



Course Title: Hardware Design & Simulation

Course Code: to be decided later

Credit Units: 2

Level: UG

L	T	P/S	SW/F W	No. of PSDA	TOTAL CREDIT UNITS
0	1	0	2	3	2

	Course Title: Hardware & Circuit Simulation	Comments (if any)
1	Course Objectives: This course intends the students to understand the basic concept of electronics hardware & its simulation in software with hands on experience.	
2	Prerequisites: Basic Electrical Engineering, Basic Electronics Engineering, Basics of Digital Electronics	
3	Course Learning Outcomes: The students will be able to <ul style="list-style-type: none"> • Understand circuits and simulation software • analyze the project components • Create a working circuit 	
4	Module I Basic Electronics Circuit and Software Simulation Proteus: Introduction to Proteus, Circuit Simulation LED Blinking: Multi-vibrator Circuits, Using Transistor, Using Op-amp. Analog Sensor: Accelerometer, Light Sensor Sound Sensors, Pressure Sensor, Analog Temperature Sensor, Humidity/Moisture Sensor Digital Sensor: Digital Temperature Sensor, Thermocouple, Thermistor, Thermostat, Resistive Temperature Detectors, Potentiometer, Encoders	30%
5	Module II Fundamentals of Arduino Board and Programming	

	Arduino Hardware, Arduino IDE Platform, Arduino Syntax, Arduino Board Layout, Types of Arduino Board, Structure: Structure, Setup (), Loop (), Functions, Variable Declaration and Definition, Datatypes, Arithmetic Expressions, Constants, Flow Control, Logical Operators, Libraries Declaration, Digital Input Output, Analog Input Output, Time Intervals, Mathematical Functions, Random Functions, Serial Communication with Computer.	35%						
6	Module III Arduino Interfacing Output Hardware: 7 Segment Displays, Liquid Crystal Displays, OLED Screen, Graphical Liquid Crystal Displays, Motor Control: Stepper Motor; Servo Motors; DC Motors – Controlling with Joystick, Indexing, Direction Control, Synchronization of two Motors, Solenoids, Electrical and Electronics Relays, Voltage	35%						
7	Pedagogy for Course Delivery: There will be two phases in the course: <ul style="list-style-type: none"> • A tutorial portion on designing, simulation and interfacing of Electronics circuit. Teams of students will design their own prototype or circuit for a simple product of their choice, build simple prototypes of their design, and document their circuit design and simulation. To interface Arduino with different sensors to make a small project guest lectures will be invited to present a range of design challenges. Challenge areas will include consumer products and the needs of the developing world, sustainability, and other users of non-profit organization services. However, it will be the students that choose the topic of the product they wish to pursue. Students will form teams around the concepts they generate. Outside experts will be invited to review the simulation design and prototyping design. • A lab portion of the course will instruct students in design and prototype development of electronics hardware component in areas such as learning required software and hardware. 							
	<p>List of Professional Skill Development Activities (PSDA):</p> <ol style="list-style-type: none"> 1. Study circuit concepts and hands on simulation software 2. Identify the hardware and software to be used in circuit design 3. Develop circuits as per specifications given <p>Assessment/ Examination Scheme:</p> <table border="1"> <thead> <tr> <th>Theory L/T (%)</th> <th>Lab/Practical/Studio/SW (%)</th> <th>Total (%)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>100</td> <td>100</td> </tr> </tbody> </table> <p>Lab/ Practical/ Studio/SW Assessment:</p>	Theory L/T (%)	Lab/Practical/Studio/SW (%)	Total (%)	0	100	100	
Theory L/T (%)	Lab/Practical/Studio/SW (%)	Total (%)						
0	100	100						

Internal Components (Drop down)	Presentation (P)	Home Assignment (HA)	Project (P)	Report Writing (RR)	Viva Voce (V)	Attendance (A)
Linkage of PSDA with Internal Assessment Component, if any	PSDA 3	PSDA 1	PSDA1, PSDA2, PSDA 3	PSDA 3	PSDA 3	
Weightage (%)	10	10	40	20	15	5

Mapping Continuous Evaluation with CLOs

Course Level Outcomes	CLO1	CLO2	CLO3
Assessment type			
Assessment Component 1	✓	✓	✓
Assessment Component 2	✓		
Assessment Component 3	✓	✓	✓
Assessment Component 4		✓	✓
Assessment Component 5		✓	✓

References:

- Richard Blum, Arduino Programming, Pearson Education, 2015 ISBN-13: 978-0672337123
- Neerparaj Raj, Arduino Projects Engineers, BPB Publication, 2016 ISBN-13: 978-8183335973
- Matthew Mackinnon, Arduino: Complete Beginners Guide for Arduino, CreateSpace Independent Publishing Platform (12 April 2016). ISBN-13: 978-1532701696