GLS UNIVERSITY
Bachelor of Computer Applications (BCA)
(Foundation Course)
Semester-IV
210302402 INTRODUCTION TO EMBEDDED SYSTEMS

1. Course Objective:

- To become familiar with the concept of embedded systems, microcontroller unit and single board computer.
- Familiarize the students with flavours of Arduino and pin description of Arduino UNO.
- To become familiar with Raspberry Pi, Photon Particle and NodeMCU.

2. Course Duration:

The course will have sessions which are divided into five modules. Each module consists of six sessions of 60 minutes each and carries a weightage of 20%.

3. Course Contents:

Module No.	Modules/Sub-Modules	No. of Sessions	Marks Weightage

I	**Introduction to Embedded Systems**
	• Define an Embedded System
	• Architecture of Embedded System
	• Embedded System
	  o Components
	  o Block Diagram
	  o Applications
	  o Characteristics
	  o Constraints
	  o Classification with examples
		06	20%

II	**Introduction to Single Board Computer** • Introduction of Raspberry PI **Introduction to Micro Controller Unit** • Photon Particle • NodeMCU • Arduino **Introduction to Hardware Components** **Arduino** • Flavors of Arduino • Pin Description of Arduino Uno • Interfacing various hardware components and modules with Arduino Uno	06	20%
III	**Arduino Sketch Structure** • Arduino Programming Software IDE • Variables • Data types • Constants • Various Operators	06	20%

IV	**Arduino control statements**
	• Arduino Programming Software IDE
	  ○ If statement
	  ○ Else statement
	  ○ Else if statement
	  ○ For statement
	  ○ While statement
	  ○ Do while statement
	  ○ Switch Case
	  ○ Continue
	  ○ Break
	Various Standard functions
	• Digital I/O
	• Analog I/O
	• Communication (Serial)
	• Math
	• Random
		06	20%

V	**Case Studies** **LED interfaces** • Patterns of LED • Rotation of LED • Traffic Light System Design • Analog to Digital Convertor **Bluetooth Interface** **GSM Interface** **Practicals :** • Interfacing with buzzer • Seven segment LED • Display of Text messages • Interfacing with GSM module • Interfacing with ultrasonic sensor • Interfacing with PIR sensor	06	20%

4. Teaching Methods:

The following pedagogical tools will be used to teach this course:

1. Lectures and Discussions
2. Practical demos
3. Assignments and Presentations

5. Evaluation:

The students will be evaluated on a continuous basis and broadly follow the scheme given below:

1.	Assignments / Presentations / Quizzes / Class Participation, etc.	30% (Internal Assessment)
2.	Internal Examination	20% (Internal Assessment)
3.	External Examination	50% (External Assessment)

6. Text Book:

Sr. No	Author/s	Name of the book	Publisher	Edition
-	-	-	-	-

7. Reference Books:

Sr. No	Author/s	Name of the book	Publisher	Edition
R1	Massimo Banzi	Getting Started with Arduino	O'REILLY	-
R2	Richard Blum	Arduino Programming in 24 Hours, Sams Teach Yourself	SAMS	-
R3	Jack Purdum	Beginning C for Arduino: Learn C Programming for the Arduino	-	Second
R4	Neerparaj Rai	Arduino Projects Engineers	BPB Publications	Latest
R5	Ashwin Pajankar	Arduino made Simple	BPB Publications	Latest
R6	John Nussey	Arduino for Dummies	John Wiley & Sons	Second

8. Reference Links:

Sr. No	Name of the book
1	http://ohm.ecce.admu.edu.ph/wiki/pub/Main/TotoAteneoStuff/Arduino_Lab_Manual_July_2011.pdf
2	https://drive.google.com/file/d/.../edit?usp=sharing
3	http://www.ele.uri.edu/Courses/ele205/ELE205Lab/ELE205_Lab_files/Arduino%20-%20Reference.pdf
4	http://www.arduino.cc/en/reference
5	http://www.slideshare.net/anija03/raspberry-pi-26689656

9. Session Plan:

Session No.	Topics / Chapters
1-3	Architecture of Embedded System, Embedded System Components, Block Diagram, Applications of embedded system
4-6	Characteristics of embedded, Constraints, Classification of Embedded Systems with examples
7-9	Introduction to SBC, Introduction to Micro Controller Unit, Hardware Components, Raspberry Introduction
10-12	Flavors of Arduino, Architecture of Arduino UNO
13-15	Introduction to Arduino Sketch Structure, Variables, Data types
16-18	Arduino Arithmetic, Operators, Constants
19-21	**Flow Control:** Loops, Conditional Statements, Digital I/O, Analog I/O function
22-24	Time function, Communication (Serial), Math, Random
25-27	**LED interfaces:** Patterns of LED, Rotation of LED, Traffic Light System Design

	Analog to Digital Convertor, Bluetooth interface, GSM interface
28-30	Interfacing with buzzer, seven segment led, display of text messages

10. Learning Outcomes:

Upon the completion of this course, students will be able to

- Understand the basic concepts of embedded systems its components, architecture and classification
- Understand the flavours of Arduino.
- Understand the Pin description, IDE of Arduino Uno
- Get knowledge of Raspberry Pi and Photon Particle