

**NIRMA UNIVERSITY**  
**SCHOOL OF TECHNOLOGY, INSTITUTE OF TECHNOLOGY**  
**M. Tech. in Electronics & Communication Engineering (Embedded System)**  
**M.Tech Semester - I**

L	T	Practical component				C
		LPW	PW	W	S	
3	-	2	-	-	-	4

<b>Course Code</b>	<b>6EC204CC22</b>
<b>Course Title</b>	<b>Embedded Systems Programming</b>

**Course Learning Outcomes (CLOs):**

At the end of the course, students will be able to -

1. Comprehend the requirements of Embedded Systems Software
2. Utilize the Software Architectures for Embedded System programming
3. Program Embedded Systems
4. Solve issues related to Run-time Environment and Memory management in Embedded Systems

**Syllabus:**

**Teaching Hours:45**

<b>UNIT I: Software Architectures</b>	<b>11</b>
Requirements of Embedded Software, Basics of Interrupts, shared data problem, latency, scheduling policy, Round Robin, Round robin with interrupt, function queue scheduling.	
<b>UNIT II: Programming Languages</b>	<b>11</b>
Desired Language Characteristics, Introduction to Object Oriented Programming concepts, C for Programming embedded systems, Object Oriented Programming for Embedded Systems in C++ , Use of Java for Embedded Systems , Run-time Exception handling	
<b>UNIT III: Programming and Run-time Environment</b>	<b>06</b>
Mixing C and assembly, Compiling, Assembling, Linking, Debugging, Basic Compilation Techniques	
<b>UNIT IV: Profiling</b>	<b>08</b>
Analysis and Optimization of Execution Time , Analysis and Optimization of Energy and Power , Analysis and Optimization of Program Size, Program Validation and Testing	
<b>UNIT V: I/O Programming &amp; Memory management</b>	<b>05</b>
Synchronization, transfer rate, latency, Polled waiting loops, interrupt driven I/O, DMA, Storage class, scope and lifetime of variables, static and dynamic allocation, shared memory, recursive/reentrant function	
<b>UNIT VI: Embedded System Software</b>	<b>04</b>
Introduction to Boot Loader, Embedded File Systems, Embedded Database and Data Structure	

**Self Study:**

The self study contents will be declared at the commencement of semester. Around 10% of the question will be asked from self study contents.

**Laboratory work:**

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

**Suggested Readings:**

1. Embedded Software Premier David Simon (Pearson)
2. Embedded Real-time Systems Programming Sri Ram Iyer and Pankaj Gupta (TMH)
3. Fundamentals of Embedded Software: where c and assembly meet Daniel W lewis (Prentice hall)
4. Introduction to Embedded Systems by Shibu K V (TMH)
5. Computers as Components Principles of Embedded Computing Design by Wayne Wolf , 2nd Edition, (Morgan Kauffman)