Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science andCommerce, 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-II	**Paper-I: The 8051 Architecture, Interfacing & Programming(ElC221**	**Paper-I: The 8051 Architecture,Interfacing & Programming (CSEL2201)**
	Paper-II: Communication Principles(ElC 222)	**Paper-II:Advanced Communication Techniques [CSEL2202]**
		Paper- III:Practical Course (CSEL 2203)
Sem-I & II	**Paper- III:Practical Course** (ELC 223)	

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

Paper-I: The 8051 Architecture, Interfacing & Programming [CSEL 2202]

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.
5. To develop programs for interfacing various I/O Devices.
6. To provide basic foundation on the fundamentals of 8051 microcontrollers.
7. To get knowledge about registers and interrupt in 8051.

Course Outcomes:

CO1: To apply a basic concepts of digital fundamentals to 8051 microcontrollers.
CO2: To identify a software and hardware structures of the 8051 microcontrollers.
CO3: To analyze the data transfer information through serial and parallel ports.
CO4: To train their practical knowledge through programming of 8051 microcontroller.
CO5: To make students able to develop programming logic.
CO6: To identify hardware and software component to build an 8051 microcontroller.
CO7: To provide fundamental operating concept of 8051 microcontroller.

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.

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

PO Justification:

PO1: Computer Knowledge:

CO1: Students able to know about digital fundamentals with 8051 microcontrollers, enhancing computer knowledge by applying foundational concepts to a specific microcontroller architecture.
CO2: Students have deep knowledge about both software and hardware structures specific to the 8051 microcontroller.
CO3: Student enhances computer knowledge by focusing on data transfer mechanisms through serial and parallel ports, providing practical insights into communication interfaces.
CO5: Students will able to develop programming logic which is essential skill for development of 8051 microcontroller.
CO6: Enhances computer knowledge by requiring identification of both hardware and software components crucial for building and understanding the 8051 microcontroller system.
CO7: Students have deep computer knowledge which provides fundamental operating concepts specific to the 8051 microcontroller, ensuring a solid understanding of its core functionality.

PO2: Design/ Development of a solution:

CO1: Students are able to apply digital fundamentals to design solutions involving 8051 microcontrollers. Provides understanding to the digital principles is must for designing effective solutions.
CO2: Students are able to recognize software and hardware structure which is fundamental to designing solutions with 8051 microcontrollers.
CO3: Analyzing data transfer mechanisms is an essential skill in designing solutions that involve communication. Students able to design solutions that incorporate efficient data transfer through various ports.
CO4: Students gained Practical knowledge through programming which directly contributes to the ability to design and develop solutions.
CO5: Developing programming logic is foundational to the design process. Students can create logical and effective solutions through programming.
CO6: Identifying components for building an 8051 microcontroller is a crucial aspect of designing solutions. Students having the knowledge needed for designing the hardware and software architectures.

PO3: Modern tool usage:

CO1: Students will apply modern tools for digital design when working with 8051 microcontrollers. Understanding digital fundamentals involves utilizing modern tools in the design process.
CO2: Student identifying software and hardware structures involves the use of modern tools for system analysis and design.
CO3: Students are able to analyze data transfer information often involves using modern tools for signal analysis and communication protocols.
CO5: Students developing programming logic which facilitated by modern tools for code development and debugging. Ensuring students are good in using modern programming tools to develop logical solutions.
CO6: Identifying hardware and software components involves using modern tools for system

modeling and design.
CO7: Understanding the fundamental operating concept often involves using simulation tools for system behavior analysis.

PO6: Individual and teamwork:
CO1: This involves individual understanding and application of digital fundamentals to 8051 microcontrollers. Additionally, students may collaborate in teams to solve more complex problems related to the application of digital concepts in microcontroller programming.
CO2: Students develop understanding of software and hardware structures requires both individual comprehension and collaborative efforts, especially in team projects where diverse skills contribute to the identification and analysis of these structures.
CO3: Students enhance skill of analyzing data transfer mechanisms which involves both individual and collaborative efforts. Students may work individually on specific aspects and come together in teams to combine their findings and insights into comprehensive analyses.
CO4: Student can develop programming skills individually through practice, and collaborative projects may provide opportunities for the students to share knowledge, troubleshoot together, and collectively enhance their practical programming abilities.
CO5: Developing programming logic is an individual skill that is also strengthened through teamwork. Collaborative problem-solving can expose students to different approaches, improving their logical thinking and programming skills.
CO6: Identifying components for microcontroller construction involves both individual research and collaborative efforts. Team projects may require students to pool their knowledge and skills in selecting appropriate hardware and software components.
CO7: Students able to understand the fundamental operating concept is an individual learning. However, in team scenarios, individuals can contribute their understanding to collectively form a comprehensive overview of the microcontroller's fundamental operation.

PO7: Innovation, Employability and Entrepreneurial skills:
CO1: Students will apply digital fundamentals to microcontrollers requires a creative and innovative approach. This contributes to fostering innovation in microcontroller applications, enhancing employability by equipping students with practical skills relevant to industry demands.
CO2: Students identifying software and hardware structure involves problem-solving and analytical skills, essential for innovation. Understanding the structures enhances employability, as it aligns with industry needs for professionals capable of comprehending and working with complex systems.
CO3: Students analyzing data transfer mechanism requires a combination of analytical skills and practical knowledge. This leads to employability by ensuring students can apply their understanding to innovate in data transfer systems, a valuable skill in various industries.
CO4: Practical knowledge in microcontroller programming is a valuable employable skill. This contributes to employability by providing students with hands-on experience and the ability to apply programming skills innovatively in various entrepreneurial contexts.
CO5: Students developing programming logic is important for innovation. This enhances employability by ensuring that students can think logically and innovatively in programming scenarios, a skill highly sought after in the job market.
CO6: Identifying components for microcontroller construction requires a mix of technical knowledge and practical application. This contributes to employability by preparing students to make innovative decisions in hardware and software selection, crucial for entrepreneurial ventures.
CO7: Understanding the fundamental operating concept is foundational for innovation in microcontroller applications. This enhances employability by ensuring students possess a solid foundation, making them adaptable to various entrepreneurial and innovative scenarios.

Paper- II: Advanced Communication Techniques [CSEL 2202]

Course Objectives:

1. To study basics of communication systems.
2. To understand telephone system.
3. To understand Amplitude Modulation.
4. To understand AM demodulation techniques.
5. To understand Frequency Modulation.
6. To understand demodulation techniques.
7. To learn the Digital communication system.

Course Outcomes:

CO1: Understand and identify the fundamental concepts and various components of communication systems.
CO2: Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
CO3: Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.
CO4: Define the need of modulation for communication systems.
CO5: Explain the behavior of the communication systems in the presence of noise.
CO6: Compare the different analog and digital modulation schemes for transmission of information.
CO7: Calculate the bit error rate for different digital modulation schemes.

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 communicationsystems. 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

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

PO Justification:

PO1: Computer knowledge:

CO3: Developing the ability to compare and contrast communication systems involves accessing and utilizing various resources, possibly through online databases, simulations, or analytical tools.

CO6: Students comparing modulation schemes may involve using computer simulations to evaluate their performance under various conditions. Computer knowledge is essential for conducting these comparisons efficiently and accurately.

CO7: Students are able to calculating the bit error rate often involves complex mathematical models and simulations. Computer knowledge is needed for using computational tools to perform these calculations and analyze the performance of digital modulation schemes.

PO2: Design/ development of a solution:

CO1: Understanding the fundamental concepts and components of communication systems lays the groundwork for designing solutions in communication engineering. This knowledge is essential for creating effective and efficient communication solutions.

CO2: Explaining signal-to-noise ratio, noise figure, and noise temperature involves understanding the impact of noise in communication systems. This knowledge is crucial for designing solutions that minimize the effects of noise and optimize system performance.

CO4: Students defining the need for modulation involves understanding the practical requirements of communication systems. This understanding is essential for designing modulation schemes that meet specific communication goals and constraints.

CO5: Students explaining the behavior of communication systems in the presence of noise is crucial for designing solutions that enhance signal integrity and minimize the impact of noise on communication. This knowledge contributes to effective system design.

CO6: Students able to comparing modulation schemes involves evaluating their suitability for different communication scenarios. This knowledge is valuable for designing solutions that employ the most effective modulation scheme based on specific requirements.

CO7: Calculating the bit error rate for digital modulation schemes is essential for assessing their performance. This skill is valuable for designing solutions that meet specific error rate criteria in digital communication systems.

PO3: Modern tool usage:

CO1: Students will develop understanding about fundamental concepts may involve the use of modern tools for simulation, modeling or analysis in communication systems.

CO3: Students having ability to compare and contrast communication systems which involves the use of modern tools to gather, analyze and present data. Students may use data analysis tools, simulation software or other modern tools to enhance their ability to evaluate communication systems.
CO4: Defining the need for modulation may involve the use of modern tools for signal analysis and visualization. Students can use software tools to explore and demonstrate the benefits of modulation in communication systems.
CO6: Comparing modulation schemes can be facilitated through the use of simulation and analysis tools. Students can utilize modern tools to simulate and compare the performance of various analog and digital modulation schemes.

PO6: Individual and teamwork:
CO1: Student having understandings about fundamental concepts may involve individual study and research. However, teamwork might be required for collaborative projects or discussions where different perspectives contribute to a more comprehensive understanding.
CO2: For getting some concepts student may require individual understanding, but teamwork can be valuable for discussing complex scenarios or solving problems collaboratively, bringing diverse insights to the analysis of signal and noise in communication systems.
CO3: Developing the ability to compare and contrast communication systems is a skill that can be honed individually, but collaborative efforts may provide a broader range of perspectives and foster a more thorough analysis of strengths and weaknesses.
CO4: Defining the need for modulation involves individual understanding of the theoretical aspects. However, teamwork may be beneficial for brainstorming and collectively exploring real-world applications and scenarios where modulation is essential.
CO6: Students able to compare modulation schemes involves individual analysis, but teamwork is valuable for sharing insights, discussing trade-offs and collectively evaluating the pros and cons of different modulation techniques.
CO7: Calculating bit error rate for digital modulation schemes may require individual mathematical proficiency, but teamwork can be beneficial for cross-verification, sharing methodologies, and collectively addressing challenges in the calculation process.

PO7: Innovation, Employability and Entrepreneurial skills:
CO1: Students are able to understand fundamental concepts which is the base for innovation in communication systems. This knowledge enhances employability by providing a solid foundation for individuals to contribute to innovative solutions and entrepreneurial endeavors in the field.
CO2: Students ability to explain and analyze signal-to-noise ratio and noise characteristics is crucial for innovation in communication systems. Understanding these parameters enhances employability by making individuals valuable contributors to innovative solutions and entrepreneurial ventures.
CO4: Students having ability to defining the need for modulation involves understanding practical applications. This knowledge enhances employability by preparing individuals to contribute innovative ideas for modulation techniques and entrepreneurial solutions in communication systems.
CO5: Students able to explain the behavior of communication systems in the presence of noise is crucial for innovation. Individuals who understand and can address noise-related challenges are better positioned for employability.
CO6: Comparing modulation schemes requires understanding their advantages and disadvantages. This knowledge contributes to innovation, employability, and entrepreneurship by enabling individuals to propose novel solutions and make informed choices in communication system design.
CO7: Calculating the bit error rate is essential for assessing the performance of digital modulation schemes. Individuals with these skills are valuable contributors to innovative projects and entrepreneurial initiatives in the communication technology sector.

Paper- III: Practical Course [CSEL 2203]

Objectives:
1. To use basic concepts for building various applications in electronics.
2. To use basic concepts for 8051 microcontroller in designing of various applications.
3. To build experimental setup and test the circuits.
4. To develop skills of programming
5. To learn advanced communications in electronics
6. To learn interfacing techniques.
7. To understand advanced communication techniques.

Course Outcomes:

CO1: Design and implement hardware circuit to test performance and application in communication electronics.

CO2: To develop skills of programming.

CO3: Design any instrumentation based application circuit and test it.

CO4: Design and test analog modulation circuit.

CO5: Simulate the 8051 program on Keil compiler.

CO6: Design, Build and test modulator and demodulator.

CO7: Develop op-amp based circuits.

List of Practical (Instrumentation): Any Four.
8 experiments compulsory.Activities (2).

<u>Section I:</u> 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

<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 Time Division Multiplexing circuit.
4. Build and test Frequency Shift Keying.
5. Build and test Delta Modulation circuit using IC.
6. Build and test Pulse Amplitude Modulation.
7. Build and test Hamming Code generator and detector circuit.
8. LED blinking using IoT. (blynk).

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

PO Justification:

PO1: Computer knowledge:

CO3: Instrumentation design may involve the use of computer-aided design tools for schematic capture and simulation. Additionally, computer knowledge is crucial for analyzing and interpreting data collected from the instrumentation circuit.

CO5: Simulating programs on a compiler like Keil involves computer knowledge, as students need to understand the compilation process, debugging, and simulation capabilities provided by the compiler to verify the functionality of their 8051 microcontroller programs.

CO6: Computer knowledge is essential for designing and simulating modulator and demodulator circuits using software tools before building and testing the physical circuits. Simulation tools aid in understanding and optimizing circuit performance.

CO7: Developing op-amp based circuits may involve using computer simulations for design and analysis. Computer knowledge is crucial for using simulation tools to predict the behavior of op-amp circuits and optimize their performance.

PO2: Design/ development of a solution:

CO1: The design and implementation of hardware circuits involve problem-solving and the development of solutions. Students, in this case, are engaged in the practical application of their knowledge, translating theoretical concepts into tangible solutions in communication electronics.

CO2: Programming skills development is a crucial aspect of designing solutions. Students learn to create programs that address specific needs in communication electronics, contributing to the broader skill set required for designing effective solutions.

CO4: Students designing and testing an analog modulation circuit requires the creation of a solution that fulfills the requirements of a communication system.

CO5: Students simulating a program on a compiler involves testing and refining a solution to meet specific criteria. By simulating the 8051 program, students are actively engaged in the development and refinement of a solution in the realm of microcontroller programming.

CO6: The entire process of designing, building, and testing a modulator and demodulator involves creating solutions for effective communication. Students apply their knowledge to develop solutions that facilitate the transmission and reception of signals.

CO7: Developing op-amp based circuits requires creating solutions for various applications. Whether it's amplification, filtering, or other functionalities, students are actively engaged in the design and development of op-amp based solutions.

PO3: Modern tool usage:

CO1: The design and implementation of hardware circuits often involve modern tools for simulation, modeling, and analysis. Students may use computer-aided design (CAD) tools to simulate and analyze the performance of their hardware circuits before physical implementation.

CO3: Designing instrumentation-based application circuits may involve the use of modern tools for schematic capture, simulation, and analysis. Students can use software tools to model and simulate their instrumentation circuits.

CO4: Designing and testing analog modulation circuits can benefit from modern simulation tools. Students may use software tools to simulate and analyze the behavior of analog modulation circuits, aiding in the design process.

CO6: The design and testing of modulator and demodulator circuits may involve modern simulation tools. Students may use software tools to simulate and analyze the performance of these circuits before building and testing them physically.

PO6: Individuals and teamwork:

CO1: Designing and implementing hardware circuits may involve both individual and teamwork. While individual skills are crucial for circuit design, collaboration may be necessary for more complex projects or when testing performance and application in communication electronics.

CO2: Programming skills development can include both individual learning and collaborative efforts. In a teamwork scenario, individuals may contribute different programming skills, and collaboration might be essential for larger projects or addressing complex programming

challenges.
CO3:Designing and testing instrumentation circuits may involve both individual design efforts and collaborative testing. While individuals may develop their application circuit designs, teamwork might be necessary to efficiently test and analyze the performance of the circuits.
CO6: Designing, building, and testing modulator and demodulator circuits may require a combination of individual design skills and teamwork during the testing phase. Collaboration becomes crucial when assembling and testing physical circuits.

PO7: Innovation, Employability Entrepreneurial skill:
CO1: Designing and implementing hardware circuits for communication electronics involves innovation in creating solutions. These skills contribute to employability by preparing students to address real-world challenges in communication technology and fostering an entrepreneurial mindset.
CO2: Developing programming skills is essential for innovation in communication electronics. These skills enhance employability as individuals proficient in programming are better equipped to contribute to innovative solutions and entrepreneurial ventures in the field.
CO4: Designing and testing analog modulation circuits involves innovation in optimizing communication systems. These skills enhance employability as individuals capable of designing and testing such circuits are valuable in industries requiring analog signal processing, and they may identify entrepreneurial opportunities.
CO5: Simulating programs on the Keil compiler involves innovation in developing and testing microcontroller programs. These skills enhance employability in embedded systems and contribute to an entrepreneurial mindset by encouraging individuals to explore new applications for microcontroller programming.
CO6: Designing, building, and testing modulator and demodulator circuits requires innovative thinking to optimize communication processes. These skills contribute to employability in communication engineering and foster an entrepreneurial mindset by encouraging students to explore novel modulation techniques.