Lesson Plan No. 1	Course Name: Microcontroller and applications Topic: Introduction to Microprocessor	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Articulate the basic concept of microprocessor and peripheral interfacing b. Explain the evolution of microprocessor c. Illustrate the various applications of microprocessor d. appreciate advantages of microprocessor based real life applications
Teaching Aids (if any)	a. YouTube video on Microprocessors b. PowerPoint presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. Have you heard about microprocessor? What do you mean by an integrated circuit? What do you mean by a processor? Which processor does your laptop have? - Introduce the basics of microprocessor. - Discuss about the Evolution of microprocessors - Talk about the processors available in the market these days. - Introduce the formal definition of Microprocessor - Highlight the importance of interfacing - Talk about utilities - Highlight the important characteristics of microprocessor - Highlight the importance of microprocessor in our life. - **Development** (30 minutes) a Microprocessor - Introduce the concept of Microprocessor - Show video on evolution of microprocessors - Introduce concept of interfacing b Interfacing - Introduce the concepts of Interfacing - Discuss the projects that can be made using microprocessors. Major players in microprocessors - Intel Advantages of microprocessors - Speed - Compatibility - Low size - Versatile - Exercise (5 minutes) –

	Give students time to discuss the various applications of microprocessors.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video Lecture https://www.youtube.com/watch?v=fS7FFOaC_iQ https://youtu.be/o6W0opScrKY 3. Homework Ask students to make a chart explaining the evolution of microprocessors discussing the advancement in features over the time. - Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 2	Course Name: Microcontroller and applications Topic: Introduction to Pin Diagram of 8085	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. understand the pin diagram of microprocessor b. analyse the various pins of 8085
Teaching Aids (if any)	a. PPT on pin diagram of microprocessor
Teaching Development	- **Introduction** (5 minutes) - Ask questions. Have you seen 8085? What do you mean by pin diagram? - **Development** (30 minutes) a. Pin diagram of 8085 - Introduce the pin diagram of Microprocessor - Show slide on pin diagram of microprocessors - - Discuss about the 40 pins of 8085 - Exercise (5 minutes) – Give students time to discuss the various applications of microprocessors.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video Lecture https://nptel.ac.in/courses/108/105/108105102/ 3. Homework Make a chart showing the pin diagram of 8085. - Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 3	Course Name: Microcontroller and applications Topic: Introduction to Architecture of 8085	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. articulate the architecture of 8085 b. explain the various blocks in the architecture of 8085
Teaching Aids (if any)	a. PPT on pin diagram of microprocessor
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Introduce the architecture of 8085. - Discuss about the various blocks in the architecture of 8085 - **Development** (30 minutes) Draw the Architecture of 8085 - Explain the various blocks present in the architecture of 8085 - Show video on architecture of 8085 - Exercise (5 minutes) – Give students time to discuss the various applications of microprocessors.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested material https://nptel.ac.in/content/storage/108/105/108105102/MP4/mod01lec01.mp4 Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 4	Course Name: Microcontroller and applications Topic: Introduction to Architecture of 8051	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. undersand the basics of 8051 microcontroller b. describe the functional block diagram of 8051
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Evolution of Microcontrollers - Introduce the architecture of 8051. - **Development** (30 minutes) - Draw the Architecture of 8085 - Explain the various blocks present in the architecture of 8085 - Inside the 8051 - Registers - ALU of microcontroller 8051 - Exercise (5 minutes) – Give students time to discuss the various applications of microcontrollers. How many bytes of RAM and onchip ROM available in 8051 Microcontroller?
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested material https://youtu.be/2AVOxLPKjeA Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 5	Course Name: Microcontroller and applications Topic: Introduction to Architecture of 8051	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. describe the functional block diagram of 8051 b. Identify a detailed h/w structure of the Microcontroller.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Evolution of Microcontrollers - Introduce the architecture of 8051. - About the temporary registers of 8051. - **Development** (30 minutes) - Discuss about the 4 register banks and about the stack. - How to use stack? - Special function Registers(SFR): • Timer/Counter register • Serial data register • Interrupt register • Power control register - Internal RAM/ROM - Exercise (5 minutes) – State the function of RS1 and RS0 bits in the flag register of Intel 8051microcontroller? -
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested material https://youtu.be/2AVOxLPKjeA Bharat Acharya: lecture 1: https://youtu.be/2-geyR_aM28 https://www.udemy.com/course/8051-architecture-bharat-acharya/ Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 6	Course Name: Microcontroller and applications Topic: Introduction to Architecture of 8051	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. distinguish and analyze the properties of Microprocessors & Microcontrollers
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - About the temporary registers of 8051. - Ask about difference between the two. - **Development** (30 minutes) - Discuss key differences of Microprocessors & Microcontrollers - Why microprocessor is used in Personal Computers whereas MicroController is used in an embedded system - Difference between Microprocessor vs. Microcontroller - Exercise (5 minutes) – Go through the architecture of 8085 and 8051 and list down the differencesin their architecture and functioning -
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested material https://www.udemy.com/course/8051-architecture-bharat-acharya/ Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 7	Course Name: Microcontroller and applications Topic: Assembler Directive of 8051	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. understand the importance of directives. b. familiarize with the types of assembler directives.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Difference between directives and instructions. - **Development** (30 minutes) In assembly language programming, the assembler directivesinstruct the assembler to - Process subsequent assembly language instructions - Define program constants - Reserve space for variables - Discuss directives with examples ORG (origin) EQU and SET etc.... - Exercise (5 minutes) – Write a program using ORG directive to start the mainprogram from 300H address. -
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested material https://youtu.be/Vrazx7AsutM Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 8	Course Name: Microcontroller and applications Topic: Addressing Modes of 8051	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the importance of addressing modes b. Familiarize with the types of addressing modes.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Difference between directives and instructions. - What is addressing mode? - - **Development** (30 minutes) - Addressing modes - Types of addressing modes - Examples based on different types of addressing modes. - Exercise (5 minutes) – Write a command to store values using direct and indirect addressing modes.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested material https://youtu.be/7q4VVR33p2g Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 9	Course Name: Microcontroller and applications Topic: Instructions Set of 8051 Microcontroller	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. understand the concept of Instruction set in 8051 b. familiarize with different types of instruction set.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What are instructions? - What instructions are you aware about? - What is the difference between operand and opcode? - - **Development** (30 minutes) - Instruction set - Types of Instruction set - Examples based on different types of Instruction set - Jumps in Instruction set Introduction to Assembly Language - Exercise (5 minutes) – Write a looping command (Program) in order to better understand the looping instruction set.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested material https://youtu.be/7q4VVR33p2g Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 10	Course Name: Microcontroller and applications Topic: 8051 Assembly Language Programming	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Familiarize with assembly language of 8051. b. Demonstrate different programs using assembly language
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What is the difference between operand and opcode? - What is assembly language? - What are different forms of programming in 8051? - - **Development** (30 minutes) Introduction to Assembly Language Writing programs for : - Loops - Jumps - Arithmetic and logical instructions - Exercise (5 minutes) – WAP to add first 10 numbers using assembly language
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested material https://youtu.be/Gru27jV1mms Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 11	Course Name: Microcontroller and applications Topic: Data Types of 8051 Programming In Embedded C	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Familiarize with the difference between C, embedded C and Assembly programming b. Understan the different types of Data Types in embedded C c. Articulate the application of data types to different situations
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. What is a data type? What data types are you aware about? Difference between the types of data types - - **Development** (30 minutes) Introduction to Embedded C Language Programming - Introduction to Data Types - Types of data types used in 8051 - Signed and Unsigned Charcter - different examples based on character as the data type - - Exercise (5 minutes) – WAP to add first 10 numbers using embedded c language
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested video https://youtu.be/Y1Q1Cq1dduA Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 12	Course Name: Microcontroller and applications Topic: Data Types of 8051 Programming In Embedded C	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understan the different types of Data Types in embedded C b. Articulate the application of data types to different situations
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. What is a data type? What data types are you aware about? Difference between the types of data types - - **Development** (30 minutes) - Types of data types used in 8051 - Signed and Unsigned Int - Sbit - SFR - different examples based on character as the above mentioned data type - - Exercise (5 minutes) – Write 8051 C programming based on signed int data type
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/Y1Q1Cq1dduA Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 13	Course Name: Microcontroller and applications Topic: Time Delay and Loop Operation	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Familiarize with concept of time delay b. Understand the Loop, Logic Operations
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. What is delay? How are delays generated? What is looping? - - **Development** (30 minutes) - Introduction to time delay - Different methods used for delay generation used in 8051 - Examples based on different modes of timers for delay generation - Loop operation - Examples based on looping in 8051 - - Exercise (5 minutes) – Write a program to add 2 a 2microsecond delay in 8051S
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested material https://youtu.be/lRa3kDroZhI Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 14	Course Name: Microcontroller and applications Topic: Logic Operations, I/O programming and Data Conversion	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Articulate the concept of logical operations programming in 8051 Embedded C. b. Understand the concept of I/O programming in 8051. c. Familiarize with the data conversions in 8051.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. What are logical operations? How many I/O Ports are in 8051? Which port is only used for I/O? - **Development** (30 minutes) - Introduction to Logical Operations - AND - OR - XOR - NOT - RR - RL - Different examples based logical operations. - Different examples based on I/O Programming - Exercise (5 minutes) – Write 8051 C programming based on Data conversion, and logical programming.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested material https://youtu.be/dGOUcka1g4Q https://youtu.be/ZNbhMZ0Uj74 https://youtu.be/AIME92jvANQ Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 15	Course Name: Microcontroller and applications Topic: Accessing Code Space, Data Serialization	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of Accessing Code Space in 8051. b. Familiarize with Data Serialization in 8051
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. What do you mean by code memory/ program memory? What is the size of RAM & ROM in 8051? - **Development** (30 minutes) - Introduction to Accessing Code ROM Space in 8051 - RAM data spaces Vs Code data Space - RAM data space usage by the 8051 C complier - Different examples based on Accessing Code ROM Space in 8051 - Data Serialization in 8051 - Different examples based on Data Serialization - Exercise (5 minutes) – Write 8051 C programming based on Data Serialization
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/4JGlqt_FYjA Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 16	Course Name: Microcontroller and applications Topic: Counter/Timer Programming in Embedded C.	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of Counter/Timer Programming in Embedded C. b. Demonstrate all the programming modes in Timer. c. Familiarize with the registers used in Timer and Counter.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. What do you mean by counter? What is the meaning of Timer? Highlight the significance of Timer/Counter in 8051. What is the need of delay in 8051 microcontroller? - **Development** (30 minutes) - Introduction to Timers in 8051 - Timer 0 - Timer 1 - TMOD Register in Timer - Modes of Programming in Timer - - Exercise (5 minutes) – Write assembly programming based on timer 0 and timer 1.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/4t6TTi2scWI Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 17	Course Name: Microcontroller and applications Topic: Counter/Timer Programming in Embedded C.	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of Counter/Timer Programming in Embedded C. b. Demonstrate all the programming modes in Timer. c. Familiarize with the registers used in Timer and Counter.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. What do you mean by counter? What is the meaning of Timer? Highlight the significance of Timer/Counter in 8051. What is the need of delay in 8051 microcontroller? Highlight the significance of TMOD register in using timers - **Development** (30 minutes) - Finding values to be loaded into the Timer - Programs & Problems based on it - Modes of Programming in Timer - Mode 0 - Mode 1 - Programs based on Mode 0 and Mode 1 - Exercise (5 minutes) – Write a program to generate a frequency of 100KHz on Pin P2.3 using timer 1 in mode 1, with a frequency of 22MHz.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/4t6TTi2scWI Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 18	Course Name: Microcontroller and applications Topic: Counter/Timer Programming in Embedded C.	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the concept of Counter/Timer Programming in Embedded C. b. Demonstrate all the programming modes in Timer. c. Familiarize with the registers used in Timer and Counter.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. Highlight the significance of TMOD register in using timers. Discuss the importance of TMOD and TCON register - **Development** (30 minutes) - Modes of Programming in Timer - Mode 2 - Programs based on Mode 2 - Counter Programming - TCON register - Exercise (5 minutes) – Write a C program to toggle all the bits of port P1 continuously with some delay in between using timer 0, 16-bit mode to generate the delay.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/4t6TTi2scWI Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 19	Course Name: Microcontroller and applications Topic: Basics of serial communication	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Familiarize with the basics of serial communication. b. Understand the importance of serial communication.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. What is communication? Highlight the importance of communication in any embedded system What is the difference between serial and parallel communication? - **Development** (30 minutes) - Introduction to 8051 serial communication and parallel communication - Compare and contrast serial versus parallel communication - List the advantages of serial communication over parallel - Explain serial communication protocol - Contrast synchronous vs asynchronous communication - Highlight the transmission modes - Simplex - Half Duplex - Full Duplex - Explain the process of data framing - Specify the importance of start bit and stop bit in data framing - - Exercise (5 minutes) – Ask students to provide examples on various transmission modes.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/5Dn69HZ_w7c Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 20	Course Name: Microcontroller and applications Topic: 8051 connections to RS232	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Familiarize with the basics of serial communication. b. Understand the importance of serial communication.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. What is the difference between serial and parallel communication? How is the connection between the embedded system established for serial communication? What are the dates rates offered in serial communication? - **Development** (30 minutes) - Describe the data rate and bps rate - Introduce the RS-232 standard - DB25 Connector - DB9 Connector - Explain the use of MAX232 and MAX 233 chips - Interface the 8051 with a RS-232 connector - - Exercise (5 minutes) – Ask students to provide summary of lecture and also emphasize on the importance of using MAX 232 with RS 232 in serial communication.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/-UXpfAggE5Q Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 21	Course Name: Microcontroller and applications Topic: Serial port operations and programming	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Familiarize with the concept of serial port operations. b. Demonstrate serial port programming using assembly and C language.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Explain the use of MAX232 and MAX 233 chips - Interface the 8051 with a RS-232 connector - importance of using MAX 232 with RS 232 in serial communication - **Development** (30 minutes) - Discuss the baud rate of 8051 - Describe serial communication features of 8051 - Program the 8051serial port in assembly and C - Program the second serial port of DS89C4x0 in Assembly and C. - Program based on the serial ports - Exercise (5 minutes) – WAP to receive bytes od data serially and put them in P1. Set the baud rate at 4800, 8-bit data, and 1 stop bit.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/LD2Fbhk2fAI Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 22	Course Name: Microcontroller and applications Topic: Introduction to basics of 8051 interrupts	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the fundamentals of basics of 8051 interrupts. b. Familiarization with the different types of interrupts.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What is an interrupt? - Polling - **Development** (30 minutes) - Introduction to 8051 interrupts - Contrast and compare interrupts versus polling - Explain the purpose of interrupt service routine (ISR) - List the 6 interrupts of 8051 - Explain the purpose of interrupt vector table - - Exercise (5 minutes) – Ask students to summarize the steps involved in executing an interrupt
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/7l3-iq6OtEE Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 23	Course Name: Microcontroller and applications Topic: Types of 8051 interrupts	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the fundamentals of basics of 8051 interrupts. b. Familiarization with the different types of interrupts.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - List the 6 interrupts of 8051 - Highlight the purpose of interrupt vector table - Discuss the steps involved in executing an interrupt - **Development** (30 minutes) - Enable or disable 8051 interrupts - Program the 8051 timers using interrupts - Describe the external hardware interrupts of 8051 - External interrupts INT0 &INT1 - Level triggered interrupts - Edge triggered interruptss - - Exercise (5 minutes) – Ask students to write a program to generate two square waves one of 5KHz frequency at pin P1.3, and another frequency 25KHz at pin P2.3. Assume XTAL=22MHz.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/UJytXyg6wpM https://youtu.be/DPsiTe0KAlI Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 24	Course Name: Microcontroller and applications Topic: Interrupt priority in 8051, Interrupt programming using embedded C	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Familiarization with the different types of interrupts. b. Articulate the Interrupt priority in 8051. c. Demonstrate the concept of Interrupt programming using embedded C.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Discuss the steps involved in Enable or disable 8051 interrupts - External interrupts INT0 &INT1 - Level triggered interrupts - Edge triggered interrupts - **Development** (30 minutes) - Contrast edge-triggered with level-triggered interrupts - Program th 8051 for interrupt-based serial communication - Define the interrupt priority of the 8051 - Interrupt priority upon reset - Setting interrupt priority with the IP register - Interrupt inside an interrupt - Triggering the interrupt by software - Program 8051 interrupts in C - Exercise (5 minutes) – Ask students to write a program based on interrupt programming in 8051 using embedded c.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/CSKnrL4milM Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 25	Course Name: Microcontroller and applications Topic: LCD Interfacing	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the basics of LCD Interfacing. b. Demonstrate various examples on LCD using 8051.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What is interfacing? - What is LCD? - Why is LCD being used? - **Development** (30 minutes) - List the reasons the LCD are gaining widespread use replacing LED's - Describe the functions of the pins of a typical LCD - List instruction command codes for programming an LCD - Introduction to LCD interfacing with 8051 - Exercise (5 minutes) – Ask students to summarize the lecture
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/P6MO-n3MUAY https://youtu.be/LtevacTk7Ww Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 26	Course Name: Microcontroller and applications Topic: LCD Interfacing	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the basics of LCD Interfacing. b. Demonstrate various examples on LCD using 8051.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Describe the functions of the pins of a typical LCD - List instruction command codes for programming an LCD - **Development** (30 minutes) - Introduction to LCD interfacing with 8051 - Interface an LCD to the 8051 - LCD Data sheet - LCD Addressing - Program an LCD in Assembly and C - Sending information to LCD using MOVC instructionss - Exercise (5 minutes) – Ask students to write a program to send letters ‘M’, ‘D’, & ‘E’ to the LCD using delays.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/P6MO-n3MUAY Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 27	Course Name: Microcontroller and applications Topic: Keyboard Interfacing	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the basics operations of keyboard. b. Demonstrate various examples on LCD interfacing with 8051.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What is a keyboard? - Why do we require a keyboard with microcontrollers? - - **Development** (30 minutes) - Explain the basic operation of a keyboard - Describe the key press and detection mechanisms - Interface a 4×4 keypad to the 8052 using C and Assembly - Explain the De-bouncing effect - - Exercise (5 minutes) – Two switches are connected to pins P0.1 & P0.2. They are also vectored to interrupt location 0003H, i.e., INT0. Write a program to test which key is pressed or to verify if both keys are pressed.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/dqo-PA-_a0Q https://youtu.be/f2wra_y5EQw https://youtu.be/yp-D8S-5ECk https://youtu.be/975CS27w16w Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 28	Course Name: Microcontroller and applications Topic: ADC 0804 interfacing	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Familiarize with the concept of ADC 0804 b. Understand the basics of ADC 0804 interfacing
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What is ADC? - Why is ADC important? - What are different types of ADC? - - **Development** (30 minutes) - Interface ADC chips to the 8051 - Interface temperature sensors to the 8051 - Explain the process of data acquisition using ADC chips - Describe factors to consider in selecting an ADC chips - Describe the function of the pins of 804/809/849 ADC chips - Describe the function of the pins of the MAX112 serial ADC chip - Interface serial ADC chips to the 8051 - Program serial and parallel ADC chips in 8051 C and Assembly - - Exercise (5 minutes) – Ask students to summarize the importance of using ADC with 8051
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://www.youtube.com/watch?v=UODCHRdyb8Y https://youtu.be/yA6fAATLrMU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 29	Course Name: Microcontroller and applications Topic: ADC 0804 interfacing	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Familiarize with the concept of ADC 0804 b. Understand the basics of ADC 0804 interfacing c. Articulate the programming of interfacing ADC with 8051
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Explain the process of data acquisition using ADC chips - Describe factors to consider in selecting an ADC chips - Describe the function of the pins of 804/809/849 ADC chips - - **Development** (30 minutes) - Describe the function of the pins of the MAX112 serial ADC chip - Interface serial ADC chips to the 8051 - Program serial and parallel ADC chips in 8051 C and Assembly - - Exercise (5 minutes) – Ask students to practice programs based on ADC 0804
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/yA6fAATLrMU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 30	Course Name: Microcontroller and applications **Topic**: DAC **0808 interfacing**	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Familiarize with the concept of DAC 0808. b. Understand the basics of DAC 0808 interfacing. c. Articulate the programming of interfacing DAC with 8051.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Explain the process of data acquisition using ADC chips - Discuss the function of the pins of the MAX112 serial ADC chip - Steps for Interfacing serial ADC chips to the 8051 - **Development** (30 minutes) - Describe the basic operation of a DAC - Interface a DAC chip to the 8051 - Program a DAC chip to produce a sine wave on an oscilloscope - Program DAC chips in 8051 C and Assembly - - Exercise (5 minutes) – Ask students to practice programs based on DAC 0808
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/yFIiJ6bJUNE https://youtu.be/M_vXUBX3-nM Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 31	Course Name: Microcontroller and applications Topic: Sensor and actuator interfacing	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Familiarize with the concept of Sensor and actuator. b. Understand the basics of interfacing sensors and actuators with 8051.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What are Sensors? - What are actuators? - What is the difference between the two? - **Development** (30 minutes) - Introduction to Sensor and actuator - Difference between Sensor and actuator - Temperature sensor - LM34 & LM35 Temperature Sensor - Explain the function of precision IC temperature sensors - Describe signal conditioning and its role in data acquisition - Interfacing of different sensors with 8051 (LM35) - Reading and displaying temperature - - Exercise (5 minutes) – Ask students to practice programs based on Temperature sensor using assembly langauge
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/jrjMQ_GW3-c https://youtu.be/eQLYQIkm1_4 Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 32	Course Name: Microcontroller and applications Topic: Speed and direction control of DC and Stepper Motors	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Familiarize with the concept of speed and direction control of DC b. Understand the basics of speed and direction control of Stepper Motors
Teaching Aids (if any)	a. PowerPoint Presentation

Teaching Development	- **Introduction** (5 minutes)
	- Ask questions.
	- What are actuators?
	- What is the difference between the two?
	- What are motors?
	- What are different types of motors?
	-
	- **Development** (30 minutes)
	- Introduction to DC Motor
	  - Unidirectional Control
	  - Bidirectional Control
	  - Pulse Width Modulation (PWM)
	- Programming of DC Motor
	- DC motor control and PWM using C
	- Programs based on DC motor
	- Introduction to stepper Motor
	- Programming of stepper Motor
	- Interfacing of motors with 8051
	-
	- Exercise (5 minutes) –
	Ask students to practice programs based on DC Motor and its speed and direction controls

Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://www.youtube.com/watch?v=iJCTMoQ4e6c&pp=ygUyc3BlZWQgYW5kIGRpcmVjdGlvbiBjb250cm9sIG9mIERDIE1vdG9ycyBXSVRIIDgwNTE%3D Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 33	Course Name: Microcontroller and applications Topic: Speed and direction control of Stepper Motors	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the basics of speed and direction control of Stepper Motors b. Demonstrate the programming of Stepper motor using C
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Unidirectional Control - Bidirectional Control - Pulse Width Modulation (PWM) - Steps involved in programming of DC Motor - **Development** (30 minutes) - Introduction to stepper Motor - Step angle - Steps per revolution - Tooth pitch - Rotation speed - RPM - Motor speed - Stepper motor control with 8051 C - Programming of stepper Motor - Interfacing of motors with 8051 - - Exercise (5 minutes) – Ask students to practice programs based on Stepper Motor and its speed and direction controls
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/EOAXox9XzTI Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 34	Course Name: Microcontroller and applications Topic: Introduction to Arduino	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the basics of Arduino and its components. b. Demonstrate basic programming of Arduino using Arduino IDE. c. Introduce Arduino and its significance in electronics and robotics.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What is Arduino? - Why is Arduino popular among professionals? - What are some common projects you can create with Arduino? Introduction to Arduino IDE Basic structure of an Arduino program (setup and loop functions) - **Development** (30 minutes) - Introduction to Arduino - History and evolution of Arduino - Types of Arduino boards (Uno, Nano, Mega, etc.) - Basic Electronics Concepts (5 minutes) - Voltage, current, and resistance - Breadboard and circuit connections - Basic Components of Arduino - Introduction to Arduino development board - Why Arduino? - Different types of Arduino boards - Different types of Arduino shields - Exercise (5 minutes) – Ask students to summarize the lecture in detail.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/H9OEAn3Uc2w Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 35	Course Name: Microcontroller and applications Topic: Programming Tools and Programming language for development board	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the various programming tools available for development boards. b. Demonstrate basic programming using a suitable language for a development board.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What are development boards used for? - Can you name some programming languages used for these boards? - Why is it important to choose the right tools for development? - **Development** (30 minutes) - Introduction to Programming Tools - Detailed explanation of IDEs (e.g., Arduino IDE, Thonny). - Advantages of using specific tools (ease of use, community support). - Setting Up Development Environment - Step-by-step installation guide for Arduino IDE. - Basic configuration for different development boards. - Writing Your First Program - Example 1: Blinking an LED on Arduino using Arduino IDE. - Exercise (5 minutes) – Ask students to write a simple program using their chosen tool and language, such as blinking an LED
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/Ab9U7NQB1kA https://youtu.be/SX8z3-BEuWQ?list=PLwWF-ICTWmB7-b9bsE3UcQzz-7ipI5tbR Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.

	Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 36	Course Name: Microcontroller and applications Topic: Interfacing with analog and digital sensors	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the differences between analog and digital sensors. b. Demonstrate the interfacing of analog and digital sensors with development boards. c. Write programs to read data from these sensors and perform basic data processing.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What are sensors used for? - Can you name some analog and digital sensors? - Overview of sensors in electronics and their importance - Difference between analog and digital sensors. - Why is it important to differentiate between analog and digital sensors? - **Development** (30 minutes) - Introduction to Sensor Interfacing - Explanation of sensor interfacing and its applications. - Basic concepts of voltage, current, and resistance in the context of sensors. - Analog Sensors - Definition and examples (e.g., potentiometers, temperature sensors, light sensors). - Analog Sensor Interfacing - Detailed steps to connect an analog sensor to a development board. - Example: Reading data from a potentiometer. - - Exercise (5 minutes) – Ask students to write a program to interface with an analog sensor (LM35 Temperature Sensor) and display the readings.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/nE1C4ghfvac?list=PLgMDNELGJ1CbufZjqWa8uoSlQWKqVwPN7 https://youtu.be/CFL3E0or2HU Spend 5 minutes to wrap up and consolidate the learnings

Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 37	Course Name: Microcontroller and applications Topic: Interfacing with analog and digital sensors	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the differences between analog and digital sensors. b. Demonstrate the interfacing of analog and digital sensors with development boards. c. Write programs to read data from these sensors and perform basic data processing.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What are sensors used for? - Can you name some analog and digital sensors? - Overview of sensors in electronics and their importance - Difference between analog and digital sensors. - Why is it important to differentiate between analog and digital sensors? - **Development** (30 minutes) - Definition and examples of Digital Sensor (e.g., push buttons, digital temperature sensors, PIR sensors). - How they provide discrete data (on/off or high/low). - Reading digital values directly. - Interfacing Digital Sensors - Connecting digital sensors to development boards. - Code example for reading digital values. - Detailed steps to connect a digital sensor to a development board. - Example: Reading data from a push button or a digital temperature sensor. - - Exercise (5 minutes) – Ask students to write a program to interface with digital sensor and display the readings.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/CFL3E0or2HU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to

	answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 38	Course Name: Microcontroller and applications Topic: Interfacing with analog and digital sensors	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the differences between analog and digital sensors. b. Demonstrate the interfacing of analog and digital sensors with development boards. c. Write programs to read data from these sensors and perform basic data processing.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What are sensors used for? - Can you name some analog and digital sensors? - Overview of sensors in electronics and their importance - Difference between analog and digital sensors. - Why is it important to differentiate between analog and digital sensors? - **Development** (30 minutes) - Definition and examples of Digital Sensor (e.g., push buttons, digital temperature sensors, PIR sensors). - How they provide discrete data (on/off or high/low). - Reading digital values directly. - Interfacing Digital Sensors - Connecting digital sensors to development boards. - Code example for reading digital values. - Detailed steps to connect a digital sensor to a development board. - Example: Reading data from a push button or a digital temperature sensor. - - Exercise (5 minutes) – Ask students to write a program to interface with digital sensor and display the readings.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/CFL3E0or2HU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.

	Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 39	Course Name: Microcontroller and applications Topic: Interfacing with analog and digital sensors	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the different types of display devices used with development boards. b. Demonstrate the interfacing of various display devices with development boards. c. Write programs to display data on these devices.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - What are display devices used for? - Can you name some common display devices used with development boards? - Why is it important to interface development boards with display devices? - **Development** (30 minutes) - Introduction to Display Interfacing - Explanation of display interfacing and its applications. - Basic concepts of digital communication (I2C, SPI). - Character LCD Interfacing - Detailed steps to connect a 16x2 LCD to a development board. - Code example for displaying text. - - Exercise (5 minutes) – Ask students to write a program to interface with a display device and show sensor data or text.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/CFL3E0or2HU Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 40	Course Name: Microcontroller and applications Topic: Interfacing with actuators	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the different types of actuators used with development boards. b. Demonstrate the interfacing of various actuators with development boards. c. Write programs to control these actuators.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Overview of actuators in electronics. - Importance of actuators in controlling physical systems - What are actuators used for? - Can you name some common actuators used with development boards? - Why is it important to interface development boards with actuators? - **Development** (30 minutes) - Introduction to Actuator Interfacing - Explanation of actuator interfacing and its applications. - Basic concepts of voltage, current, and control signals. - DC Motor Interfacing - Detailed steps to connect a DC motor. - - - Exercise (5 minutes) – - Ask students to write a program to interface with an actuator and control its operation.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/uku6PpRdt4w?si=fVTBsuFQvCdkIIGO. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 41	Course Name: Microcontroller and applications Topic: Interfacing with actuators	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the different types of actuators used with development boards. b. Demonstrate the interfacing of various actuators with development boards. c. Write programs to control these actuators.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Overview of actuators in electronics. - Importance of actuators in controlling physical systems - What are actuators used for? - Can you name some common actuators used with development boards? - Why is it important to interface development boards with actuators? - **Development** (30 minutes) - DC Motor Interfacing - Detailed steps to connect a DC motor - Code example for controlling motor direction and speed. - Stepper Motor Interfacing - Detailed steps to connect a stepper motor. - - Exercise (5 minutes) – - Ask students to write a program to interface with an actuator and control its operation.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/uku6PpRdt4w?si=fVTBsuFQvCdkIIGO. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 42	Course Name: Microcontroller and applications Topic: Interfacing with actuators	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the different types of actuators used with development boards. b. Demonstrate the interfacing of various actuators with development boards. c. Write programs to control these actuators.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Overview of actuators in electronics. - Importance of actuators in controlling physical systems - What are actuators used for? - Can you name some common actuators used with development boards? - Why is it important to interface development boards with actuators? - **Development** (30 minutes) - Detailed steps to connect a stepper motor. - Code example for controlling stepper motor rotation. - Relay Interfacing (5 minutes) - Detailed steps to connect a relay module. - Code example for switching a relay. - - - Exercise (5 minutes) – - Ask students to write a program to interface with an actuator and control its operation.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/uku6PpRdt4w?si=fVTBsuFQvCdkIIGO. Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 43	Course Name: Microcontroller and applications Topic: Serial Communication	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the basics of serial communication. b. Demonstrate the setup and use of serial communication between development boards and other devices.
Teaching Aids (if any)	a. PowerPoint Presentation
Teaching Development	- **Introduction** (5 minutes) - Ask questions. - Overview of serial communication. - Importance of serial communication in embedded systems. What is serial communication? Can you name some common protocols used for serial communication? Why is serial communication important in embedded systems? - **Development** (30 minutes) - Introduction to Serial Communication Setup - Explanation of hardware connections and configurations. - Overview of serial communication libraries in popular development environments (e.g., Arduino IDE). - UART Communication Setup and Programming - Detailed steps to set up UART communication. - Code example for sending and receiving data using UART. - SPI Communication Setup and Programming - Detailed steps to set up SPI communication. - Code example for sending and receiving data using SPI. - I2C Communication Setup and Programming - Detailed steps to set up I2C communication. - Code example for sending and receiving data using I2C. - - Exercise (5 minutes) – - Ask students to write a program to set up serial communication and exchange data between two devices.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/8GX5brSZ_1E?si=Dib8YS5xkt4o8DYD Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss.

	Spend 5 minutes to evaluate student assimilation of the lesson contents

Lesson Plan No. 44	Course Name: Microcontroller and applications Topic: Wireless Communication using RF Module	Course No.: ECE-401

Objectives	At the end of the lesson the student shall be able to: a. Understand the basics of wireless communication using RF modules. b. Demonstrate the setup and use of RF modules for wireless data transmission. c. Write programs to establish wireless communication between two devices using RF modules.
Teaching Aids (if any)	a. PowerPoint Presentation

Teaching Development	- **Introduction** (5 minutes)
	- Ask questions.
	- What are RF modules?
	- Can you name some applications of RF modules?
	- Overview of wireless communication using RF (Radio Frequency) modules.
	- Importance of RF modules in remote control, telemetry, and sensor networks.
	- Why is wireless communication important in modern electronics?
	- Basics of RF Communication
	- Definition and key concepts (transmitter, receiver, frequency, modulation).
	- Types of RF modules (transmitter, receiver, transceiver).
	-
	- **Development** (30 minutes)
	- Introduction to RF Module Setup
	  - Explanation of hardware connections for RF modules.
	  - Overview of setup procedures in popular development environments.
	- Transmitter Setup and Programming
	  - Detailed steps to set up a transmitter RF module.
	  - Code example for transmitting data wirelessly using RF.
	- Receiver Setup and Programming
	  - Detailed steps to set up a receiver RF module.
	  - Code example for receiving data wirelessly using RF.
	- Wireless Communication Setup
	  - Integration of transmitter and receiver modules for bidirectional communication.
	  - Testing and troubleshooting tips.
	-
	- Exercise (5 minutes) –

	- Ask students to write a program to establish wireless communication between two devices using RF modules.
Closure	1. Summarize the Lesson Learning Outcomes and get affirmation from students on these. 2. Suggested Video https://youtu.be/s_G3S0t9Iyo?si=uuVQpuwA9drUITyV Spend 5 minutes to wrap up and consolidate the learnings
Evaluation	1. Reflective Questions (What, Why, Who?). Allow students to answer and discuss. Spend 5 minutes to evaluate student assimilation of the lesson contents