

Govt. of Karnataka, Department of Technical Education
Diploma in Computer Science
Sixth Semester

Subject: Embedded and Real-Time Systems

Contact Hrs / week: 4

Total hrs: 64

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| | | 64 | 140 + 5 Objectives |

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| | | 7.1.2 | Portable Operating System Interface (POSIX) |
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| 8 | | | Representative embedded Systems |
| | 8.1 | | Digital Thermometer |
| | 8.2 | | Handheld Computer |
| | 8.3 | | Navigation System |

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|---|-----|-------|-------------------------------------|
| | | | |
| | 8.4 | | IP Phone |
| | 8.5 | | Software-defined Radio |
| | 8.6 | | Smart Cards |
| | 8.7 | | RF Tags |
| 9 | | | Future Trends |
| | 9.1 | | Emerging Technologies |
| | | 9.1.1 | Pervasive / Ubiquitous |
| | | 9.1.2 | Java for Embedded Systems |
| | | 9.1.3 | Security of Embedded systems |
| | | 9.1.4 | Embedding Intelligence |
| | 9.2 | | Emerging Applications |
| | 9.3 | | The greatest songs are still unsung |
| | | | |

Text book:

1. Embedded / Real-Time Systems : Concepts, Design And Programming, Black Book , Dr. K V K K Prasad , DreamTech Press, ISBN: 9788177224610

Reference

1. Embedded System Design , Frank Vahid / Tony Givargis, Wiley, ISBN: 9788126508372

General Objectives:

1. To know the important features, specialties and simple architecture of ES
2. An overview of the S/W architecture and the tools required for development of systems
3. To Understand the H/w platforms and communication interfaces for embed systems
4. To understand the concepts of Embedded / RTOS.
5. To know the architectures of representative embedded systems

Specific Objectives:

| | |
|----------|----------------------------------------------------------------------|
| 1 | Introduction to Embedded System |
| | Understand what is an embedded systems |
| | List the various application areas in which embedded system are used |
| | Categorize embedded system |
| | Gain knowledge of the architecture of the embedded systems |
| | Understand the requirements of embedded systems |
| | Learn about the recent trends in embedded system development |

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| 2 | Architecture of Embedded Systems |
| | Learn the hardware architecture of an Embedded system |
| | Gain knowledge of the software architecture of an embedded system |
| | Get an overview of the TCP/IP protocol architecture |
| | Understand the process of creating an executable image for the embedded system |
| | Grasp the details of Cross platform development |
| | Know the various tools required for Hardware/software development |
| | |
| 3 | Programming for Embedded Systems |
| | Understand the important features of ANSI standard for C language |
| | Learn the intricacies of C programming for Embedded Systems through examples in bit manipulations |
| | Learn Function calls for FILE I/O & memory management |
| | Understand the importance of code Optimization |
| | Gain knowledge of coding guidelines |
| | Appreciate the importance of C++ & JAVA programming languages for Embedded software development |
| | |
| 4 | Hardware Platforms |
| | Gain knowledge of different types of hardware platforms |
| | Learn in brief about a simple 89C51 based development board |
| | |
| 5. | Communication Interfaces |
| | Appreciate the need for communication interface |
| | Understand the Ethernet & Wireless LAN interfaces |
| | Grasp the details of IEEE 1394 Interface |
| | Gain knowledge of Infrared & Bluetooth wireless interfaces |
| | |
| 6 | Embedded /RTOS Concepts |
| | Understand the architecture of the Kernel of an OS |
| | Learn the details of Task scheduling algorithm |
| | Gain knowledge of inter-task communication |
| | Understand the details of Kernel objects such as tasks, task scheduler, ISR, Semaphores, Mutexes, Mail Boxes, Message Queues, Event Registers, Pipes, Signals & timers |
| | |
| 7 | Overview of Embedded / Real Time Operating Systems |
| | Understand the commonalities & differences in the operating systems available off – the – shelf |
| | Get a good understanding of commercial & open source OS used in embedded / real time systems as well as hand held/ mobile devices |
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| 8 | Representative Embedded System |
| | Understand the architecture of Representative Embedded systems viz., digital thermometer, hand held computer, navigation system, IP Phone and software-defined Radio |
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| 9 | Future trends |
| | Gain & understanding of the emerging Technologies |
| | Learn about new applications of these Technologies |
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Max. Marks: 100

Max. Time: 3 Hours

Model Question Paper

- Note: 1. Section –I is compulsory.
2. Answer any TWO questions from each remaining Sections.

Section - I

- 1 a. Fill in the blanks 5x1=5
- i.
- ii.
- iii.
- iv.
- v
- b). Explain the building blocks of navigation system 5

Section – II

2. a). what is an Embedded system? List the various applications of embedded systems 5
- b). Differentiate between hard real time system & soft real time system. 5
- c) Explain the internal architecture of a processor 5
- 3 a). Differentiate between an embedded OS and a real time OS 5
- b). What is cross platform development? List its tools 5
- c). Explain the process of generating an executable image for embedded software 5
- 4 a). Explain the boot sequence of an embedded system 5
- b) Write a C functions i) to demonstrate bit wise operators?
- ii) to check whether the bit is set to 1 or not 10

Section-III

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|----|-------------------------------------------------------------------|----|
| 5 | a). Write a C program to implement CRC 32 algorithm | 15 |
| 6 | a).List the important features of 89C51 development board | 5 |
| | b). List the important features of ATmega 128 microcontroller | 5 |
| | c). What are the reasons for the need of communication interfaces | 5 |
| 7. | a). What are the advantages of USB over RS 232 | 5 |
| | b). Explain the protocol architecture of Ethernet LAN | 5 |
| | c). What is IrDA interface? What are its advantages & limitations | 5 |

Section -IV

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|-----|-------------------------------------------------------------------------------|----|
| 8. | a). What are the objects of an OS kernel | 5 |
| | b). Explain the difference between semaphore & mutex | 5 |
| | c) Differentiate between preemptive & non preemptive OS | 5 |
| 9. | a). What are the memory management services provided by the kernel | 5 |
| | b). List the various mobile / handheld OS and explain their features in brief | 10 |
| 10. | a). what is a smart card? List the various applications of smart card | 5 |
| | b). Explain applications of pervasive computers and ubiquitous computers | 5 |
| | c). Write a short note on embedded intelligence | 5 |