COURSE STRUCTURE AND DETAILED SYLLABUS

# **MECHANICAL ENGINEERING**

For B.TECHFOUR YEAR DEGREE PROGRAMME (Applicable for the batches admitted from 2020-2021)



VAAGDEVI COLLEGE OF ENGINEERING (Autonomous) Bollikunta, Warangal-506 005 Telangana State, India.

## **R20** Regulations

## B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS) MECHANICAL ENGINEERING

## **COURSE STRUCTURE**

(R20 Regulations applicable for the batches admitted from Academic Year 2020-2021)

S.NO	Course Code	Title of the Course	L	Т	Р	Credits
1	B20MA01	Linear Algebra and Calculus	3	1	0	4
2	B20CH01	Engineering Chemistry	3	1	0	4
3	B20ME02	Engineering Graphics	1	0	4	3
4	B20CS01	Programming for Problem Solving	4	0	0	4
5	B20EN02	English language and interactive Communication skills Lab	0	0	3	1.5
6	B20CS02	Programming for Problem Solving Lab	0	0	3	1.5
7	B20ME04	Engineering Workshop	0	0	2	1
8	B20MC01	Induction Programme	-	-	-	-
		Total	11	2	12	19

## **I-SEMESTER**

## **II-SEMESTER**

SI.NO	Course Code	Title of the Course	L	Т	Р	Credits
1	B20MA02	Differential equations and vector calculus	3	1	0	4
2	B20PH03	Engineering Physics	3	1	0	4
3	B20CE01	Engineering Mechanics	3	1	0	4
4	B20CS06	Introduction to Python Programming	1	0	2	2
5	B20EE01	Basic Electrical and Electronics Engineering	3	0	0	3
7	B20EE02	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
8	B20PH05	Physics Lab	0	0	3	1.5
9	B20MC03	NSS/NCC	0	0	2	0
		Total	13	3	10	20

## LINEAR ALGEBRA AND CALCULUS

## **B. TECH- I Semester**

L/T/P/C 3/1 /0 /4

#### Pre-requisites:

**Course Objectives:** Mathematical Knowledge at pre-university level Objectives To learn

- > Concept of rank of matrix and apply to know the consistency of system of linear equations.
- > To determine Eigen values, Eigen vectors of matrices.
- Analyse the nature of sequence and series.
- > Geometrical approach to the mean value theorems and their applications.
- > To find extreme value of function of two and three variables.

#### UNIT-I

#### Matrices

Types of Matrices: Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, orthogonal, Unitary matrices, Rank of a matrix by Echelon form and Normal form, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations.

## UNIT-II

## **Eigen Values and Eigen vectors**

Linear Transformation and Orthogonal Transformation: Eigen values and Eigen vectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem;

#### UNIT-III

#### **Sequences and Series**

Definitions, limit, Convergent, Divergent and Oscillatory sequences and Series.Comparison test, p-test, D-Alembert's ratio test; Cauchy's Integral test; Cauchy's nth root test. Alternating series: Leibnitz test, Absolute and Conditionally Convergence.

#### UNIT-IV

#### Calculus

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series. Definition of Improper Integral: Beta and Gamma functions and their applications.

#### UNIT-V

#### Multivariable calculus (Partial Differentiation and applications)

Definitions of Limit and continuity.Partial Differentiation; Total derivative; Jacobian; Functional dependence and independence, Maxima and Minima of functions of two and three variables using method of Lagrange's method of undetermined multipliers.

#### **Course Outcomes:**

On successful completion of this course, students will be able to:

CO1: Understand the principles of matrix to calculate the characteristics of system of linear equations using multiple methods.

CO2: Determine Eigen values, Eigenvectors of matrices.

CO3: Analyse the nature of sequence and series to identify the convergence.

CO4: Evaluate limits of single-variable functions graphically and computationally. Analyse improper integrals using Beta and Gamma functions.

CO5: Calculate Partial derivatives, extreme of functions of multiple variables.

## **Text Books**

- 1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012.
- 2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John wiley& Sons, 2006.

## References

- 1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
- 2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
- 3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

## **ENGINEERING CHEMISTRY**

#### **B. TECH- I Semester**

L/T/P/C 3/1 /0 /4

#### Pre-requisites: Course Objectives:

- > To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
  - To impart the basic knowledge of surface chemistry and the phases present in the matter which makes the student to understand the technology based on them.
  - To acquire the knowledge of electrochemical cells, different batteries, corrosion which are essential for the Engineers in industry water treatment which is essential for the Engineers in industry.
  - To acquire the skills and knowledge to organic reactions and importance of polymers in engineering and everyday life.

## UNIT-I:

## **UNIT-I: Batteries & Corrosion**

Introduction to Electrochemical and Electrolytic cells, Galvanic cell, e.m.f, and Electro chemical seriesapplications. Batteries: primary cells-lithium cells. Secondary cells – Pb-acid storage cell, lithium-ion cells, Fuel cells-hydrogen-oxygen fuel cell. Methanol-oxygen fuel cell-advantages and applications.

**Corrosion:** Introduction, causes of corrosioin, types of corrosion-dry and wet corrosion-mechanism of electrochemical corrosion. Factors affecting on corrosion and corrosion control methods- cathodic protection(sacrificial anodic protection and impressive current cathodic protection) and surface coatings (anodic and cathodic), Methods of application of metal coatings-Hot dipping(galvanization and tinning) and electroplating of copper.

## **UNIT-II:**

## Water Technology

Introduction, types of hardness, units and Numerical problems. Estimation of hardness of water-EDTA method. Boiler troubles-scales and sludges. Treatment of Boiler feed water-Ion-exchange process. Desalination of brackish water-Reverse Osmosis. Domestic water treatment-specifications and steps involved in the treatment of potable water.

## UNIT - III:

## **Combustion and Fuels**

Combustion- chemistry of combustion, calorific value HCV and LCV its calculations.

Introduction and classifications, characters of good fuel, solid fuels proximate and ultimate analysis and their significance. Liquid fuels- petrolium –refining, cracking and knocking, octane no, cetane no, Bio-diesel – source and transeesterification, applications.

## UNIT-IV:

## Polymers

Polymers: Introduction to polymers, classification of polymers, types of polymerization, mechanism of free radical addition, ionic polymerization. Plastics: Properties of thermosetting (Bakelite, Nylon)) and thermoplastics (PE, PVC) resins. Conducting polymers - classification, mechanism of conduction in conducting polymers - poly acetylene and ploy aniline, applications.

## UNIT-II:

Phase rule and Surface Chemistry

## **R20** Regulations

Phase rule: Definition of terms, phase rule equation, phase diagrams: one component system – water system, two component system- Ag-Pb system, Iron-carbon phase diagram-cooling curves, annealing and case hardening.

Surface Chemistry: Adsorption-types of adsorption, adsorption isotherms- Freundlich adsorption isotherm and Langmuir adsorption isotherm, applications of adsorption

## **Course Outcomes:**

The basic concepts included in this course will help the student to gain:

- > The knowledge of batteries and corrosion.
- > The knowledge of water treatment and
- > The knowledge of polymers and their uses.
- > The required knowledge of principles and concpts f phase rule and surface chemistry.
- > The knowledge of combustion and fuels.

## **Suggested reading:**

- 1. Text book of Engineering Chemistry by Jain & Jain.
- 2. Text book of Engineering Chemistry, CENGAGE learning by Prasanta Rath, B. Ramadevi, Ch. Venkata Ramana Reddy & Subhendu Chakroborty.
- 3. University chemistry, by B. H. Mahan
- 4. (iv)Engineering Chemistry by Shashi Ch

## **ENGINEERING GRAPHICS**

## **B. TECH- I Semester**

L/T/P/C 1/0 /4 /3

## **Pre-requisites:**

**Course Objectives:** 

- > Use various engineering drawing instruments.
- Learn the basic convention of drawings, dimensioning, scales and conic sections like ellipse, parabola and parabola.
- Learn projection of points, lines viewed in different positions.
- > Learn projections of plane surfaces and solids viewed in different positions.
- Gain knowledge of sections of solids and their usage in real time applications and conversion of orthographic projection to isometric projection vice-versa.

## Unit – I

## **Introduction to Engineering Drawing:**

Principles of Engineering Graphics and their significance, ISO and ANSI standards for coordinate dimensioning- usage of Drawing instruments, lettering

- a. Conic sections including the Rectangular Hyperbola (General method only);
- b. Roulettes-Cycloid, Epicycloid, Hypocycloid
- c. Involute
- d. Scales Plain, Diagonal and Vernier Scales.

## Unit –II

Principles of Orthographic Projections in First Angle Projection- Conventions Projections of Points Projection of lines: Parallel, Perpendicular, inclined to one plane and inclined to both the planes.

## Unit-III

Projection of planes: Plane parallel, perpendicular and inclined to one reference plane. Planes inclined to both the reference planes – Auxiliary Planes;

Projection of Regular Solids-Projection of regular solids, Cube, prisms, pyramids, tetrahedron, Cylinder and cone, axis inclined to one plane and both planes – Auxiliary Views Projections of Regular Solids.

## Unit-IV

Sections and sectional views of right angular solid-Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

## Unit-V

## **Isometric Projections:**

Chapter-I Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric views to Orthographic views and Vice-versa, Conventions.

Chapter-II Overview of Computer Graphics: listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software -The Menu System, Toolbars Standard, Object Properties, Draw, Modify and Dimension.

## **Text Books**

- 1. Agrawal B & Agrawal C.M. (2012), Engineering Graphics, TMH Publications.
- 2. Bhatt N.D., Panchal V.M. & Ingke P.R., (2014), Engineering Drawing, Charotar Publishing House.

## References

- 1. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
- 2. (Corresponding set of) CAD Software Theory and User Manuals.
- 3. Engineering Graphics. P I Varghese Tata McGraw Hill Education Pvt. Ltd.
- 4. Engineering Drawing P.J.Shan S.Chand Publishers.
- 5. Engineering Drawing Johle/Tata McGraw Hill Book Publishers.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Analyse the Projections of Points.
- 2. Understand the projections of solids.
- 3. Estimate the use of drawings, dimensioning, scales and conic sections
- 4. Modify the applications of this knowledge in computer graphics.
- 5. Compare the Conversion of Isometric views to Orthographic views

## PROGRAMMING FOR PROBLEM SOLVING

## B. TECH- I Semester

L/T/P/C 4/0 /0 /4

Pre-requisites: Nil

## **Course Objectives:**

- > To provide the necessary knowledge on general engineering problem solving methodologies.
- To provide necessary foundations for step by step computer program development and to present the basic concepts in C programming language.
- > To prepare the students to write modular and readable C Programs.
- > The Course introduces the essential concepts like abstract data types, user defined data types.
- To analyze the performance of algorithms and how to use such knowledge for later processing with the help of files.
- Aims to train the students to write working programs to solve problems.

## UNIT -I

Introduction: Steps in Problem Solving, Algorithms, Flowcharts, Pseudo code, Types of Programming Languages, Introduction to C, History of C, Structure of a C Program.

Introduction to C Programming: The C Character Set, Identifiers and - Keywords, Data Types, Constants and Variables, Declarations, Expressions & Statements, Input / Output Statements (Formatted and Unformatted), Creating and Running a C program.

Operators and Expressions : Unary Operators, Arithmetic Operators, Relational and Logical Operators, Assignment Operators, Conditional operator, Bitwise Operators, special operators, Precedence & Associativity, Type Casting and Type Conversion.

## UNIT – II

Control Statements: Branching Statements – if, if-else, else- if, nested-if. Switch statement. Un - conditional Branching Statement- goto. Looping Statements- while, do-while, for, nested loops. Break & Continue.

Functions : Introduction, Defining a Function, Types of Functions, Accessing a Function, Function Prototypes, Passing Arguments to a Function – call by value, Recursion.

Storage Classes: Automatic Variables, External (Global) Variables, Static Variables, Register.

## UNIT – III

Arrays: Definition - Single Dimensional Arrays, Multi Dimensional Arrays, Declaration, Initialization, Reading & Writing elements in to an Array, Passing Arrays to Functions. Linear Search, Binary search, Bubble sort.

Strings: Declaration and Initialization of Strings, Reading and Writing a String, String Manipulation Functions, String as Array of Characters, Array of strings, Sorting of Strings.

Structures and Unions: User-Defined Data Types, Defining a Structure, Processing

Structure, Array of Structures, Nested Structures, Passing Structures To Functions. Unions. Typedef, Enumerated types - enum.

## UNIT – IV

Pointers: Introduction, Pointer Declarations, Pointer to Pointer, Operations on Pointers -Pointer Arithmetic, Dynamic Memory Allocation – Malloc(), Calloc(), Realloc(), Free(). Pointers and Functions - call by Reference, Pointers and Arrays (one dimensional, two dimensional), Array of Pointers. Structures and Pointers, Self-Referential Structures.

## UNIT- V

File Handling: Introduction, Text Files and Binary Files, File Handling Functions-Opening and Closing a File, File Opening Modes, Reading and Writing a File. Random Access File Functions – fseek(), rewind(), ftell(). Command Line Arguments, C Preprocessor Directives.

## **Course Outcomes:**

CO-1: Understanding how problems are posed and how they can be analyzed for obtaining solutions.

CO-2: Learning of sequencing, branching, looping and decision making statements to solve scientific and engineering problems.

CO-3: Implementing different operations on arrays and creating and using of functions to solve problems.

CO-4: Understanding and exploring the various methods of memory allocations.

CO-5: Ability to design and implement different types of file structures using standard methodology.

## **TEXT BOOK:**

1. Byron Gottfried, "Programming with C". Third Edition(Schaum's Outlines) McGraw Hill.

## **REFERENCE BOOKS:**

- 1. B.A. Forouzan and R.F. Gilberg ,"C Programming and Data Structures" , Cengage Learning (3rd Edition)
- 2. Pradip Dey & Manas Ghosh, "Programming in C", 2nd Edition, Oxford University Press, 2013.
- 3. E. Balaguruswamy, "Programming in ANSI C ", McGraw-Hill Education, 2008.

## ENGLISH LANGUAGE AND INTERACTIVE COMMUNICATIONS SKILLS LAB

## **B. TECH- I Semester**

L/T/P/C 0/0 /3 /1.5

## Pre-requisites: Nil

The *i*-English Skills Lab considers English as a skill and focuses on the production and practice of sounds of the language to familiarize the students with the use of English in everyday situations both in formal and informal contexts.

## **Course Objectives**

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
- To sensitize students to the nuances of English speech sounds, stress and intonation to use in day to day situations.
- To enable students to write simple texts with unity, brevity and coherence using apt vocabulary.
- To improve students' IT skills and research skills to search for needed information from the Internet and use it in e-mails.

## **Course Outcomes**

After completing this course, students will be able to -

- ◆ understand their strengths and weaknesses in English usage in formal and informal contexts.
- ✤ use English comfortably in their individualized contexts.
- ◆ use IT skills and research skills in English speaking and writing.
- \* improve their vocabulary, pronunciation, receptive and expressive skills in English.

## Learning and Teaching Approaches

The lab uses an integrated approach to language teaching that teaches all four language skills - listening, speaking, reading, and writing in natural settings. Both teachers and students are encouraged to respond through pair and group work with active learning strategies such as role play, debates, presentations, and brainstorming. Instructors and Students are encouraged to use online, print media and electronic media resources in conjunction with the course modules and make the best use of worksheets, quizzes, presentations, discussions, role plays and assignments.

This lab links learning approaches with assessment tasks to provide students with the opportunity to accept responsibility for their own learning. Even if students are unable to communicate fluently in English in the beginning of the course, instructors will use English as the language of instruction. Instead of switching to Telugu or other regional languages when there is a problem communicating to students, teachers are expected to use alternative strategies, such as slowing down, repetition, asking others to explain, using simpler vocabulary or using mind map diagr

## Syllabus

## i-English Skills Lab shall have four modules. Module 1: Part – 1 Individualized Speaking Skills

- 1. I can introduce myself in English when meeting someone for the first time.
- 2. I can talk about familiar, everyday topics: my hobbies and interests.
- 3. I can talk about familiar, everyday topics: my past experiences.

- 4. I can talk about familiar, everyday topics: my future plans, goals, and predictions.
- 5. I can talk about familiar, everyday topics: my college and stream.
- 6. I can talk about familiar, everyday topics: C-block, my subjects and teachers.
- 7. I can talk about familiar, everyday topics: regional, domestic, and international issues.
- 8. I can ask effective follow-up questions.
- 9. I can ask for and give opinions.
- 10. I can agree with someone politely.
- 11. I can disagree with someone politely.
- 12. I can talk about personal and ethical problems.
- 13. I can talk about solutions to personal and ethical problems.
- 14. I can answer questions from a passport officer.
- 15. I can make a hotel reservation on the telephone.
- 16. I can make a restaurant reservation on the telephone.
- 17. I can order food and drinks on phone / from a waiter at a restaurant.
- 18. I can ask a salesperson at a clothing store for assistance.
- 19. I can ask for directions when I am lost in a new place/city.
- 20. I can give directions to someone who is lost.

## Part – 2. Towards Ideal English Pronunciation

Introduction to English speech sounds, stress, accent, rhythm and intonation with individualized practice.

## **Module 2: Writing Skills**

- 1. I can write the name of my university, college, department, and engineering stream in English.
- 2. I can use Brainstorming and Clustering effectively.
- 3. I can write an introduction for an essay.
- 4. I can write body paragraphs for an essay.
- 5. I can write a conclusion for an essay.
- 6. I can use peer-feedback to rewrite parts of an essay.
- 7. I can rewrite an essay based on feedback received from a teacher.

## Module 3: IT Skills

- 1. I can submit homework online using e-mail observing e-mail etiquette.
- 2. I can view homework feedback and complete follow-up online exercises using the suggested websites.

## Module 4: Research Skills

- 1. I can identify a research question and develop survey questions individually.
- 2. I can identify a research question and develop survey questions as a member of a group.
- 3. I can conduct research by gathering survey data from others.
- 4. I can analyze results by ranking / tabulating survey data.
- 5. I can present survey findings individually to peers.
- 6. I can present survey findings as a member of a group to peers.

## Minimum Requirement of infrastructural facilities for *i*-English Skills Lab:

The *i*-English Skills Lab needs to have space in the middle with movable chairs, tables for interaction and audio-visual aids with a Public-Address System, an LED TV and a projector.

The Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students. The computer systems are to be networked with LAN to connect teachers with the students systems to transfer materials and to monitor student activities. High fidelity headphones with microphones are to be provided for students for individualized learning.

## The Academic Honesty Policy of BSH department for English Classes

The following will be considered violations of our academic honesty policy:

- 1. Copying answers from another student's exercise, quiz, etc. before or during class.
- 2. Showing your exercise, quiz, etc. to another student before or during class.
- 3. Using any form of 'cheat sheet' in performing an exercise, quiz, etc.
- 4. Taking copies of an exercise, quiz, etc. (including unused copies) outside of the classroom. (This includes taking pictures of the exercise, quiz, etc.)
- 5. Copying answers from another student's exercise, quiz, etc. while it is being administered.
- 6. Copying any portion of a homework exercise from another student.
- 7. Allowing any portion of your homework exercise to be copied by another student.
- 8. Copying (or closely paraphrasing) portions of a homework assignment from other sources (printed matter, the Internet, etc.) and presenting it as your own, regardless of whether you acknowledge the source. This includes using translation software to translate any portion of your submission into English.
- 9. Sharing Gmail User ID's or Passwords with another student.

Any of the above violations will result in a score of 0 for ALL exercises on that day.

## **Distribution and Weightage of Marks**

Instructors use a variety of assessments in this course to assess learning. It is recommended that the lab work counts at least 50 per cent of students' final grades. Instructors advise the students for the assignments during the lab work that are to be graded. The remaining of the grades will be determined by mid-semester and end-semester examinations. The practical examinations for the lab practice shall be conducted as per the college norms prescribed for the core engineering practical sessions.

For the *i*-English Skills lab sessions, there shall be continuous evaluation during the year for 50 sessional marks and 50 end-semester examination marks. Of the 50 marks, 30 marks shall be awarded for day-to-day work and 20 marks to be awarded by conducting internal lab test(s). The end– semester examination shall be conducted by the teacher concerned, by inviting the external examiner. In case of the non-availability of the external examiner, other teacher of the same department can act as the external examiner.

## PROGRAMMING FOR PROBLEM SOLVING LAB

## **B. TECH- I Semester**

L/T/P/C 0/0 /3 /1.5

## Pre-requisites: Nil

**Course Objectives:** 

- To provide the necessary knowledge on general engineering problem solving methodologies.
- To provide necessary foundations for step by step computer program development and to present the basic concepts in C programminglanguage.
- > To prepare the students to write modular and readable C Programs.
- The Course introduces the essential concepts like abstract data types, user defined data types.
- To analyze the performance of algorithms and how to use such knowledge for later processing with the help of files.
- > Aims to train the students to write working programs to solve problems.

## WEEK-1

Write a C program to find the areas of shapes like circle, square, rectangle and triangle

Write a C program to demonstrate Type Casting and Type Conversion.

## WEEK-2

2.a) Write a C program to find the roots of a quadratic equation.

2.b) Write a C program to find greatest of any 3 numbers.

2.c) 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)

## WEEK-3

Fibonacci sequence is defined as follows: the first and second terms insequence 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.

A positive integer d is said to be a factor of another positive integer N if when N is divided by d, the remainder obtained is zero. For example, for number 12, there are

6 factors 1, 2, 3, 4, 6, 12. Every positive integer k has at least two factors, 1 and the number k itself.Given two positive integers N and k, write a program to print the kth largest factor of N.

Input Format: The input is a comma-separated list of positive integer pairs (N, k).

## **Output Format:**

The k<sup>th</sup> highest factor of N. If N does not have k factors, the output should be 1.

#### **Constraints:**

- 1<N<1000000000
- 1<k<600.
- You can assume that N will have no prime factors which are larger than 13.

## B.Tech- MECHANICAL ENGG Example

- **Input**: 12,3
- **Output**: 4

Write a C program to find the second largest number in a set of n numbers.

## WEEK-4

Write a C program to generate Pascal's triangle.

Write a C program to find the LCM(Least Common Multiple) and GCD

(greatest common

divisor) of two given integers.

Write a C program to generate all the prime numbers between 1 and n, where n is a value

supplied by the user.

## WEEK-5

Write a C program to find sum of series 1+x^1+x^2+x^3+.....+x^n using functions.

Write a C program to find factorial of a given number using Recursion. 5.c) Write a C program to demonstrate the use of Storage Classes

## WEEK-6

Write a C program to find both the largest and smallest number in a list of integers.

N monkeys are invited to a party where they start dancing. They dance in a circular formation, very similar to a Gujarati Garba or a Drum Circle. The dance requires the monkeys to constantly change positions after every 1 second.

The change of position is not random & you, in the audience, observe a pattern. Monkeys are very disciplined & follow a specific pattern while dancing.

Consider N = 6, and an array monkeys =  $\{3,6,5,4,1,2\}$ .

This array (1-indexed) is the dancing pattern. The value at monkeys[i], indicates the new of position of the monkey who is standing at the ith position.

Given  $\hat{N}$  & the array monkeys[], find the time after which all monkeys are in the initial positions for the 1st time.

## Constraints

1<=t<=10 (test

cases)

1<=N<=10000 (Number of

## monkeys) Input Format

First line contains single integer t, denoting the number of test

cases. Each test case is as follows -

Integer N denoting the number of monkeys.

Next line contains N integer denoting the dancing pattern array, monkeys[].

# **Output** t lines.

Each line must contain a single integer T, where T is the minimum number of seconds after which all the monkeys are in their initial position

Write a C program to insert an element at a given position in an Array using functions.

7. Write a C program to perform all of the following:

a) Matrix Addition and subtraction

b) Matrix Multiplication

c) Find Transpose and test if a matrix is symmetric or not

d) A traditional chess board consists of 8 rows and 8 columns. Write a program to count the number of safest places that a King can be positioned when 3 queens (ministers) are placed at different positions on the chess board.

## WEEK-8

8.a) Write a C program to perform linear

search 8.b) Write a C program to perform

binary search

8.c) Write a C program to sort the elements using bubble

## sort WEEK-9

Write a C program to insert a sub-string in to a given main string at a given position.

## ENGINEERING WORKSHOP

## **B. TECH- I Semester**(Civil, Mechanical, EEE)

L/T/P/C 0/0 /2 /1

## Pre-requisites: Nil

#### **Course Objectives:**

- > Know the usage of various tools and their application in carpentry, tin smithy.
- Know the usage of various tools and their application in black smithy, foundry, welding and house wiring.
- > Make lap joint and dove tail joint in carpentry.
- ➤ Make scoop, funnel and tray like items in tin smithy.
- ➤ Use one way, two-way switches, parallel and series connections in house wiring.
- $\succ$  Know the basics of welding.

## UNIT – I

**TRADES FOR EXERCISES:** (Any six trades from the following for Mechanical Engineering Branch & Any four trades for all other Branches with minimum of two exercises in each trade)

- 1. Carpentry
- 2. Fitting
- 3. Tin Smithy
- 4. Black Smithy
- 5. House wiring
- 6. Foundry
- 7. Plumbing
- 8. Soldering

## UNIT – II

## TRADES FOR DEMONSTRATION & EXPOSURE

- 1. Demonstration of Power tools & wiring
- 2. Welding.
- 3. Machine Shop

## UNIT – III

IT WORKSHOP I: Computer hardware, identification of parts, Disassembly, Assembly of computer to working condition, simple diagnostic exercises.

IT WORKSHOP II: Installation of operating system windows and Linux simple

diagnostic exercises.

## **TEXTBOOKS:**

- 1. Workshop Manual P.Kannaiah / K.L.Narayana/Scitech Publishers.
- 2. Workshop Manual Venkat Reddy/BS Publication / 6th Edition.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Know the fundamental knowledge of various trades and their usage in real time Applications.
- 2. Compare Foundry, Welding, Black smithy, Fitting, Machine shop and house wiring.
- 3. Understand the basis for analyzing power tools in construction and wood working, electrical engineeringand mechanical engineering.
- 4. Apply basic concepts of computer hardware for assembly and disassembly.

## INDUCTION PROGRAMME

## **B. TECH- I Semester**

L/T/P/C 0/0 /0 /0

## DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

## **B. TECH- II Semester**

L/T/P/C 3/1 /0 /4

## Pre-requisites: Mathematical Knowledge at pre-university level

**Course Objectives:** 

To learn

- > Methods of solving the applications of differential equations.
- > To solve initial value problems using differential equations.
- > Evaluation of multiple integrations and their applications
- > The physical quantity involved in Engineering field related to vector field.
- > To apply fundamental theorems of vectors integrations in their applications.

## **UNIT-I: First Order ODE**

Exact, Non-Exact, linear and Bernoulli's equations, Applications: Newton's law of cooling, Law of Natural growth and decay.

## **UNIT-II: Ordinary Differential Equations of Higher Order**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type  $e^{ax}$ , sin ax, cos ax, polynomials in x,  $e^{ax} V(x)$ ; method of variation of parameters.

## **UNIT-III: Multivariable Calculus (Integration)**

Evaluation of Double Integrals (Cartesian and polar coordinates), Change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double.

## **UNIT-IV: Vector Differentiation**

Vector point functions and scalar point functions. Gradient, Divergence and Curl.Directional derivatives, Tangent plane and normal line.Scalar potential functions. Solenoidal and Irrotational vectors.

## **UNIT-V: Vector Integration**

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

## **COURSE OUTCOMES:**

On successful completion of this course, students will be able to:

- **CO1:** Apply the fundamental concepts of ordinary differential equations toreal time problems.
- **CO2:** Find the complete solution of a non homogeneous differential equations and applying its concepts in solving physical problems of Engineering.
- CO3: Evaluate the multiple integrals in various coordinate systems.
- **CO4:** Apply the concepts of gradient, divergence and curl to formulate Engineering problems.
- **CO5:** Analyse line, surface and volume integrals using fundamental theorems.

## **TEXT BOOKS**

- 1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42<sup>nd</sup> Editions, 2012.
- 2. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.

## REFERENCES

- 1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
- 2. Paras Ram, Engineering Mathematics, 2<sup>nd</sup> Edition, CBS Publishers
- 3. S.L. Ross, Differential Equations, 3<sup>rd</sup> Ed., Wiley India, 1984.

## **ENGINEERING PHYSICS**

## **B. TECH- II Semester**

L/T/P/C 3/1 /0 /4

#### **Course Objectives:**

- The course aims at making students to understand the basic concepts of principles of Physics in a broader sense with a view to lay foundation for the various engineering courses.
- Students will be able to demonstrate competency and understanding of the concepts in Mechanics, Rigid body dynamics, ultrasonic, Lasers and semiconductor physics, a broad base of knowledge in Physics
- The main purpose of this course is to equip engineering undergraduates with anunderstanding of the scientific method, so that they may use the training beneficially in their higher pursuits
- > Hence Physics the foundation on which stands the elaborate structure of technology

#### Unit I: Lasers

Characteristics of lasers, absorption, spontaneous emission, stimulated emission. Einstein's theory of matter radiation interaction and A and B Coefficients; amplification of light by population inversion, Ruby laser, He-Ne laser,  $CO_2$  laser, applications of lasers in science, Engineering and Medicine.

#### Unit II: Physics of Semi-Conductor Opto-electronics:

Classification of materials in to conductors, semi- conductors and insulators, calculation of carrier concentration in intrinsic and extrinsic (N-type) semiconductors, Direct and indirect band gap semiconductors. Energy diagram of P-N diode, LED, Types of semiconductor photodetectors, working principles and characteristics of PIN diode, Solar Cell.

#### Unit III: Mechanics

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates.

## Unit IV: Ultrasonics - Nondestructive testing (NDT) of materials

Introduction, Production of ultrasonic waves, Magnetostriction method, piezoelectric method, detection of ultrasonic waves, properties of ultrasonic weaves, Applications of ultrasonic: SONAR, cavitation, drilling, sonogram.

Ultrasonic transducer- ultrasonic flaw detector: Pulse echo system, transmission.

#### **Unit V: Rigid body dynamics**

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion;

#### **Course outcomes:**

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

- 1. Learns about transformation concepts in Mechancis
- 2. Gains knowledge on basics of rigid body dynamics and lasers which leads to new innovations and improvements
- 3. The knowledge of physics relevant to engineering is critical for converting ideas into technology.
- 4. An understanding of Physics also helps engineers understand the working and limitations of existing devices and techniques, which eventually leads to newinnovations and improvements.

## **Text Books**

1. M N Avadhaulu, P G Kshirsagar, "A Text book of Engineering Physics", S Chand & Co., New Delhi 2011

- 2. V Rajendran, "Engineering Physics," Tata McGraw Hill Publishing Co Ltd, New Delhi 2012
- 3. P K Palani Swami, "Modern Engineering Physics", Siltech Publications
- 4. R K Gaur, S L Gupta, "Engineering Physics", Dhanpat Rai 2013

## References

- 1. D. S Mathur, "Properties of Matter", S Chand & Co., New Delhi 2012
- 2. R C Hibbeller. "Engineering Mechanics: Combined static and synamics", Prentice Hall, 2010
- 3. Vela Murali, "Engineering Mechanics", Oxford University Press 2010
- 4. A Nelson, "Engineering Mechanics: Statics and Dynamics", Tata McGraw Hill Publishing. Ltd New Delhi 2017

## **ENGINEERING MECHANICS**

## **B. TECH- II Semester**

L/T/P/C 3/1 /0 /4

## Pre – Requisites: None

#### **Course Objectives:**

- To know about the system of forces and their conditions for the equilibrium of particles and rigid bodies.
- To develop capacity to predict the effect of centroid and Moment of Inertia for carrying out the design functions of engineering.
- To gain knowledge by applying concepts and principles for engineering problems and also this course will be act as basics for core engineering study.

## UNIT – I

**Introduction to Engineering Mechanics** – Basic Concepts - Resultants of Force System: Parallelogram law – Forces and components- Resultant of Coplanar Concurrent Forces – Components of Forces in Space – Moment of Force - Principle of moments – Coplanar Applications – Couples - Resultant of any Force System.

**Equilibrium of Force Systems:** Free Body Diagrams, Equations of Equilibrium-Equilibrium of Planar Systems- Equilibrium of Spatial Systems.

#### UNIT – II

**Friction:** Introduction – Theory of Friction – Angle of friction - Laws of Friction – Static and Dynamic Frictions – Motion of Bodies: Wedge, Screw, Screw-jack, and Differential Screw-jack.

#### UNIT – III

**Centroids and Centers of Gravity:** Introduction – Centroids and Centre of gravity of simple figures (from basic principles) – Centroids of Composite Figures - Theorem of Pappus – Center of gravity of bodies and centroids of volumes.

**Moments of Inertia:** Definition – Polar Moment of Inertia –Radius of gyration- Transfer formula for moment of inertia - Moments of Inertia for Composite areas - Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses- Transfer Formula for Mass Moments of Inertia - Mass Moment of Inertia of composite bodies.

#### UNIT – IV

**Kinematics:** Motion of a particle – Rectilinear motion – motion curves – Rectangular components of curvilinear motion– Kinematics of Rigid Body - Types of rigid body motion - Angular motion - Fixed Axis Rotation

**Kinetics:** Translation - Analysis as a Particle and Analysis as a Rigid Body in Translation – Equations of plane motion - Angular motion - Fixed Axis Rotation – Rolling Bodies.

## $\mathbf{UNIT} - \mathbf{V}$

**Work - Energy Method:** Work Energy Equations for Translation – Work Energy Applications to Particle Motion – Work Energy applied to Connected Systems - Work Energy applied to Fixed Axis Rotation and Plane Motion. Impulse and Momentum.

## **COURSE OUTCOMES:**

The students will be able to

CO1: Understand the basic concepts of engineering mechanics and force Systems.

CO2 : Calculate the friction developed in motion of bodies.

CO3: Calculate centroid and moment of inertia for simple and composite bodies.

CO4: Apply the concepts of mechanics for solving problems of particles and rigid body motion CO5 : Understand the Work Energy method for plane motion

## **TEXT BOOKS:**

- 1. Timoshenko S, Young D.H, Rao J. V, Sukumar Pati Engineering Mechanics, 5th Edition, McGraw Hill Education, 2017
- 2. Ferdinand. L. Singer, Engineering Mechanics Statics and Dynamics, 3<sup>rd</sup> Edition, Harper International Edition, 1994.

## **REFERENCES:**

- 1. Irving H. Shames, Engineering Mechanics, 1<sup>st</sup> Edition, Pearson, 2011
- YVD Rao, K. Govinda Rajulu, M. Manzoor Hussain, A Textbook of Engineering Mechanics, 1<sup>st</sup> Edition, Academic Publishing Company, 2016
- 3. M.V. Seshagiri Rao & D Rama Durgaiah, Engineering Mechanics, Universities Press, India, 2005
- 4. Tayal, A.K , Engineering Mechanics Statics and dynamics, 14<sup>th</sup> edition, Umesh Publication, Delhi, 2012.
- 5. K. L. Kumar, Vennu kumar, Engineering Mechanics,4<sup>th</sup> Edition,Tata McGraw-Hill Education (India) Pvt Limited, 2011
- 6. S. S. Bhavikatti, Fundamentals of Engineering Mechanics, 3<sup>rd</sup> Edition, New Academic Science, 2011

## INTRODUCTION TO PYTHON PROGRAMMING

## **B. TECH- II Semester**

L/T/P/C 1/0 /2 /2

Pre-requisites: None

## **Course Objectives:**

The purpose of the course is to make students

- To develop basic Python programs
- > To develop Python programs with conditional statements
- > To develop Python Programs with looping statements.
- > To develop Python functions and call them.
- > To get exposure to various problems solving approaches of computer science

#### Unit – I

Introduction to Python: What is Python?, What is Python Good For?, Python History, How does Python Execute a Program, Review of a Simple Program, Some of the Basic Commands. Statements, Input/Output Operations.

## Unit – II

Keywords, Variables, Assigning values, Standard Data Types, Strings, Operands and operators. Understanding the Decision Control Structures: The if Statement, A Word on Indentation, The if ... else Statement, The if ... else Statement.

#### Unit – III

Loop Control Statements: The while Loop, The for Loop, Infinite Loops, Nested Loops. The break Statement, The continue Statement, The pass Statement, The assert Statement, The return Statement.

## Unit – IV

Functions- Function Definition and Execution, Scoping, Arguments: Arguments are Objects, Argument Calling by Keywords, Default Arguments, Function Rules, Return Values.

## Unit – V

Advanced Function Calling: The apply Statement, The map Statement, Indirect Function Calls, Anonymous Functions.

Modules: Importing a Module, Tricks for Importing Modules, Packages.

#### **Course Outcomes:**

- Defining the fundamentals of writing Python scripts
- Expressing the Core Python scripting elements such as variables and conditional control structures
- Implement the Python scripting using looping statements.
- Apply Python functions to facilitate code reuse
- Extending how to work with modules and packages.

#### **Text Books:**

- 1. The Complete Reference-Python by Martin C. Brown, Mc Graw Hill
- 2. Python Bible- Complete Python Language Reference by Dave Brueck and Stephen Tanner

## **Reference Books:**

- 1. Python Programming for Beginners by Adam Stewart
- 2. Python Essential Reference (3rd Edition) by David M. Beazleyf

## **BASIC ELECTRICAL & ELECTRONICS ENGINEERING**

#### **B. TECH- II Semester**

L/T/P/C 3/0 /0 /3

# Pre-requisites: None

Course objectives:

## In this course it is aimed to introduce

- > The basic concepts of electrical circuits which is the foundation for network theory
- > To understand about single phase AC circuits.
- > To understand functioning of different types of DC machines and transformers.
- > To understand the various operations of transistors and special purpose diodes
- > To learn basic concepts of diodes, Rectifiers and filters.

UNIT-I: Electrical Circuits: Circuits concept, R-L-C Parameters, Voltage and Current sources, Source Transformation, V–I relationship for Passive elements. Kirchoff's Laws. Network reduction techniques – series, parallel, series parallel, star-delta & star-delta transformations, Nodal Analysis, Mesh analysis with DC excitations. Network Theorems -Thevenin's. Norton's. Maximum Power Transfer. Superposition, Reciprocity Theorems with DC excitation Calculation of Power (VI)

**UNIT-II**:Single Phase AC Circuits - R.M.S. and Average values, Form Factor, steady state analysis of series, Parallel and Series parallel Combinations of R, L and C with Sinusoidal excitation concept of reactance, Impedance, Susceptance and Admittance –Concept of Power Factor.

**UNIT-III:**Transformers and DC Machines:: D.C.Machines: Constructional features, Methods of Excitation, E.M.F. Equation and Applications, Torque development in D.C motor Characteristics of DC motors, losses, Efficiency, Speed control of DC Shunt motors Role of Transformers in the fields of engineering, Transformer principle, Ideal and Practical Transformers Equivalent circuit, Regulation and Efficiency.

**UNIT-IV:**P-N Junction Diode - Diode equation, V-I characteristic, Temperature dependence, Bipolar Junction Transistor (BJT) - Construction, Principle of Operation, CB,CE and CC configurations, Zener Diode, Zener diode characteristics, Use of Zener diode as simple regulator.

## UNIT-V:

Operational amplifier basics, op amp inverting and Non Inverting amplifier, Rectifiers and Filters - The P-N junction as a rectifier - A Half Wave Rectifier, Bridge Rectifier, Filters –Inductor Filters, Capacitor Filters.

## **Course Outcomes:**

## After Completion of the course, the students will be able to

- 1. Analyze circuit theorems, mesh and nodal analysis, series and parallel networks, Electrical power.
- 2. Gain knowledge on AC circuits, reactance, Impedance, Susceptance and Admittance and Power Factor
- 3. Learn the working principle of DC motors, Transformers
- 4. Study the characteristics of PN Junction diode and zener diode
- 5. Learn the basic of Amplifiers and Rectifiers.

## **Text Books:**

- 1. Circuit Theory Analysis and Synthesis by A Chakrabarti, Dhanpat rai & co.
- 2. Basic Electrical Engineering, P Ramana, M. Suryakalavathi, G. T. Chandra Sekhar,1st Edition, S. Chand Technical Publications, 2018
- 3. Electronic Devices and Circuits, S. Salivahanan and N Suresh Kumar, 3rd Edition TMH, Revised 2019

## **References:**

- Network Analysis by M.E Van Valkenburg, Pearson Publications 3<sup>rd</sup> Edition
  Principles of electrical machines by V K Mehta, S Chand Publications
- 3. Electronics devices and circuits by I J NagrathPHI Publications

## **BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB**

#### **B. TECH- II Semester**

L/T/P/C 0/0 /3 /1.5

## Pre-requisites: None

#### **Course objectives:**

- Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.
- Provide working knowledge for the analysis of basic DC circuits used in electrical and electronic devices.
- > To explain the working principle, construction, applications of DC machines
- > Highlight the operation of diodes, transistors, rectifiers and filters.

## List of Experiments

- 1. Verification of Kirchhoff"s Laws.
- 2. Verification of Superposition and Reciprocity Theorems.
- 3. Verification of Thevenin's and Maximum Power transfer theorem.
- 4. Speed Control of DC Shunt Motor.
- 5. Swinburne's Test on DC shunt machine.
- 6. Brake test on DC shunt motor.
- 7. OC & SC tests on single phase transformer.
- 8. PN Junction Diode characteristics (Forward bias & Reverse bias).
- 9. Transistor CE Characteristics (Input and Output)
- 10. Rectifier with and without filters (Full wave & Half wave)

## **Course outcomes:**

## After the course completion, the students are able to

- Learn to simplify complex electric and electronic circuits by applying the KVL and KCL laws
- Identify the optimal loading onmachines.
- Analyze the performance of DC machines
- Identify and analyze the performance and operation of semi conducting devices.

## PHYSICS LAB

## **B. TECH- II Semester**

## Pre-requisites: None

## **Objectives:**

- The purpose of doing experiments in the laboratory is not simply to verify a principle but also to explore the related phenomena and to find their applicability. The students are suggested to work in this direction and get benefit out of it.
- To get practical knowledge which is related to the engineering course in the development of new technologies.
- > To impart fundamental knowledge in handling the equipments in Physics laboratory.

## S.No

## Name of the Experiment

- 1 Torsional Pendulum- Determination of rigidity modulus of materials of a wire
- 2 Determination of energy gap of material of a p-n junction
- **3** Study of LED diode V-I and P-I characteristics
- 4 Study of LASER diode V-I and L-I characteristics
- 5 Bending losses of optical fibres and evaluation of numerical aperture of a given optical fibre
- 6 Study of decay charge & determination of time constant of RC circuit
- 7 Study of characteristics of Solar cell
- 8 Determination of wavelength of laser source- Diffraction grating
- 9 Determination of frequency of AC supply Sonometer
- **10** Determination of wavelength of monochromatic source using diffraction grating

## **Outcomes:**

- The laboratory course helps the student how to operate different equipments related to engineering. It also allows the student to develop experimental skills to design new experiments in engineering
- The course enlightens the student about modern equipment like Solar cell, Optical fibres etc.
- With the exposure to these experiments, the student can compare the theory and correlate with experiment

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L/T/P/C 0/0 /3 /1.5

## NSS?NCC

**B. TECH- II Semester** 

L/T/P/C 0/0 /2 /0