivatives and integrals - Transform of periodic functions - Initial and final value theorems - Inverse transforms - Convolution theorem - Solution of linear second order ordinary differential equations with constant coefficients.

d. Activities: Students shall be exposed to MATLAB programming to solve simple problems in integration, vector calculus and Laplace transform.

e. Learning Resources

i. TEXT BOOKS

1. Grewal, B.S, "*Higher Engineering Mathematics*", Forty Fourth Edition, Khanna Publishers, New Delhi, 2020.
2. Kreyszig Erwin, "*Advanced Engineering Mathematics*", Tenth Edition, John Wiley and Sons, New Delhi, 2016.

ii. REFERENCE BOOKS

1. Bali, N, Goyal, M, & Watkins, C, "*Advanced Engineering Mathematics*", Seventh Edition, Firewall Media, New Delhi, 2009.
2. Jain, R.K, & Iyengar, S.R.K, "*Advanced Engineering Mathematics*", Third Edition, Narosa Publications, New Delhi, 2007.
3. Wylie, R.C, & Barrett, L.C, "*Advanced Engineering Mathematics*", Sixth Edition, Tata McGraw Hill Education Pvt. Ltd, New Delhi, 2012.
4. Peter V. O'Neil, "*Advanced Engineering Mathematics*", Cengage learning, Seventh Edition, 2007.
5. Weir, M.D, & Joel Hass, *Thomas Calculus*, Twelth Edition, Pearson Education, India, 2016.

Course Code	Course Name	L	T	P	C
PH2151	**Physics of Non-Conventional Energy Sources**	3	0	0	3

Category: Foundation Courses (Basic Science Courses)

a. Preamble

This course enables the students to familiarize and acquire knowledge of various forms of non-conventional energy sources and its utilization in different applications.

b. Course Outcomes

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

CO No.	Course Outcome	Knowledge level
CO1	Describe the energy sources and its applications	K3
CO2	Acquire knowledge about solar energy applications	K3
CO3	Understand the wind turbine system and environmental aspects	K3
CO4	Describe biomass conversion technologies	K3
CO5	Explain the different electro- chemical energy storage devices	K2

c. Course Syllabus   **Total: 45 Periods**

FUNDAMENTALS OF ENERGY SOURCES 9

Introduction – Conventional Energy Sources - Present Scenario - Energy Crisis – Classification of Energy Sources–Non-Conventional Energy Sources – Salient features – Types – Environmental effects of Energy

SOLAR ENERGY 9

Solar Energy Basics - Introduction – The Sun as a source of energy – The earth – Extraterrestrial and Terrestrial radiations – Spectral Distribution of Solar radiation – Depletion of Solar radiation – Measurements of Solar Radiation – Photoelectric Effect – Basics of Solar Cell – Semiconductor – PN Junction – Generation of electron hole pair – Photo Conduction – Solar Cell Construction – Solar furnace – Solar Green House – Thermoelectric Materials.

WIND ENERGY 9

Origin of Wind – Nature of winds – Wind Data–Variation of Wind Speed with Height – Estimation of Wind Energy at a Site – Wind Data Statistics – Capacity Factor – Horizontal axis Wind Turbine – Vertical axis Wind Turbine.

BIO MASS ENERGY 9

Biomass Energy and its useful forms – Composition and Fuel Properties – Biomass Conversion Technologies – Physical Method – Incineration – Thermo Chemical– Biochemical - Biomass Gasification – Biogas Production from Waste Biomass

EMERGING TECHNOLOGIES 9

Electrochemical Energy Storage: Secondary Battery Storage – Lead Acid Battery – Lithium Ion Battery – Sodium Sulphur Battery – Zebra Battery – Flow Batteries - **Fuel Cell**: Classification of fuel cells – Phosphoric Acid Fuel Cell (PAFC) – Alkaline Fuel Cell–Polymer Electrolyte Membrane Fuel cell – Solid Oxide Fuel Cell–Fuel Cell power plant

d. Activities: Following activities shall be implemented to enhance the knowledge of Non-Conventional Energy Sources in various streams of Engineering.

- Model making
- Concept mapping
- Presentation

e. Learning Resources

i. TEXT BOOKS

1. Khan.B.H, "*Non-Conventional Energy Resources*", McGraw Hill Education Pvt. Ltd., Third Edition, 2017.

ii. REFERENCEBOOKS

1. Rai.G.D, "*Non Conventional Energy Sources*", Khanna Publishers, First Edition, 2004.

2. Rai.G.D, "*Solar Energy Utilisation*", Khanna Publishers, First Edition, 1995.

3. Sukhatme.S.P, Nayak.J.K, "*Solar Energy-Principles of Thermal Collection and Storage*", McGraw-Hill Publishing company Ltd., Third Edition, 2008.

4. JulienChen.C, "*Physics of Solar Energy*", John Wiley & Sons, Inc., First Edition, 2011.

5. Arno Smets, Olindo Isabella, Rene van Swaaij, MiroZeman, Klaus Jager, "*Solar Energy: The Physics and Engineering of Photovoltaic Conversion, Technologies and Systems*", UIT Cambridge Ltd., First Edition, 2016.

6. Yogi Goswami.D, "*Principles of Solar Engineering*", CRC Press, Third Edition, 2015.

Course Code	Course Name	L	T	P	C
GE2151	**Engineering Graphics**	2	0	3	3

Category: Foundation Course (Engineering Science)

a. Preamble

This course develops the students graphical skills to present their design ideas related engineering products. It helps to read and understand the projection of objects, sectioning and development of different shape of products. It comprehensively expose them to existing national standards related to technical drawings.

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Draw orthographic projection of lines by rotating line method and plane surfaces using rotating object method	K2
CO2	Draw the projection of solids for simple object like	K2
CO3	Construct the section of solids when cutting plane inclined to one reference plane and development of lateral surfaces	K2
CO4	Draw isometric and perspective sections of simple solids	K2
CO5	Draw freehand sketching of basic geometrical constructions and multiple views of objects	K2

c. Course Syllabus   **Total: 75 Periods**

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

PROJECTION OF POINTS, LINES AND PLANE SURFACE [6 +9]

Orthographic projection - principles - Principal planes-First angle projection - projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object.

PROJECTIONS OF SOLIDS [6+9]

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes by rotating object method.

PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES [6+9]

Sectioning of above solids in simple vertical position when 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.

ISOMETRIC AND PERSPECTIVE PROJECTIONS [6+9]

Principles of isometric projection – isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones - Perspective projection of simple solids - Prisms, pyramids and cylinders by visual ray method.

ORTHOGRAPHIC PROJECTION [6+9]

Curves used in engineering practices: Conics - Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid - Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles - Representation of Three Dimensional objects - Layout of views- Freehand sketching of multiple views from pictorial views of objects simple objects. Curves used in engineering practices: Conics - Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid - Drawing of tangents and normal to the above curves.

d. Activities

Students shall be exposed to do the hands on practices on visualize the drafting skills.

e. Learning Resources

  i. **i. TEXT BOOKS**

1. Natarajan, K. V., *'A text book of Engineering Graphics'*, Dhanalakshmi Publishers, Chennai, 2006.
2. Venugopal K. and Prabhu Raja V., - *Engineering Graphics*, New Age International (P) Limited, 2008.

  ii. **ii. REFERENCE BOOK**

1. Bhatt N.D. and Panchal V.M., - *Engineering Drawing*, Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C.M., - *Engineering Drawing*, Tata McGraw Hill Publishing CompanyLimited, NewDelhi, 2008.
3. Gopalakrishna K.R., - *Engineering Drawing* (Vol. I & II combined), Subhas Stores, Bangalore, 2007.
4. 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.
5. N S Parthasarathy And Vela Murali, - *Engineering Graphics*, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., - *Engineering Drawing*, Pearson, 2nd Edition, 2009.

Course Code	Course Name	L	T	P	C
GE2152	**Environmental Science and Engineering**	**3**	**0**	**0**	**3**

Category: **Foundation Courses**

a. Preamble

This course will provide an introduction to current topics in environmental science and engineering by giving an overview of current environmental issues, their underlying science and knowledge limitations, and exploring the best-available engineering solutions to some of our most pressing environmental problems.

b. Course Outcomes

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

CO.No.	Course Outcome	Knowledge Level
CO1	Infer the benefits offered by the environment and ecosystem	K3
CO2	Recognize the reasons to minimize the exploitation of various natural resources	K3
CO3	Illustrate the importance of biotic resources and their conservation	K3
CO4	Identify the existing environmental challenges related to pollution and its management	K3
CO5	Acquire information about laws and mitigation measures taken to control various environmental problems	K3

c. Course Syllabus **Total: 45 periods**

ENVIRONMENT AND ECOLOGY 9

Mulidisciplinary nature of Environmental Studies - Environment - Definition, scope and importance, need for public awareness - Concept of ecosystem – structure and function of an ecosystem – producers, consumers and decomposers- Energy flow in the eco system – Nutrient flow in the Ecosystem- Biogeochemical cycles (Carbon, Nitrogen), Food chain, Food web, Ecological pyramid- Ecological Succession - Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) - Field Study of Simple Ecosystems.

BIODIVERSITY AND BIOTIC RESOURCES 9

Introduction to biodiversity - Definition: genetic, species and ecosystem diversity - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values - India as a mega diversity nation - Hotspots of Biodiversity - Endangered and endemic species of India - Threats to Biodiversity: habitat loss, poaching, man-wildlife conflicts - Conservation of biodiversity: In-situ and ex-situ conservation of Biodiversity - Field study of local area to document environmental assets – river / forest / grassland / hill.

NATURAL RESOURCES 9

Forest resources: Use and over-exploitation, deforestation, timber extraction, mining, dams and their effects on forests and tribal people. Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Rain water harvesting. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, use of alternate energy sources (Tidal energy, Geothermal Energy, Biofuels). Land resources: Land as a resource, land degradation, man induced landslides, soil erosion. Role of an individual in conservation of natural resources.

ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES   **9**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Noise pollution (d) Marine pollution (e) Nuclear Pollution and (f) Soil Pollution. Solid waste management: causes, effects and control - E- waste and biomedical waste: management and handling rules. Role of an individual in prevention of pollution - Pollution case studies

ENVIRONMENTAL PROBLEMS AND EFFORTS TOWARDS SUSTAINABLE FUTURE   **9**

Environmental Problems: Population and its explosion, Urban Sprawl, Climate change, Global warming, acid rain, Ozone layer depletion, Disasters (flood, cyclone, earthquake, tsunami, COVID19) - Impacts on human environment - Concept of Sustainable Development: International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol- Pollution Control Boards and Pollution control Acts in India: Environment Protection act, Air Act- 1981, Water Act 1974, Forest Act 1980, Wild life Act 1971. Environment Ethics - EIA: EIA process and Benefits. Role of Information Technology in monitoring Environment.

d. Activities

Activities to improve the conceptual learning:

- Minute paper tests
- Objective Quizzes
- Model/Chart work
- Group discussion / Seminars

e. Learning Resources

i) TEXT BOOKS:

1. Bharucha, E, "*Textbook for Environmental Studies*", Second Edition, Universities Press Pvt. Ltd.

2. Joseph, B., "*Environmental Studies*", Third Edition, McGraw Hill Education (India) Private Limited, Chennai, 2018.

ii) REFERENCE BOOKS:

1. Miller, T. G. Jr., Spoolman, S., "*New Environmental Science*", 14th Edition, Wadsworth Publishing Co, New Delhi, 2014.

2. De, A. K., "*Environmental Chemistry*", 7th Edition, New Age International Publishers, New Delhi, 2014.

3. Masters, G. M., "*Introduction to Environmental Engineering and Science*", Second edition, Pearson Education, 2004.

Course Code	Course Name	L	T	P	C
EM2151	**Coding Techniques – II**	3	0	0	3

Category: Employability Enhancement Courses (Programming Courses)

a. Preamble

This course enables the students to understand the importance of coding using python to solve the real-time challenges by computer. This course enriches the logical skills of the students to instruct the computer for solving the problems. This course focuses on problem solving using Python programming language.

b. Course Outcomes

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

CO.No.	Course Outcome	Knowledge Level
CO1	Develop simple computational problems	K3
CO2	Solve simple real world problems using looping statements and functions	K3
CO3	Make use of string, list and tuple to represent compound data	K3
CO4	Develop simple programs using built-in and user defined packages	K3
CO5	Illustrate the use of exception handling and file handling in Python Programming	K2

c. Course Syllabus **Total: 45 Periods**

INTRODUCTION TO PYTHON AND DECISION MAKING CONSTRUCTS 9

Introduction to Python Programming - Python Interpreter and Interactive Mode - Variables and Identifiers - Arithmetic Operators - Values and Types - Statements - Operators - Boolean Values - Operator Precedence - Expression - Conditionals: If - else Constructs.

LOOPING AND FUNCTIONS   9

Loop Structures/Iterative Statements – While Loop – For Loop – Break Statement – Continue Statement – Functions: Function Call and Returning Values – Parameter Passing - Local and Global Scope – Recursive Functions.

STRING, LIST AND TUPLE   9

Strings: Introduction, Indexing, Traversing, Concatenating, Appending, Multiplying, Formatting, Slicing, Comparing, Iterating - Basic Built-in String Functions - Introduction to Data Structures - List - Adding Items to a List - Finding and Updating an Item - Nested Lists - Cloning Lists - Looping Through a List – Sorting a List - List Concatenation - List Slices - List Methods - List Loop - Mutability - Aliasing - Tuples: Creation, Accessing, Updating, Deleting Elements in a Tuple, Tuple Assignment, Tuple as Return Value, Nested Tuples, Basic Tuple Operations – Sets.

DICTIONARIES MODULES AND PACKAGES   9

Dictionary: Creating, Accessing, Adding Items, Modifying, Deleting, Sorting, Looping, Nested Dictionaries Built-in Dictionary Function - Finding Key and Value in a Dictionary - Modules - Module Loading and Execution - Packages - Standard Libraries (Time, Math, Numpy, Pandas, PyGame) - User-defined Packages.

FILE HANDLING AND EXCEPTION HANDLING   9

Introduction to Files - File Path - Opening and Closing Files - Reading and Writing Files - File Position - Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

d. Activities: Students shall be exposed to basic Python programming concepts and to solve simple problems using python.

e. Learning Resources

i. TEXT BOOKS

1. Allen B. Downey, *"Think Python: How to Think Like a Computer Scientist"*, 2nd edition, Shroff/O'Reilly Publishers.

2. Guido van Rossum & Fred L. Drake Jr., 2011, *"An Introduction to Python – Revised and Updated for Python 3.2"*, Network Theory Ltd.

ii. REFERENCE BOOKS

1. John V Guttag 2013, *"Introduction to Computation and Programming Using Python"*, Revised and Expanded Edition, MIT Press.

2. Charles Dierbach 2016, *"Introduction to Computer Science using Python"*, Wiley India Edition.

3. Timothy A. Budd 2015, *"Exploring Python"*, Mc-Graw Hill Education (India) Private Ltd.

4. Kenneth A. Lambert 2012, *"Fundamentals of Python: First Programs"*, Cengage Learning.

5. Reema Thareja 2017, *"Python Programming: Using Problem Solving Approach"*, Oxford University Press.

Course Code	Course Name	L	T	P	C
CY2151	Chemistry Laboratory	0	0	3	1

Category: **Foundation Courses (Basic science courses)**

a. Preamble

This course enables the students to inculcate experimental skills to test water quality parameters, such as, acidity, alkalinity, hardness, DO etc. It also familiarize the students with electroanalytical techniques such as pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.

b. Course Outcomes

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

CO.No.	Course Outcome	Knowledge Level
CO1	Analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO	K3
CO2	Analyse the chloride content in a water sample	K3
CO3	Determine the amount of metal ions through volumetric techniques	K3
CO4	Analyse the impurities in solution by electro analytical techniques	K3
CO5	Determine the molecular weight of given polymeric material	K3

c. Course Syllabus **Total: 30 Periods**

CHEMISTRY LABORATORY

1. Determination of alkalinity in water sample.

2. Determination of hardness in water by complexometric method.

3. Estimation of metals like Cu, Ni by complexometric method.

4. Determination of chloride content of water sample.

5. Determination of DO content of water sample.

6. Determination of strength of given acid using conductivity meter.

7. Determination of strength of acids in a mixture of acids using conductivity meter.

8. Determination of strength of given acid using pH meter

9. Estimation of iron content of the given solution using potentiometer.

10. Determination of molecular weight of polymer using Ostwald Viscometer.

d. Activities

Activities to improve the experimental learning:

- To prepare standard solutions
- To use chemical balance

e. Learning Resources

i) TEXT BOOKS:

1. Mendham, J, Denney, R. C., Barnes, J. D., Thomas, M., and Sivasankar, B, *Vogel's Textbook of Quantitative Chemical Analysis*, 2009.

ii) REFERENCE BOOKS:

1. Gurdeep. R. Chatwal, Sham. K. Anand, "*Instrumental Methods of Analysis*", Himalaya Publishing House, 2014.

2. Gary D. Christian, "*Analytical Chemistry*", Sixth Edition, Wiley India Pvt Ltd, New Delhi, 2008.

3. Skoog, D. A, Holler, F. J, Crouch, S. R., "*Principles of Analytical Chemistry*, 7th Edition, Cengage Learning Inc., 2018.

Course Code	Course Name	L	T	P	C
EM2152	Coding Techniques - II Laboratory	0	0	3	1

Category: Employability Enhancement Courses (Programming Courses)

a. **Preamble**

This course enables the students to develop simple applications in Python using basic constructs, I/O statements and expressions, decision making and looping statements, functions, usage of packages, file and exception handling

b. **Course Outcomes**

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

CO.No.	Course Outcome	Knowledge Level
CO1	Implement Python codes to solve simple problems using Statements, Expressions and conditional statements	K3
CO2	Develop simple applications using functions for effective code reuse and debugging	K3
CO3	Build solutions for simple problems using Strings, lists, tuples and dictionaries in Python	K3
CO4	Use packages in Python for solving simple applications	K3
CO5	Develop simple real world applications involving file operations and Exception handling mechanisms using Python Programming	K3

c. **Course Syllabus**   **Total: 45 Periods**

1. **PYTHON PROGRAMS USING I/O STATEMENTS AND EXPRESSIONS TO**:

    a. Find simple interest and compound interest

    b. Find gross salary of a person, given basic pay, DA%, TA% and PF%

    c. Find the area of shapes (triangle, circle)

    d. Swap two numbers

    e. Display the student information (collect the information from the end user)

2. **PYTHON PROGRAMS USING DECISION-MAKING AND LOOPING CONSTRUCTS TO:**

   a. Find GCD of two given numbers

   b. Find LCM of two given numbers

   c. Generate 'n' prime numbers

   d. Exponentiation (power of two given numbers)

   e. Check if a given number is Happy number or not

   f. Solve quadratic equation

3. **PYTHON PROGRAMS USING FUNCTIONS TO:**

   a. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions

   b. To print all pronic numbers between a range

   c. Display Fibonacci series using recursion

   d. Find the sum of digits of a given number using recursion

4. **PYTHON PROGRAMS USING STRINGS TO:**

   a. Find the ASCII value of a character

   b. Check if a string contains any special character

   c. Sort strings in alphabetical order

   d. Find all close matches of input string from a list

5. **PYTHON PROGRAMS USING LIST AND TUPLE TO :**

   a. Display the duplicate elements

   b. Right rotate the elements

   c. Matrix Multiplication

   d. Create a list of tuples from given list having number and its cube in each tuple

6. **PYTHON PROGRAMS USING DICTIONARY TO:**

   a. Sort list of dictionaries by values in Python – Using lambda function

   b. Merging two Dictionaries

   c. Scraping And Finding Ordered Words In A Dictionary using Python

7. PYTHON PROGRAMS USING NUMPY, PANDAS AND PYGAME TO:

    a. Sort an array using Numpy

    b. Using Pandas,create a Student dataframe and display first and last 'n' rows

    c. Draw basic shapes (Circle, Rectangle)

8. PYTHON PROGRAMS USING FILES AND EXCEPTION HANDLING MECHANISMS TO:

    a. Take command line arguments and count number of words in it

    b. Find the most frequent words in a text read from a file

    c. Read the necessary information from text file to generate an electricity bill and catch the corresponding exceptions

d. Learning Resources

REFERENCE BOOKS

1. Allen B. Downey, *Think Python: How to Think Like a Computer Scientist*, 2nd edition, Shroff/O'Reilly Publishers.

2. Guido van Rossum & Fred L. Drake Jr., 2011, *An Introduction to Python – Revised and Updated for Python 3.2*", Network Theory Ltd.

Course Code	Course Name	L	T	P	C
GE2153	**Engineering Practices Laboratory**	0	0	4	2

Category: Foundation Course (Engineering Science)

a. Preamble

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

b. Course Outcome

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

CO. No.	Course Outcome	Knowledge Level
CO1	Fabricate carpentry components and pipe connections including plumbing works models using sheet metal works	K3
CO2	Use welding equipment for joining the structures and lathe for doing simple operations like facing and turning.	K3
CO3	Demonstrate various electrical switches and wiring	K3
CO4	Measure the various electrical quantities	K3
CO5	Elaborate on the components, gates, soldering practices	K3

c. Course Syllabus   **Total: 60 Periods**

CIVIL ENGINEERING PRACTICE 12

Buildings:

1. Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
2. Study of pipe connections requirements for pumps and turbines.
3. Preparation of plumbing line sketches for water supply and sewage works.
4. Hands-on-exercise:

   Basic pipe connections – Mixed pipe material connection – Pipe connections with differentjoining components.
5. Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

1. Study of the joints in roofs, doors, windows and furniture.
2. Hands-on-exercise:
   i. Wood work, joints by sawing, planning and cutting

MECHANICAL ENGINEERING PRACTICE   **18**

Welding:
   1.   Preparation of butt joints, lap joints and T- joints by

       Shielded metal arc welding.

Basic Machining:
   1.   Simple Turning and Taper turning

   2.   Drilling Practice

Sheet Metal Work:
   1.   Forming & Bending:

   2.   Model making – Trays and funnels.

Machine assembly practice:
   1.   Study of centrifugal pump

   2.   Study of air conditioner

   3.   Study of 3D Printing

GROUP –B (ELECTRICAL & ELECTRONICS)

ELECTRICAL ENGINEERING PRACTICE   **14**
   1.   Residential wiring using switches, fuse, indicator,

       lamp and energy meter.

   2.   Fluorescent lamp wiring.

   3.   Stair case wiring

   4.   Measurement of energy using single phase energy

       meter.

   5.   Measurement of electrical quantities – voltage,

       current, impedance, power & power factor in RLC

       circuit.

   6.   Measurement of resistance to earth of electrical

       equipment.

   7.   Study of UPS

   8.   Study of Protective Devices- Fuses, Circuit

       Breakers & Relays

1. Study of Electronic components and equipments, Resistor color coding, measurement of AC signal parameters (peak-peak, rms period, frequency) using CRO.

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.

6. Study of Mixed Storage Oscilloscope

d. Activities

Students shall be exposed to the hands on experience in basic mechanical operations like carpentry, welding, lathe, electrical wiring and basic electronics

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	Name of the Equipment	Nos.
I	**CIVIL**	
1	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets.
2	Carpentry vice (fitted to work bench)	15 Nos.
3	Standard woodworking tools	15 Sets.
4	Models of industrial trusses, door joints, furniture joints	5 each
5	Power Tools:	
	(a) Rotary Hammer	2 Nos.
	(b) Demolition Hammer	2 Nos.
	(c) Circular Saw	2 Nos.
	(d) Planer	2 Nos.

	(e) Hand Drilling Machine	2 Nos.
	(f) Jigsaw	2 Nos.
II	**MECHANICAL**	
1	Arc welding transformer with cables and holders	5 Nos.
2	Welding booth with exhaust facility	5 Nos.
3	Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets.
4	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
5	Centre lathe	2 Nos.
6	Hearth furnace, anvil and smithy tools	2 Sets.
7	Moulding table, foundry tools	2 Sets.
8	Power Tool: Angle Grinder	2 Nos.
9	Study-purpose items: centrifugal pump, air-conditioner, 3D Printer One each	
III	**ELECTRICAL**	
1	Assorted electrical components for house wiring	15 Sets
2	Electrical measuring instruments	10 Sets
3	Study purpose items: Iron box, fan and regulator, emergency lamp 1 each Megger (250V/500V)	1 No.
4	Power Tools:	
	(a) Range Finder	2 Nos.
	(b) Digital Live-wire detector	2 Nos.
IV	**ELECTRONICS**	
1	Soldering guns	10 Nos.
2	Assorted electronic components for making circuits	50 Nos.
3	Small PCBs	10 Nos.
4	Multimeters	10 Nos.
5	Study purpose items: Telephone, FM radio, low-voltage power supply	