# Course: Introduction to Embedded System Design

**Course Code:** noc20-ee98

**Session:** 2020-21

**Duration:** 12 Weeks

**Assessment procedures:** Weekly Assignment (25%) + proctored certification Exam (75%)

**Week 1**: Introduction to Embedded Systems and Computer Systems Terminology. Modular approach to Embedded System Design using Six-Box model: Input devices, output devices, embedded computer, communication block, host and storage elements and power supply.

**Week 2**: Microcontroller Based Embedded System Design. Salient Features of Modern Microcontrollers. Elements of Microcontroller Ecosystem and their significance.

**Week 3**: Design of Power Supply for Embedded Systems. Linear Regulator Topologies. Switching Power Supply Topologies. Power Supply Design Considerations for Embedded Systems.

**Week 4**: Introduction to MSP430 Microcontroller. MSP430 CPU Architecture. Programming Methods for MSP430. Introduction to Lunchbox Platform.

**Week 5**: Fundamentals of Physical Interfacing. Connecting Input Devices:Switches, Keyboard and Output devices: LEDs, Seven Segment Displays(SSD). Assignment: MCQ/MSQ

**Week 6**: Advanced Physical Interfacing: Driving load - high side, low side and H-bridge. Multiplexing displays including Charlieplexing. Shaft encoder.

**Week 7**: Programming the MSP430. Basics of version control system - Git. Installing and using Code Composer Studio(CCS). Introduction to Embedded C. Interfacing LEDs and Switches with MSP430 using Digital Input and Output.

**Week 8**: MSP430 Clock and Reset System. MSP430 Clock sources and distribution. Types of Reset sources. Handling Interrupts in MSP430. Writing efficient Interrupt Service Routine (ISR).

**Week 9**: Interfacing Seven Segment Displays and Liquid Crystal Displays with MSP430. Low Power Modes in

MSP430. Introduction to MSP430 Timer Module and it's Modes of Operation.

**Week 10**: Generating Pulse Width Modulation (PWM) using Timer Capture Mode. ADC operation in MSP430. Interfacing analog inputs. Generating random numbers using LFSR and other methods. Adding DAC to MSP430. Custom Waveform generation using MSP430.

**Week 11**: Timer Capture Modes. Measuring frequency and time period of external signals and events. Serial Communication Protocols: UART, SPI, I2C. Interfacing Universal Serial Communication Interface (USCI) Module of the MSP430 for UART Communication. Advanced Coding Exercises based on Interrupt driven Programming.Building an Electronics Project.

**Week 12**: Circuit Prototyping techniques. Designing Single Purpose Computers using Finite State Machine with Datapath (FSMD) approach. MSP430 Based Project Design and Implementation. Recap of Course Coverage.

**List of students enrolled**

| | | | | |
|---|---|---|---|---|
| 1 | Saumya Pancholi | | 41 | Sanskruti Khandelwal |
| 2 | Parul Sinha | | 42 | Krishan Kumawat |
| 3 | Aditi Jain | | 43 | Krishan Kumawat |
| 4 | Aditya Dadhich | | 44 | Kunal Sharma |
| 5 | Paritosh Ajmera | | 45 | Megha Mangal |
| 6 | Aman Kumar Garg | | 46 | Manoj Garg |
| 7 | Anany Jain | | 47 | Kartik Mathur |
| 8 | Anchal Yadav | | 48 | Mayank Shrimali |
| 9 | Anjali Mukherji | | 49 | Naman Gupta |
| 10 | Ankit Yadav | | 50 | Naveen Baloda |
| 11 | Anmol Kumar | | 51 | Neelesh |
| 12 | Simran Arora | | 52 | Nilesh Dadheech |
| 13 | Rohit Arora | | 53 | Nitesh Yadav |
| 14 | Arpit Solanki | | 54 | Nitesh Sharma |
| 15 | Atul Jain | | 55 | Nilesh Sharma |
| 16 | Atul Singh Rao | | 56 | Saumya Pancholi |
| 17 | Avadhesh Khandelwal | | 57 | Parth Bhandari |
| 18 | Ayush Kumar Jajodia | | 58 | Prakhar Khatter |
| 19 | Ayush Gautam | | 59 | Puneet Mathur |
| 20 | Bahadur Choudhary | | 60 | Parikshit Rathore |
| 21 | Daksh Sharma | | 61 | Rishabh Mandawariya |
| 22 | Deepika Kerwal | | 62 | Rahul Kumar |
| 23 | Divyanshu Acharya | | 63 | Roshan Suthar |
| 24 | Dinesh Kumar Tak | | 64 | Ruchi Kumari |
| 25 | Dhananjay | | 65 | Sakshi Sharma |
| 26 | Abhishek Dusad | | 66 | Saransh Sharma |
| 27 | Gorakh Gupta | | 67 | Saumya Gautam |
| 28 | Gunjan Gupta | | 68 | Yash Saxena |
| 29 | Hardee Verma | | 69 | Sangeeta Sharma |
| 30 | Himani Devi | | 70 | Saurabh Sharma |
| 31 | Ikshansh Vashist | | 71 | Shashank Pandiya |
| 32 | Ishant Bhatia | | 72 | Himanshu Shekhar |
| 33 | Virendra Singh Rathore | | 73 | Shubhi Samaria |
| 34 | Jayesh Singh Sagar | | 74 | Shivam Kumar Gaur |
| 35 | Jyoti Sharma | | 75 | Siddharth Rawat |
| 36 | Jayesh Sharma | | 76 | Hidanshu Sikri |
| 37 | Harsh Kanojia | | 77 | Sabhyata Agarwal |
| 38 | Kunal Kaushik | | 78 | Sonu Saini |
| 39 | Keshav Hinger | | 79 | Sourav Soni |
| 40 | Khushi Garg | | 80 | Suraj Sharma |

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|---|---|---|---|---|
| 81 | Antima | | 90 | Vibhu Mathur |
| 82 | Swapnil Saini | | 91 | Vidushi Pareek |
| 83 | Tanuj | | 92 | Vikas Kumar |
| 84 | Ajay Thakur | | 93 | Vikram Gurjar |
| 85 | Udyan Srivastava | | 94 | Vishal Sen |
| 86 | Ujala Jhanwar | | 95 | Yash Gohil |
| 87 | Varnit Kashyap | | 96 | Yash Soni |
| 88 | Rajat Verma | | 97 | Yogesh Dabodiya |
| 89 | Vipul Gupta | | | |