

Semester – IV
Subject Name: Electrical Software Skill - II
Subject Code: 09EE2405
Diploma Branches in which this subject is offered: Electrical Engineering

Objective: Understanding electrical engineering concepts is necessary in a fast-growing electrical world. Also, it is necessary to develop new things with several add-ons. Many experiments and research work need to be carried out to develop new things, which is an expensive and time-consuming process. The simulation software like MATLAB and hardware interfacing like Arduino provides an advantage in this issue. Using this software provides excellent GUI support and graphical interface, so it is easy to understand existing electrical engineering concepts, very helpful in developing new concepts, and useful in solving the issue in the existing system. So working on this platform will enhance students' ability to understand, develop, and solve problems in the field of electrical engineering.

Credits Earned: 2 Credits

Course Outcomes: After learning the course the students should be able:

1. To understand and apply the fundamentals of programming.
2. To understand and develop a program files.
3. To understand and develop a circuit simulation.
4. To identify different boards and apply programs on Arduino board.
5. To interface different sensors with Arduino board.

Pre-requisite of course: Basic knowledge of DC and AC Circuit, Computer Fundamental Skill, Electrical DC machine and Transformer and Basic Electronics.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term work	
0	0	4	2	00	30	20	25	25	100

Contents:

Unit	Topics	Contact Hours	Weightage (%)
1	Introduction to MATLAB • Introduction to MATLAB	00	00



	• Getting started with MATLAB, Log on and off in MATLAB, Installed location on MATLAB, Accessing of MATLAB, File write and save. • Default MATLAB screen, Current folder window, Workspace window, The command window • Basics of MATLAB, General commands in MATLAB, MATLAB functions, MATLAB variables, MATLAB statements		
2	Programing in MATLAB • Introduction • Variable, Array, and Matrices • Different types of MATLAB operator Arithmetic Operators, Relational Operator, and Logical Operator • Plot and Subplot Label, Title, Legends, Color, Mark and line style, Axis property, Zoom out and zoom in • MATLAB functions • Branching function, Catch/Try function, If function • Loop function For loop function, While loop function • String function, Input function, Output function	00	00
3	Simulink in MATLAB • Introduction • Create and Save Simulink file • Commonly used blocks in Simulink Ground block, Terminal block, Bus creator, Bus selector, Sine wave block, Product, In terminal, Out terminal, Relation operator, Sum. • Logic and bit operations • Create Sub system, Comment Out • Math operations • Sink Display, Scope, Terminator, To file, To workspace, Stop simulation, Go to From • Sources • Constant, Clock, Pulse generator, Ramp, Repeating sequence, Sine wave, Step • Sim-caps • Sim-power system	00	00
4	Arduino hardware and software • Introduction • Different types of Arduino board Arduino Uno, Arduino Due, Arduino Mega, Arduino Leonardo • Different types of sensors	00	00



	Ultrasonic module, IR infrared, Soil moisture sensor, Microphone sensor, Pressure sensor, Photo-resistor sensor, Thermal sensor, Rotary encoder, Smoke sensor, Humidity sensor, Vibration sensor, Speed sensor, Fire detection sensor, PIR sensor, Accelerometer • Different tools, Parts, and Meter for Arduino hardware Soldering iron, Multi-meter, Needle-nose plier, Wire stripper, Screwdriver set, Flush cutter, Tweezer, Breadboard, USB A-B cable, 9-v battery, Battery cap, Different color LED, Different resistor, Photo-resistor, and Jumper wire. • Arduino IDE Downloading and installing Arduino IDE software, the main window of IDE • Setup and loop • Variables • Logical operators EQUAL operator, AND operator, OR operator, NOT operator • Conditional statement Communication with digital and analog components • Communication between PC and Arduino board • Interfacing of the push button • Interfacing of speaker • Single LED interface and blinking of LED • Multiple LED interface and blinking of LED • Interfacing different sensors with Arduino Ultrasonic module, IR infrared, Soil moisture sensor, Microphone sensor, Pressure sensor, Photo-resistor sensor, Thermal sensor, Rotary encoder, Smoke sensor, Humidity sensor, Vibration sensor, Speed sensor, Fire detection sensor, PIR sensor, Accelerometer		
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List of Experiments

Sr. No.	Unit No.	Name of Topics	Contact Hours
1	1	To prepare m file containing given arithmetic operations and take a printout of the results.	4
2	2	To prepare m file to plot a single graph in one figure and multiple graphs in one figure of single and three phase sinusoidal supply voltage, also give its title, axis label, and colour and take a printout of the results.	4
3	2	To prepare m file to plot 3d graph and bar graph of given data and take a printout of results.	2
4	2	To write m file using different loop functions and take a printout.	2

5	2	To create a user-defined function in MATLAB and utilize it in the new script file.	2
6	3	To prepare a circuit in Simulink and measure the circuit's voltage, current, and power.	2
7	3	To analyze single-phase half wave and full wave rectifier using MATLAB-Simulink.	2
8	3	To do an analysis of three phase full wave bridge rectifier with R, RL, RC, and RLC load	4
9	3	To measure different electrical quantities in a three-phase system.	4
10	3	To perform speed control of DC motor using armature control method.	4
11	4	To interface LED with Arduino uno board	4
12	4	To interface pressure sensor with Arduino board	4
13	4	To interface speaker with Arduino uno board	2
14	4	To interface ultrasonic sensor with Arduino uno board	4
15	4	To achieve automatic on-off of LED using LDR with Arduino uno board	4
16	4	To interface PIR sensor with Arduino board	4
17	4	To interface temperature sensor with Arduino board.	4

References:

1. Rudra pratap, "*Getting started with MATLAB 7*", Oxford university press. 2008
2. Agam kumar tyagi, "*MATLAB and Simulink for engineers*", Oxford university press. 2012
3. Roland premier, "*MATLAB for electrical and coputer engineering students and professionals with Simulink*", scitech publishing. 2013
4. S.C.Chakravarty, "*Technology and engineering applications of Simulink*", Intech. 2012
5. Jody culkin, Eric hagan, "*Make: learn electronics with arduino*", shroff publishers and distributors pvt. ltd. 2017
6. Michael margolish, "*Arduino cookbook*", Oreilly. 2011

Instructional Method:

- a. The course delivery method will depend upon the requirement of content and the need of students. The teacher in addition to the conventional teaching method by the black board may also use any of tools such as demonstration, programming, Simulink, Quiz, brainstorming, MOOCs etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory.

- c. Practical examination will be conducted at the end of the semester for an evaluation of the performance of students in the laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory
- e. Show video or animation of MATLAB SIMULATION and Application of Arduino

Supplementary Resources:

<https://in.mathworks.com/examples/>

<https://in.mathworks.com/support/learn-with-matlab-tutorials.html>

<https://www.arduino.cc/en/Main/Tutorials>

<https://www.tutorialspoint.com/arduino/>

<https://hackr.io/tutorials/learn-arduino>

<https://learn.adafruit.com/category/learn-arduino>

<https://www.makerspaces.com/arduino-uno-tutorial-beginners/>