



**Gyanmanjari**  
Innovative University

Course Syllabus  
Gyanmanjari Diploma Engineering College  
Semester-5

**Subject:** Embedded Systems - DETEC15212

**Type of course:** Major

**Prerequisite:** Basic Electronics, Digital Circuits, Microprocessor & Microcontroller

**Rationale:**

This course lays a solid foundation to provide optimized solutions for different computing needs. Microprocessors handle complex, general-purpose tasks, while microcontrollers excel at dedicated, real-time control within embedded systems. The evolution of microprocessors and microcontrollers, enabling new possibilities in various fields, from AI and IoT to high-performance computing and space exploration.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		C	Theory Marks		Practical Marks		
			ESE		MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

*Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA-Active Learning Activities.*

**Course Content:**

Unit No.	Course content	Hrs	% Weightage
1.	<b>Fundamentals of Embedded Systems</b> Introduction to Embedded Systems, Classification of Embedded Systems, Comparison: Microprocessor vs Microcontroller vs Embedded System, Features of Embedded Systems: Real-time operation, Dedicated functionality, Reliability and efficiency, Basic Embedded System Architecture: CPU, Memory (ROM, RAM), Input/Output devices.	12	20%



2.	<b>Microcontroller &amp; Embedded C Programming</b> Review of 8051 Microcontroller Architecture, Memory organization and I/O ports, Introduction to Embedded C, Difference: Embedded C vs General C, Structure of Embedded C program, Data types, operators, control statements, Bit-level operations, I/O port programming using Embedded C, Simple programs: LED blinking, Delay generation, Introduction to Interrupts.	15	25%
3.	<b>Analog to Digital &amp; Digital to Analog Converters</b> Introduction, D/A Converters, Performance Parameters of DAC, Basic Conversion Techniques, D/A Converters IC, Applications of DAC, Sample & Hold Circuit, A/D Converters, Performance Parameters of ADC, Types of A/D Converters, A/D Converters using V/F Converter, A/D Converters using V/T Conversion, Example of A/D Converter IC.	18	30%
4.	<b>Semiconductor Memories</b> Introduction, Characteristics of Memories, Classification of Memories, Serial Random Access Memories, Read Only Memory (ROM), Read and Write Memory (RAM), Comparison between SRAM and DRAM, Comparison between RAM and ROM, Memory Organization, Expanding Memory Size, Content Addressable Memory (CAM), Charge-Coupled Devices (CCD) Memory.	9	15%
5.	<b>Programmable Logic Devices</b> Programmable Logic Devices, ROM/PROM as a PLD, Programmable Logic Array (PLA), Programmable Array Logic (PAL), Comparison between PROM, PLA & PAL.	6	10%

**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1	<b>Reverse Engineering Code Analysis:</b> Students will analyze different Types of Microprocessors, microcontrollers, and embedded systems through real-world examples. Upload Document on GMIU Web Portal. (Student in a Group size of 2)	10
2	<b>Embedded C Programming &amp; Simulation Task</b> Students must develop and simulate Embedded C programs for basic interfacing and control. Upload file on GMIU Web Portal. (Student in a Group size of 2).	10
3	<b>Micro Project</b> Students will design and simulate a simple embedded system integrating sensors, control logic, and output devices. and Upload video of working Model on GMIU Web portal. (Student in a Group size of 2)	10
Total		30



**Suggested Specification table with Marks (Theory):60**

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	30%	25%	15%	10%	0%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Course Outcome:**

After learning the course, the students should be able to:	
CO1	Explain the fundamentals, classification, architecture, and characteristics of embedded systems.
CO2	Develop basic embedded applications using the 8051 microcontroller and Embedded C programming.
CO3	Analyze the operation and performance of Analog-to-Digital and Digital-to-Analog converters.
CO4	Explain the organization, classification, and characteristics of semiconductor memories.
CO5	Compare and apply various Programmable Logic Devices (PLDs) for digital system implementation.

**List of Practical:**

Sr. No	Descriptions	Unit No	Hrs
1.	Study of Embedded System Development Tools	1	2
2.	LED Blinking using Embedded C	2	2
3.	LED Pattern Generation	2	2
4.	Switch Interfacing	2	2
5.	Delay Generation using Timer	2	2
6.	DAC using R-2R Ladder Network	2	2
7.	DAC using IC (DAC0808 or equivalent)	3	2



8.	Study of DAC Characteristics	3	2
9.	ADC using IC (ADC0804 or equivalent)	3	2
10.	Study of ADC Characteristics	3	2
11.	Study of Memory Organization / ROM-based Logic Implementation	4	4
12.	Mini Project	1-5	6
<b>Total</b>			<b>30</b>

### Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content, 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

### Reference Books:

- [1] R. Kamal, Embedded Systems: Architecture, Programming and Design, 2nd ed., New Delhi, India: McGraw Hill Education, 2008.
- [2] M. A. Mazidi, J. G. Mazidi, and R. D. McKinlay, The 8051 Microcontroller and Embedded Systems: Using Assembly and C, 2nd ed., New Delhi, India: Pearson Education, 2006.
- [3] S. K. V., Introduction to Embedded Systems, 2nd ed., New Delhi, India: McGraw Hill Education, 2017.
- [4] F. Vahid and T. Givargis, Embedded System Design: A Unified Hardware/Software Introduction, New York, USA: John Wiley & Sons, 2002.
- [5] A. P. Godse and D. A. Godse, *Digital Fundamentals*, Pune, India: Technical Publications, 2022.

