VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY: VISAKHAPATNAM

DEPARTMENT OF MECHANICAL ENGINEERING

PROGRAM STRUCTURE (VR-19)

I Year- I Semester

S. No	Course Code	Name of the Course	L	T	P	Credits
1.	1000191100	Mathematics-I	3	1*	0	3
2.	1000191120	Engineering Physics	3	1*	3	4.5
3.	1000191121	Technical English Communication	2	0	3	3.5
4.	1003191100	Engineering Mechanics	3	1*	0	3
5.	1005191120	Problem Solving and Programming using 'C'	3	1*	3	4.5
6.	1000191110	Engineering Exploration	0	0	4	2
Total Credits:						**20.5**

Course code		L	T	P	Credits
1000191100	MATHEMATICS – I	3	1	0	3

Course Overview:

This course deals with differential equations and its application with more focus on Engineering Mathematics. This course helps the students to learn relevant mathematical tools which are required in the analysis of problems in engineering and scientific professions. Topics included in this course are functions of two variables, higher order linear differential equations, Laplace Transforms, Inverse Laplace transforms, Partial differential equations of first order.

Course Objectives:

1. Utilize mean value theorems to find the characteristics of the function and acquire the knowledge maxima and minima of functions of two variables.
2. To discuss higher order differential equations.
3. To discuss Laplace Transform and its properties.
4. To apply Inverse Laplace transform to different types of functions and to solving initial value problems.
5. To solve first order partial differential equations by analytical methods.

UNIT- I

Mean Value Theorems: Rolle's Theorem – Lagrange's Mean Value Theorem – Cauchy's Mean value Theorem. Functions of several variables – Jacobian – Functional dependence – Maxima and Minima of functions of two variables without constraints.

Outcome: The student is able to find stationary point of a curve and extreme values of a given function.

Activity/Event: Finding current in LCR circuits.

UNIT II

Linear Differential Equations of Higher Order: Non-homogeneous linear differential equations of second and higher order with constant coefficients with non-homogeneous terms of the typee^{ax},$\sin ax$, $\cos ax$, x^k, method of variation of parameters.

Outcome: The student will be able to solve higher order linear differential equations with constant coefficients.

Activity/Event: Finding Extreme value of functions of two variables.

UNIT-III

Laplace Transforms: Introduction - Laplace transforms of standard functions – Shifting Theorems - Transforms of derivatives and integrals - multiplication by t^n - division by t – Unit step function, Unit impulse function.

Outcome: The student will be able to Understand Laplace transform of standard functions.

Activity/Event: Seminar by student.

UNIT -IV

Inverse Laplace Transforms: Introduction - Properties – Inverse Laplace by using partial fractions and Convolution theorem (without proof)-solving initial and boundary value problems by using Laplace Transform.

Outcome: The student is able to apply Inverse Laplace transform of standard functions.

Activity/Event: The student will be able to apply Inverse Laplace transform technique to solve differential equations with given initial conditions.

UNIT-V:

Partial Differential Equations of first order: Solutions of first order linear (Lagrange) equation and nonlinear (standard type $f(p,q)=0, f(z,p,q)=0, f(x,p)=g(y,q)$&$claurits$) equations.

Outcome: Student is able to solve first order partial differential equation by different analytical methods.

Activity/Event: Modelling the linear first order PDE and solving.

Text Books:

1. Higher Engineering Mathematics by H.K. Dass, S.Chand Publications.
2. Higher Engineering Mathematics 2e, B. V. Ramana, TataMcGrawHill Publishing Co. Ltd.

Reference Books:

1. Engineering Mathematics, Greenburg, 2nd Ed, Pearson education.
2. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi.
3. A Text book of Engineering Mathematics, N.P.Bali, Laxmi Publications (P) Ltd.
4. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Edition.

Course code	ENGINEERING PHYSICS	L	T	P	Credits
1000191120		3	1	3	4.5

Course Overview:
The course covers the topics of crystal structures, crystal systems, X-ray diffraction and their applications. Further, deals with the concepts of Oscillations, Acoustics, Ultrasonics, lasers, optical fibers and nanomaterials.

Course Objectives:
To introduce the basic concepts of crystallography, X-ray diffraction, Oscillations, Acoustics and Ultrasonics. Further, to enhance the knowledge related to lasers, optical fibers and its different components to make it suitable for various purposes. Also, provide an insight into latest research topics of nanomaterials synthesis and characterization.

UNIT-I

CRYSTAL STRUCTURES:

Introduction to solids -Fundamental terms of crystal structures - Unit cell- coordination number- Lattice parameters – seven crystal systems - Bravais' lattices - Packing factor for Simple cubic, Body centered cubic and Face centered cubic.

Outcome: Student will be able to understand the basic concepts of crystal structures and crystal systems.

Activity:

(Virtual lab experiment) To study various crystals structures

UNIT II

CRYSTAL PLANES AND X-RAY DIFFRACTION:

Introduction— Important features and significance of Miller indices - Crystal planes – Separation between successive (h k l) planes - Bragg's law- Experimental technique for X-ray diffraction: Laue method (single crystal).

Outcome: Student will be able to identify various planes in a crystal and understand the structural determination of crystals using X-ray diffraction.

Activity:

- Building models of simple cubic (SC), face centered cubic (FCC) and body centered cubic (BCC) using commercially available wooden sticks

Experiments:

- Determination of lattice constant of cubic crystal material by powder XRD pattern

Unit-III

OSCILLATIONS AND VIBRATIONS:
Introduction - Simple Harmonic Motion- Damped Harmonic oscillator - Forced oscillations.

ACOUSTICS AND ULTRASONICS:

ACOUSTICS : Introduction - Reverberation time - Sabine's formula – Acoustics of concert-hall,

ULTRASONICS :ultrasonics production (Magnetostriction and piezoelectric method) – Applications of Ultrasonics

Outcome: Student will be able to understand the knowledge of Ultrasonics to understand non-destructive testing and also understand the nature and characterization of acoustic design.

Activity:

- To find the velocity of sound waves in a given rod with Kundt's tube apparatus.
- To find the Young's modulus of the material of the rod.

Experiments:

- Determination of Rigidity modulus of a material – Torsional pendulum
- Determination of 'g' from Compound pendulum
- Melde's Experiment – Transverse and Longitudinal Modes
- Determination of Velocity of Ultrasonic waves in a given liquid using Ultrasonic Interferometer
- Sonometer – verification of transverse laws
- LCR series and parallel resonance

Unit-IV:
LASERS AND FIBER OPTICS:

LASERS : Characteristics of laser light – stimulated absorption, spontaneous and stimulated emission of radiation – population inversion (2-level, 3-level and 4–level schemes) - Einstein coefficients – basic components of laser - Ruby laser – He - Ne laser and applications of lasers.

FIBER OPTICS: Principle of optical fiber – acceptance angle, numerical aperture and Applications of optical fibers.

Outcome: Students will be able to understand the basic concepts of optical fiber and laser. Also working principle of Ruby, He-Ne, semiconductors lasers and optical fibers. Further, their applications in day to day life.

Activity:

- To calculate the beam divergence and spot size of the given laser beam.

Experiments:

- Determination of particle size of lycopodium powder using semiconductor laser.
- Evaluation of Numerical Aperture of a given fiber
- To determine the bending losses of Optical fibers.

Unit-V:

NANOMATERIALS:

Introduction- Zero, one and two dimensional nanomaterials, Synthesis of nanomaterials: top-down and bottom- up approaches - Ball milling & Sol-gel, Applications of nanomaterials.

Outcome: Student will be able to understand the properties of nanomaterials and their synthesis and apply the knowledge to produce nanomaterials for different applications.
Activity: Identification of nanomaterials.
Experiments:

- Determination of nanoparticle size of a lycopodium powder using semiconductor laser
- Preparation of nanoparticles of silver

Text Books:

1. Solid State Physics, A. J. Dekker, Macmillan India Pvt. Ltd., (2011)
2. Introduction to Solid State Physics, C. Kittel, Wiley indiaPvt. Ltd, (2012)
3. R. N. Chaudhury, waves and oscillations, 2nd edition, new age publications,2001, ISBN (13) : 978-81-224-2842-1
4. Solid State Physics: Structure And Properties Of Materials, M. A. Wahab, Narosa Publishing House Pvt. Ltd. (2005)

Reference Books:

1. University Physics by Young and Freedman, Pearson Education (2012)
2. A Text Book of Engineering Physics by Dr. M. N. Avadhanulu and Dr. P. G. KshiraSagar, S.Chand& Company Ltd., (2014).
3. Fundamentals and Applications of Ultrasonic Waves by J. David N. Cheeke, CRC Press LLC (2002).
4. Elements of X-Ray Diffraction, B. D. Cullity Pearson Education India; 3 edition (2014)
5. Laser Fundamentals, William T. Silfvast, 2nd edn, Cambridge University press, New York (2004)
6. NANO: The Essentials: Understanding Nanoscience and Nanotechnology, T. Pradeep, McGraw Hill, 2017
7. Physics Vol 1& 2 (5ed), Resnick , Halliday, Krane, Wiley; Fifth edition (2007)

Course code	TECHNICAL ENGLISH COMMUNICATION	L	T	P	Credits
1000191121		2	0	3	3.5

Course Overview:

In this course students will read, analyze, and interpret material from general and technical fields, and will practice reading, writing, listening and speaking skills on a variety of contemporary topics.

Course Objectives:

- To introduce students to the specific use of English for Technical Communication.
- To develop the overall English proficiency of students and enable them to function effectively in different professional contexts.
- To strengthen student skills in the areas of reading, writing, listening and speaking and enable them to function effectively in their professional sphere

UNIT- I

Reading:1) How to Regain Green Cover 2) Solution to Plastic Pollution

Writing: Functional grammar [articles, prepositions of time, place, direction and movement, verb-tense, subject-verb agreement]

Listening: TED Talk on Water Harvesting (LC) –Answering comprehension based Qs ~ Listening to improve pronunciation

Speaking: Functional English(LC) ~ Introducing oneself

Outcomes: The student will be able to :

read, understand and interpret material on Environment.

speak about himself/herself.

listen to an audio and take notes from the audio clip.

Activities: Reading Comprehension- Note making while reading 1&2

Letter Writing

Experiments:

1. Just A Minute –Tell about oneself
2. Note taking while listening to the TED talk
3. Interactions

UNIT-II

Reading Texts: 1) The Hubble Telescope 2) Genesis of ISRO

Writing: Writing formal letters ~ Functional grammar ~Modals - Paraphrasing

Listening: Listening to a debate on " Colonizing the Moon" (LC) ~ Note Taking

Speaking: (LC) Making mini presentations on general topics

Outcomes: The student will be able to:

read, understand and interpret material on Space Technology

analyze the functions of language and grammar in spoken and written forms

write formal letters and paraphrase the text.

prepare and exhibit oral presentation skills by using ICT(Individual/team)

Activities:

- Reading Comprehension
- Letter Writing-Formal

Experiments:

1. Making a mini presentation

Unit-III:

Reading Texts: 1) Southern Splendour 2) Tourism in India: Role in Conflict and Peace

Writing: Paragraph writing ~ Functional grammar [relative pronouns, comparative adjectives, adverbs]

Listening: (LC) Listening comprehension ~ Listening for global meaning ~ Listening for getting at the nuances and the mood of the speaker

Speaking: (LC) Telephonic Skills ~ participating in an interactive video and teleconferencing

Outcome: The students will be able to :

read, understand and interpret material on Travel.

write Paragraph and Essays with proper coherence.

pronounce the words with apt pronunciation

maintain proper telephonic etiquette.

Activities:

Reading Comprehension

Paragraph writing

Essay writing

Experiments:

1. Letters and Sounds- Some pronouncing Patterns
2. Telephonic Skills

Unit-IV:

Reading Texts: 1) Wind Energy 2) How pertinent is the nuclear option

Writing: Writing a formal E-mail

Speaking: Group Discussion (LC)

Listening: Listening to an Interview (LC) related to the text ~ listening critically for understanding the attitude/tone of the speaker

Outcome: The students will be able to:
read, understand and interpret material on Energy Sources.
write formal Email.
participate in Group Discussion without hesitation.

Activities:
Reading Comprehension
Email Writing

Experiments:

1. Group Discussion
2. Mock-Interview

Unit-V:

Reading Texts: 1) The Evolution of Media
2) The Top Ten Developments in Journalism in the 2000s

Writing: Interpret graphic tools [tables, pie & bar charts ~ writing an abstract ~ Leveraging ICT for communication ~ Preparing a PPT(LC)

Speaking: Making short presentations [individual/team] with the aid of PPT
Listening: Listening to Situation/Scene ~ Sub skills: Listening to understand one's viewpoint ~Listening to understand speaker's intention ~Listening for local understanding.

Outcome: The students will be able to:
read, understand and interpret material on Media.
interpret graphical data
present PPT without hesitation.
listen to a situation and respond

Activity:
Information Transfer

Experiment:
Oral Presentation

Suggested Books:

- Elango, K et.al 2014. Mindscapes: English for Technologists and Engineers, Orient Blackswan, Hyderabad.

Reference Books:

- Balasubrmanyam M. 1985. Business Communication. Vani Educational Books, New Delhi
- Balasubramanian T. 1989. A Text book of Phonetics for Indian Students. Orient Longman, New Delhi.
- Krishnaswamy, N and Sriraman, T. 1995. Current English for Colleges. Macmillan India Ltd. Madras.
- Mohan Krishna and Meera Banerjee. 1990. Developing Communication Skills. Macmillan India Ltd.New Delhi.
- Narayanaswamy V R. 1979. Strengthen your Writing. Orient Longman, New Delhi.
- Naterop, Jean, B. and Rod Revell. 1997. Telephoning in English. Cambridge University Press, Cambridge

Course code		L	T	P	Credits
1003191100	**ENGINEERING MECHANICS**	3	1*	0	3

Course Overview:

This course introduces the principles required to solve engineering mechanics problems. It addresses the modeling and analysis of static equilibrium problems with an emphasis on real-world engineering applications and problem solving.

Course Objectives:

Learn how to resolve forces and understand the conditions of equilibrium.
To Understand and Analyze the Concept of Friction.
To identify the concepts of Centroid and Centre of Gravity and evaluate moment of inertia.
To understand the dynamics where the bodies subjected to motion are analyzed.

Unit-I:

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems, Graphical method for the equilibrium of coplanar forces. Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Lami's Theorem.

Outcome :

Able to draw Free Body Diagram and analyze the force systems for equilibrium conditions.

Activity/Event :

Demonstration of Lami's theorem and Free Body Diagrams can be done by the students.

Unit-II:

Introduction to Friction- limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction. Applications – Ladder friction and wedge friction

Outcome:

Identify the areas of friction and find the frictional forces between contact points and surfaces.

Activity/Event :

Calculating the coefficient of friction for different materials

UNIT III :

Centroid : Centroids of simple figures (from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, pappus theorem.

Outcome:

Able to differentiate between centroid and centre of gravity and determine Centroid and CG for composite sections.

Activity/Event :

Different plane areas and solids will be given to students to identify centroid and centre of gravity.

Unit-IV:

Area moments of Inertia : Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures.

Mass Moment of Inertia: Moment of Inertia of Masses, mass moment of inertia of composite bodies.

Outcome:

At the end of the unit, the student should be able to

Find MI of various composite sections based on related theorems.

Activity/Event :

Different plane areas and solids will be given to students to calculate area and mass moment of inertia

Unit-V:

Kinematics: Rectilinear motion – Velocity and Acceleration – Motion of Rigid Body

Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation.

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System. Impulse momentum method.

Outcome:

At the end of the unit, the student should be able to solve problems related to kinematics and kinetics applying laws of motion, Apply the work energy concept to solve the kinetic problems.

Activity/Event :

Demonstration of the concepts of Kinematics through videos.

Text Books:

1. Engineering Mechanics - S. Timoshenko & D. H. Young., 4th Edn , Mc Graw Hill publications.
2. Engineering Mechanics: Statics and Dynamics,N H Dubey,Mc Graw Hill publications.

Course code	PROBLEM SOLVING AND PROGRAMMING USING C	L	T	P	Credits
1005191120		3	1*	3	4.5

Course Overview:

C is a basic building block for every language. It is a general Purpose Language. To develop the programming skills 'C' is the only platform to develop programming techniques for any type languages.

Programming is an increasingly important skill, whether you aspire to a career in software development, or in other fields. This is because programming is fundamentally about figuring out how to solve a class of problems and writing the algorithm, a clear set of steps to solve any problem in its class. This course will introduce you to a powerful problem-solving process. In this course, you will learn how to develop an algorithm, and then progress to reading code and understanding how programming concepts relate to algorithms.

Course Objectives:

- ✓ To understand computer programming and its roles in problem solving
- ✓ To understand and develop well-structured programs using C language

Unit-I:

Introduction to computers: Computer systems, computer Languages, computer number systems.

Introduction to C programming: Background and characteristics of C, Flow Charts, algorithms and pseudo code. Structure of a C Program, Input/output Statements in C, writing C programs, compiling and executing C programs.

Outcome:

- ✓ Illustrate flowchart and algorithm to the given Problem.
- ✓ Outline the Basic Structure of Computer.
- ✓ Explain the Structure of C Program

Activity/Event:

Design a flow chart and develop an algorithm for a real time application.

Unit-II:

Programming Style: Tokens of C, Keywords, Variables, Constants and rules to form variables and constants, Data Types, Declaration of Variables and initialization, Operators, Operator precedence and associativity. Type conversions

Flow of Control: Selection: Two way selection, multi-way selection

Repetition and Unconditional Control Statements: concept of loop ,pre test and post test loops, initialization and updating loops ,while statement, do-while statement, for statements, nested loops, break ,continue, goto.

Outcome:

- ✓ Explain basic Structure of the C-PROGRAMMING, declaration and usage of variables.
- ✓ Build C programs using operators and control structures.

Activity/Event:

- ✓ Build a C Program which has Linear Solution.

Unit-III:

Arrays and Strings:

Arrays: One-Dimensional Arrays, Declaration, Array Initialization, Input and Output of Array Values, Two-Dimensional Arrays.

Strings: String Fundamentals, String Input and Output, String manipulation functions.

Outcome:

- ✓ Build C programs to access arrays, strings and functions.
- ✓ Compare Array and Strings.
- ✓ Understand & Applying Various Library Functions

Activity/Event:

- ✓ Build pre-processor directive for strings

Unit-IV:

Modular Programming:

Function and Parameter Declarations: Function definition, types of functions, declaration and definition of user defined functions, its prototypes and parameters, calling a function. Arrays as Function Arguments, Variable Scope, storage class, recursive functions.

Outcome:

- ✓ Explain modular Programming
- ✓ Identify Categories of Functions.

Activity/Event:

Simulate how function calls are handled in turbo c with a suitable example using structure chart

Unit-V:

Pointers, Structures, Unions and files:

Pointers: Concept of a Pointer, Initialization of pointer variables, pointers as function arguments, address arithmetic, pointers to pointers, Pointers and arrays, Array of Pointers, parameter passing techniques. Dynamic memory allocation.

Structures and Unions: Structures declaration, Initialization of structures, accessing structures, unions.

Files: Declaring, Opening and closing file streams, Reading from and writing to text files.

Outcome:

- ✓ Explain the Concept of Dynamic memory allocation
- ✓ Develop C programs using pointers
- ✓ Outline basic concepts on files

Activity/Event :

Create array of structure dynamically for real-time application

Text Books:

- Programming in C, ReemaThareja, and Oxford.
- The C programming Language, Brain W.kernighan, Dennis Ritchie,2e,pearson
- C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage. Pub. Programming with C, Bichkar, Universities Press.

Reference Books:

- ANSIC Programming garyJ.Bronson. Cengage learning.
- Let us 'C' by yashwantkanethkar, BPB Publications, 16 edition.

PROBLEM SOLVING AND PROGRAMMING USING C LAB

1. a) Write a C program to compute perimeter and area of rectangle
   b) Write a C program to calculate distance between points
   c) Write a C Program to Simulate 3 Laws of Motion
2. a) Write a C Program to convert Celsius to Fahrenheit and vice versa
   b) Write a C program to find maximum of three numbers using conditional operator.
3. a) Write a C Program to find Whether the Given Year is a Leap Year or not.
   b) Write a C Program to find grade of student.
   c) Write a menu driven program to compute area of different geometrical shapes
4. a) Write a C Program to Find Whether the Given Number is
   i)Strong number ii)perfect number
   b) Write a C Program to print the following between 1 to n
   i)Prime Number ii) Armstrong Number
5. Demonstration of arrays& Strings
   a) Write a C program to perform Linear Search
   b) Write a C program to perform transpose of two matrices
   c) Write a C program to perform multiplication of two matrices
   d) Implementation of string manipulation operations with and **without** library function.
   i)copy ii) concatenate iii)length iv)compare
6. a) Write a C program to find cube of any number using function.
   b) Write a c program to find area and volume of geometric shapes using functions.
   c) Write a C program to check whether a number is even or odd using functions.
7. a) Write a C Program illustrating Fibonacci, Factorial using recursion
   b) Write a C program to find power of any number using recursion.
   c) Write a C program to find GCD and LCM using recursion
8. a) Write a C Program to Access Elements of an Array Using Pointer
   b) Write a C Program to find the sum of numbers with arrays and pointers.
   c)Write a c program to illustrate parameter passing techniques
9. a)Write a C Program to Store Information of a student Using Structures
   b) Write a C program to create memory for int, char and float variable at run time.
10. a)Write a program in C to copy a file in another name
    b)Write a C program to append multiple lines at the end of file

Course code		L	T	P	Credits
1000191110	Engineering Exploration	0	0	4	2

Course Overview:
This course aims in teaching the Inter disciplinary engineering knowledge to students with the help of activity-based learning. This course teaches "Engineering Design, Mechanisms, Platform based development & Data acquisition and analysis" concepts to cover the basic knowledge & practices of multiple engineering disciplines.

Course Objectives:
To understand the importance of multi-disciplinary Engineering knowledge in the current world, for making any project. To learn Engineering design process for creating any new product/system. To learn the fundamental practical knowledge for starting any inter-disciplinary project.

Unit-I:

Introduction to Engineering and Engineering Study: Introduction to Engineering, Difference between science and engineering, scientist and engineer, needs and wants various disciplines of engineering, some misconceptions of engineering, Role of engineers in solving social problems, Graduate Attributes.

Outcome: Student will learn about Engineering & it's evolution in solving social problems. Will also learn about Variety of engineering branches and their contributions to society.

Activity theme: Activities aimed to understand Engineering

Activities: (only for integrated theory and lab course)

1. Identifying Various Engineering disciplines involved in a project/system

2. Listing down various social problems in the world & Finding how engineering can solve the social problems.

Unit-II:
Engineering Design: Engineering Design Process, Multidisciplinary facet of design, Generation of multiple solution, Introduction to Mechatronics systems, Motor and Battery Sizing concepts, Introduction to PCB design.

Outcome: Student will be able to understand the Engineering Design procedure & applying the same knowledge for making / creating a new product/model.

Activity theme: Activities based on the designing & making of models

Activities: (only for integrated theory and lab course)

1. Converting 230V of AC to 5V of DC power.
2. Making of a Bridge Structure.
3. Preparing a Full Adder circuit using IC's
4. Creating a mobile App using MIT app inventor

Unit-III:

Mechanisms: Basic Components of a Mechanism, Degrees of Freedom (Mobility of a Mechanism), 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism.

Outcome: Student will be able to understand the importance & working of mechanisms.

Activity theme: Creating a model which illustrate any mechanism

Activities: (only for integrated theory and lab course)

1. Determining the Degree of Freedom for a given structure
2. Assembling of Scissor jack mechanism

Unit-IV:

Platform based development: Introduction to platform-based development (Arduino) programming and its essentials, Introduction to sensors, transducers and actuators and its interfacing with Arduino.

Outcome: Student will be able to gain knowledge about the various sensors, transducers, actuators &Arduino device. To Program Arduino for any inter-disciplinary project.

Activity theme: To Program to control lights, Motors, Sensors etc., on Arduinoplatform.

Activities: (only for integrated theory and lab course)

1. Obstacle detection using IR sensor on Arduino Platform
2. Measuring distance using Ultrasonic sensor on the Arduino Platform
3. Measuring Temperature and Humidity using DHT sensor on Arduino Platform

Unit-V:

Data Acquisition and Analysis: Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Usage of Microsoft Excel tool for descriptive statistics, Data Acquisition using Sensors interfaced with Arduino, exporting acquired data to Microsoft Excel and analysis using visual representation.

Outcome: Student will be able to understand the importance of data collection & analysis. Able to use various sensors with Arduino, acquires data from sensors and analyzing the data through a computer

Activity theme: Acquiring data from sensors using Arduino

Activities: (only for integrated theory and lab course)

1. Data Analysis through Arduino programming for multiple sensors