Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
Autonomous

Course Structure & Credit Distribution for
S. Y. B. Sc. (Comp. Sci.) (Sem. IV) (2022 Pattern)
(w.e.f. June, 2023)

Semester	Paper Code	Title of Paper	No. of Credits
IV	UCSEL241	Advance Embedded System	3
	UCSEL242	Advance Communication and IoT	3
	UCSEL243	Practical Course	3

ANEKANT EDUCATION SOCIETY'S
Tuljaram Chaturchand College of Arts, Science and Commerce,
Baramati (Autonomous)
S.Y.B.Sc. (Comp.Sci.)
(2022 Pattern)
Paper-I: Advance Embedded System
Paper Code – UCSEL241
Credits - 4

Course Objectives:

1. To introduce the Building Blocks of Embedded System.
2. To educate about the characteristics and need of advance embedded system.
3. To introduce various communication interfaces in embedded systems.
4. To impart knowledge about various wireless communication devices.
5. To introduce and learn Single Board Computers
6. To introduce Basics of Real time data and example tutorials to discuss real time applications.
7. To learn Arduino IDE.

Course Outcomes:

1. Acquire basic knowledge about the fundamentals of embedded systems.
2. Acquire knowledge about devices and buses used in embedded networking.
3. Develop programming skills in embedded systems for various applications.
4. Acquire knowledge about basic concepts of Arduino IDE.
5. Acquire knowledge about devices and buses used in embedded systems.
6. Acquire knowledge about the hardware and software in Embedded System using SBCs.
7. Acquire knowledge about the Internet of Things and an online application tool Blynk.

Unit 1: Introduction to Embedded Systems **(12)**
History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, Applications of embedded systems, and Characteristics of embedded systems.

Unit 2: Communication Interface **(12)**
Onboard communication interfaces-I2C, SPI, CAN, parallel interface; External communication interfaces-RS232 and RS485, USB, infrared, Bluetooth, WI-FI, ZigBee.

Unit 3 : Introduction to Embedded systems using single board computers (SBC) **(12)**
Single boards computer block diagram, types, Comparison of SBC models, Specifications, I/O devices (Storage, display, keyboard and mouse), Network access devices. Arduino Microcontroller board.

Unit 4: Case Studies **(12)**
LED Blinking using Arduino, 7 segment display using Arduino, Data display on LCD using Arduino, Temperature monitoring system using Arduino, Intruder Detector System Using Arduino, Blynk IoT.

Recommended books:

1. Embedded Systems - Raj Kamal, TMH.
2. .Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013.
4. An Embedded Software Primer - David E. Simon, Pearson Education.
5. Arduino: The complete guide to Arduino for beginners, including projects, tips, tricks, and programming – James Arthur, Ingram Publishing, 2020.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	-	-	-	-	-	2	1
CO2	1	1	-	-	-	-	1
CO3	2	1	2	-	1	-	2
CO4	1	1	1	-	-	-	-
CO5	-	-	-	-	1	-	3
CO6	3	2	2	-	1	2	3
CO7	3	2	2	2	-	1	2

Course Objectives:
   1. To impart knowledge about the basic communication system in Electronics.
   2. To educate about the modulation and demodulation techniques.
   3. To know about different data collecting and accessing techniques for communication.
   4. To expose students about the wireless communication system.
   5. To study the recent trends adopted in cellular systems.
   6. To introduce the students to recent wireless standards.
   7. To get knowledge about wireless electronics applications.

Course Outcomes:
   1. Discuss various types of communication system.
   2. Solve the numerical problems related to data transmission.
   3. Get the knowledge about technologies in telephones and MODEM.
   4. Learn about the concept of wireless communication.
   5. Discuss the cellular system design and technical challenges.
   6. Summarize the principles and applications of wireless systems and standards like GSM, Wi-Fi, Bluetooth, IoT.
   7. Design Real Time Applications regarding wireless communication.

UNIT-1: Introduction to Electronic Communication   [12]

Block diagram of Electronic Communication System, types of communication (Base band and Broadband, Simplex and Duplex), Serial (Asynchronous and Synchronous) and Parallel communication, Definition of Signal bandwidth, channel bandwidth, data rate, baud rate.

Modulation and Demodulation **-** Introduction to concepts of modulation and demodulation, Need of modulation, Modulation techniques: Analog modulation: Amplitude, Phase and Frequency modulation, modulation index and frequency spectrum. Digital modulation: Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM), MODEM.

UNIT-2: Multiplexing and Multiple Accessing   [12]

Study of multiplexing: FDM, TDM, CDM, WDM. Concept of Spread Spreading, Study of Multiple Accessing: FDMA, TDMA, CDMA.

UNIT- 3: Wireless Communication systems   ` [12]

Introduction to wireless communication system. Need of wireless communication systems. Mobile Communication, Cellular concept, working of GSM, Concept of Hand over. Bluetooth and Wi-Fi (Comparison based on range, data rate, frequency, Power).

Unit- 4: Internet of Things   **[12]**

        Introduction, Definitions and History of Internet of Things, Need of IoT, IoT Architecture, Applications – Home Automation, Smart Cities, IoT in Environmental Protection, Habitat Monitoring, Agricultural Automation.

Recommended Books:
1. Communication Electronics: Principles and Applications. L. E. Frenzel 3rd Edition.
2. Modern Electronic Communication. G.M. Miller 7th Edition
3. Mobile Communication Jochen Schiller 2nd Edition.
4. Wireless Communications: Principles and Practice. Rappaport
5. Wireless Communications and Networks. William Stallings
6. Hakima Chaouchi, ― "The Internet of Things Connecting Objects to the Web" ISBN : 978-1- 84821-140-7, Wiley Publications
7. Olivier Hersent, David Boswarthick, and Omar Elloumi, ― "The Internet of Things: Key Applications and Protocols", Wiley Publications

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	-	-	-	-	2	-
CO2	-	1	-	1	-	-	-
CO3	1	-	-	-	3	2	1
CO4	1	1	-	1	-	-	-
CO5	1	-	-	1	-	-	1
CO6	2	-	-	-	-	1	2
CO7	2	2	2	-	-	-	-

Paper- III: Practical Course [UCSEL243]

<u>**Course Objectives:**</u>
1. Understand and study of SBC (Arduino UNO) and learn Arduino IDE.
2. Learning numerous applications using Arduino UNO.
3. Study of various hardware devices like 7segment display and LCD.
4. Designing of various modulator and demodulator circuits.
5. Design and generate error detector and error corrector circuit for 4 bit data.
6. Analyze different wireless communication techniques.
7. Learn serial communication in Arduino IDE.

<u>**Course Objectives:**</u>
1. Learn Arduino IDE.
2. Get knowledge about the programming in Arduino IDE for different applications.
3. Discuss various hardware interfacing devices and their applications in real time.
4. Design and implement hardware circuit to test performance and application in communication electronics.
5. Understand concept of Embedded Systems.
6. Design and implement hardware circuit and software to test performance and application in Embedded Systems.
7. Know the IoT technology Android Application.

<u>**Section I:**</u> **Advance Embedded System**
1. Understanding Arduino UNO Board.
2. Installing and work with Arduino IDE
3. LED Blinking with Arduino
4. Seven Segment Display interfacing with Arduino.
5. LCD interfacing with Arduino
6. Serial Communication with Arduino
7. LED control with ESP8266
8. Interfacing Arduino with Cloud (Thingspeak API)

<u>**Section II : Advanced Communication Systems**</u>

1. Build and test Amplitude Modulator and Demodulator.
2. Build and test Time Division Multiplexing circuit.
3. Build and test Frequency Shift Keying.
4. Build and test Delta Modulation circuit using IC.
5. Build and test Pulse Amplitude Modulation.
7. Build and test Hamming Code generator and detector circuit.
8. LED blinking using IoT. (Blynk).

Activities :
1. Internet Survey of Recent Trends in Electronics.
2. Seminar
3. Group Discussion
4. Hobby Project

*8 experiments and one Activity are compulsory.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1	-	-	-	1	1
CO2	1	1	1	-	-	-	-
CO3	1	-	-	-	-	2	2
CO4	1	2	-	-	1	2	2
CO5	2	2	2	2	-	-	2
CO6	1	1	2	-	-	-	-
CO7	2	2	2	2	2	2	2