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

Course Structure For S. Y. B. Sc. (Computer Science)
2020-21

Equivalence Subject/Paper and Transitory Provision

Sem	Old Syllabus	New Syllabus
Sem-I	Paper-I : Digital System Hardware (EIC 211)	Paper-I: Fundamentals of Memory organization and Embedded System (CSEL2101)
	Paper-II: Analog Systems (EIC 212)	Paper-II: Analog Electronics (CSEL 2102)
		Paper- III: Practical Course (CSEL 2103)
Sem-II	Paper-I: The 8051 Architecture, Interfacing & Programming (EIC 221)	Paper-I: The 8051 Architecture, Interfacing & Programming (CSEL2201)
	Paper-II:Communication Principles (EIC 222)	Paper- II: Advanced Communication Techniques [CSEL 2202]
		Paper- III: Practical Course (CSEL 2203)
Sem-I & II	Paper- III: Practical Course (ELC 223)	

S.Y.B.Sc. (Computer Science) Electronics -Semester I

Paper I:Fundamentals of Memory organization and Embedded System (CSEL2101)

Objectives:

1) Apply knowledge of computer architecture and organization appropriate to the discipline
2) Analyze given processing element, and identify and define the computing requirements.
3) Design, implement, and evaluate a microcontroller-based system, process, component, or program to meet desired needs.
4) Use current techniques, skills, and tools necessary for Low-Level computing.

UNIT- 1: Memory [12]

Memory Architecture, Memory Hierarchy, Introduction to USB storage device, Memory parameters (Access time, speed, capacity, cost), Vertical & horizontal Memory expansion (increasing the capacity, increasing word size, increasing the capacity and word size), Associative Memory, Cache memory, cache mapping techniques, virtual memory.

UNIT- 2: Computer Organization [12]

Concept of Address Bus, Data Bus, Control Bus. Register based CPU organization, stack organization, I/O organization: need of interface, block diagram of general I/O interface. Working concepts like polling, interrupt initiated data transfer. Concept of DMA, DMA transfer, DMA Controller Serial communication: Synchronous, asynchronous and their data transmission formats, RS–232, General block diagram of UART, USB.

UNIT- 3: Microprocessor [12]

Evolution of Microprocessor (8086 to Pentium 4), Features like address, data, bus size, speed, cache capacity, number of parallel instructions executed. Concept of RISC & CISC, Von-Neumann & Harvard Architecture, pipeline. Architecture of basic microprocessor: 8086 & Pentium (Basic Version), pipeline. Introduction to multicore processors.

UNIT- 4: Introduction To Embedded System [12]

History & need of Embedded System, Definition of an embedded system, Basic components of Embedded System, characteristics of embedded systems, Applications of embedded systems. Classification of Embedded System, Advantage & Disadvantage, Introduction to Embedded C, Difference between C & Embedded C, Basic structure of embedded C program, Introduction of Arduino, its types and features, interfacing LED, LCD etc.

Recommended Books:

1. Fundamental of Digital electronics : R.P. Jain
2. Digital design : M. Morris Mano, Prentice-Hall of India
3. Computer System Architecture : Morris Mano, Prentice-Hall of India
4. Embedded C - Michael J Point
5. The Pentium Microprocessor : James Antonakos
6. Microprocessors and Interfacing Programming and Hardware: Douglas V. Hall- TATA McGRAW-HILL EDITION
7. The Intel Microprocessors : Barry B. Brey- Pearson Education Asia
8. Embedded System, Architecture and programming,Rajkamal,TMH,2008

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Paper-II : Analog Electronics (CSEL 2102)

Objectives:

1) To understand basics of analog electronics
2) To study different types of sensors
3) To understand different types of signal conditioning circuits
4) To learn data conversion techniques
5) To apply knowledge of analog systems in different applications

UNIT 1: Analog Systems [12]

Introduction of Analog electronic systems. Definition of sensors and transducers. Classification of sensors: Active and passive sensors. Specifications of sensors: Accuracy, range, linearity, sensitivity, resolution, reproducibility. Temperature sensors (LM-35), optical sensor (LDR), displacement sensor (LVDT), Passive Infrared sensor (PIR). Introduction to Op-amp, specifications of op-amp, types of Op-amp: Inverting and non-inverting with expression, Applications of Op-amp.

UNIT- 2: Signal Conditioning [12]

Introduction to signal conditioning, Signal conditioning of passive sensors using bridge circuit: Wheatstone's bridge, Level Shifter, Amplifier, Three OP-amp instrumentation amplifier, Filters; active and passive filters, Concept of Order of filters. Working principle of Single order Op-Amp based Low Pass Filter, High Pass Filter, Band Pass Filter, Notch Filter, Band reject filter; Working of Voltage to frequency Converter using Op-amp.

UNIT- 3: Data Converters [12]

Digital to Analog Converter (DAC): Resistive divider, R-2R ladder, Parameters: Linearity, resolution, accuracy, Analog to Digital Converter (ADC): Types of ADC- Flash, Successive approximation, single slope, dual slope. Parameters of ADC: Linearity, resolution, conversion time, accuracy. Applications of DAC and ADC.

UNIT- 4: Case studies [12]

Temperature monitoring system using LM35, Intruder detector system using PIR sensor, Electrocardiography (ECG), Schmitt trigger.

Recommended Books:

1. Sensors & Transducers : Dr. A. D. Shaligram: CTC publications
2. Op-Amps and Linear Integrated Circuits: Ramakant Gaikwad: PHI: 4th Ed.
3. Electronic Instrumentation: H. S. Kalsi: TMH: 2nd Ed.
4. Modern Electronic Instrumentation and Measurement Techniques: Albert D. Helfrick, William D. Cooper: PHI publications
5. Electronic measurements : K.A. Bakshi, A. V. Bakshi and U. A. Bakshi, Technical publications.
6. A Course in Electrical and Electronic measurements and Instrumentation: A.K. Sawhney: Dhanpat Rai & Sons Educational & technical publishers
7. Handbook of Biomedical instrumentation: R. Khandpur, Tata McGraw Hill Publications 2003.

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Paper- III: Practical Course [CSEL 2103]

Objectives:

1. To use basic concepts for building various applications in electronics.
2. To understand design procedures of different electronic circuits as per requirement.
3. To build experimental setup and test the circuits.
4. To develop skills of analyzing test results of given experiments.

Total Practical to be conducted 10.

8 experiments compulsory.

Activities (2) :

Section I : Fundamentals of Memory organization and Embedded System

1. Study of read and write action of RAM (using IC 2112/4 or equivalent).
2. Knowledge of hardware that goes in the making of a computer: Assembling of PC. Installation of OS, setting up of dual boot, installation of hardware and software.
3. Arduino with LCD
4. Display counter using Arduino
5. Interfacing of Seven Segment Display to arduino
6. Analog to Digital Conversion using arduino
7. Pulse Width Modulation using arduino
8. Wireless Connectivity to Arduino
9. Serial communication using RS 232

Section II : Analog Electronics

1. LM-35 based temperature sensing system.
2. IC-741 Op Amp. As Inverting and Non-inverting amplifier.
3. Build and test DAC using R-2R Ladder network.
4. Flash ADC using discrete components.
5. Build and test LDR based light control system.
6. Study of Linear Variable Differential Transformer.
7. Build and test Instrumentation Amplifier.

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S.Y.B.Sc. (Computer Science) Electronics -Semester II

Paper-I: The 8051 Architecture, Interfacing & Programming (ELC 221)

Objectives:

1. To study the basics of 8051 microcontroller
2. To study the Programming and interfacing techniques of 8051
3. To apply knowledge of 8051 to design different application circuits
4. To introduce the basic concepts of advanced Microcontrollers

UNIT- 1: Basics of Microcontroller & Intel 8051 architecture [12]

Introduction to microcontrollers, difference in controller and processor. Architecture of 8051, Internal block diagram, Internal RAM organization, SFRS, pin diagram of 8051, I/O ports and specifications of I/O Ports, External Memory Interface.

UNIT-2: Programming model of 8051 [12]

Instruction classification, Instruction set, Addressing Modes: Immediate, register, direct, indirect and relative, assembler directives (org, end), features with example, I/O Bit & Byte programming using assembly language for LED and seven segment display (SSD) interfacing. Introduction to 8051 programming in C.

UNIT- 3: Timer / counter, serial communication, Interrupts & Programs using 'C' [12]

TMOD, TCON, SCON, SBUF, PCON Registers, Timer modes, programming for time delay using mode 1 and mode 2. Introduction to interrupt ,Interrupt types and their vector addresses, Interrupt enable register and interrupt priority register(IE,IP), Synchronous and asynchronous

serial communication , Programming serial port without interrupt, Use of timer to select baud rate for serial communication.

UNIT- 4: Interfacing, programming using 'C' & Applications of 8051 [12]

Interfacing ADC, DAC, LCD, stepper motor. Study of advance micro controllers (ARM & PIC): Features and applications

Recommended books:

1. 8051 microcontroller and Embedded system using assembly and C : Mazidi, Mazidi and McKinley, Pearson publications
2. The 8051 microcontroller – Architecture, programming and applications: K.Uma Rao and AndhePallavi, Pearson publications.
3. ARM System Developers guide: Sloss, Andrew n. Symes.
4. Design with PIC microcontrollers: Peatman, Pearson publications.

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Paper- II: Advanced Communication Techniques [CSEL 2202]

Objectives:

1. To understand basics of communication systems.
2. To understand modulation, demodulation and multiplexing of signals.
3. To understand digital communication techniques
4. To introduce concepts in advanced wireless communication.

UNIT-1 : Introduction to Electronic Communication [12]

Importance of Communication, Elements of Communication system, Electromagnetic spectrum, types of communication, serial and parallel communication, Concepts of communication system : Signal bandwidth, channel bandwidth, data rate, baud rate, Nyquist theorem, Signal to noise ratio, and channel capacity, Shannon theorem, Error handling code : Hamming code.

UNIT-2 : Modulation and Demodulation [14]

Introduction to concepts of modulation and demodulation. Modulation techniques: Analog modulation: Amplitude, Phase and Frequency modulation, Circuit diagram and working of transistorized amplitude modulator and diode demodulator. Equation of amplitude modulated wave, modulation index and frequency spectrum. (Phase and frequency modulation circuits are not expected). Digital modulation: Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Block diagram and working, delta modulation circuit, MODEM - concept of ASK, FSK, BPSK, QPSK and block diagram of MODEM using FSK.

UNIT-3 : Multiplexing and Multiple Access Techniques [10]

Study of multiplexing and multiple access techniques: Space division multiplexing , Time division multiplexing , Frequency Division Multiplexing , Code division multiplexing, Introduction to Spread Spectrum, Introduction to multiple access and corresponding access types : FDMA , TDMA , CDMA.

UNIT- 4 : Advance 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). Internet of Things : Introduction, Need, Architecture, Applications, introduction to 5G.

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

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Paper- III: Practical Course [CSEL 2203]

Objectives:

1. To use basic concepts for building various applications in electronics.
2. To understand design procedures of different electronic circuits as per requirement.
3. To build experimental setup and test the circuits.
4. To develop skills of programming
5. To learn advanced communications in electronics

8 experiments compulsory.
Activities (2).

Section I: The 8051 Architecture, Interfacing & Programming

1. Arithmetic, logical & code conversion problems using assembly/C programming
2. Interfacing the thumbwheel & seven segment display.
3. Traffic light controller using microcontroller.
4. Interfacing LCD to Microcontroller.
5. Waveform generation using DAC Interface.
6. Event counters using opto- coupler using seven segment display / LCD.
7. Speed Controller of stepper motor using microcontroller

Section II : Advanced Communication Systems

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).