**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**KATHMANDU UNIVERSITY**

**Subject: Embedded System Course Code: COMP 306**

**Credit:3 F.M: 100 (50 Internal +50 Final)**

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| **Course Description:** | The purpose of this course is to introduce the general concepts of Embedded System. The concept includes the design of Embedded System and its Implementation. It will cover some advanced topic at the end of the semester through the Project Work. | |
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| ***Objectives:*** | * To make the student able to understand the concept the Embedded System * To make the student able to design and implement real world application such as Mobile application and Electronic kits. | |
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| ***Prerequisite:*** | Student should have the prior knowledge of computer network, computer architecture and organization, microprocessor. He/she should be familiar with concept of some programming languages like C, C++ , Assembly Language. | |
| **Grading Policy:** | | |
| ***Final Exam:*** | 50 % | |
| ***Internals:*** | First Internal: | 10% |
| Second Internal: | 10% |
| Lab Performance (Project) : | 20% |
| Assignments: | 10% |
| ***Text Books:*** | *Course Book: Embedded/Real Time Systems. Concepts, Design and Programming Black Book - A Dr. K.V.K.K Prasad.*  *Reference Book: The 8051 Microcontroller and Embedded Systems, Using Assembly and C- M.A.Mazidi, J.G.Mazidi, R.D. McKinlay* | |

**Chapter 1. History and overview of embedded systems [1 hrs]**

 1.1 Introduction to Embedded System

1.2 History of Embedded System

1.3 Economic Challenges

1.4 Major application areas of Embedded Systems

1.5 Purpose of Embedded System

**Chapter 2. Fundamentals of Embedded Systems [1 hrs]**

2.1 What is Embedded System?  
2.2 Categories of Embedded Systems

2.3 Overview of Embedded System Architecture  
2.4 Specialties of Embedded Systems  
2.5 Recent Trends in Embedded Systems

**Chapter 3.Hardware architecture [10 hrs]**

3.1 Central Processing Unit  
3.2 Memory  
3.3 Clock Circuitry  
3.4 Chip Select  
3.5 Input/output Devices  
3.6 Communication Interfaces  
3.7 Power Supply Unit

**Chapter 4. Software Architecture [6 hrs]**

4.1 Services Provided by an Operating System   
4.2 Architecture of Embedded Operating Systems  
4.3 Categories of Embedded Systems  
4.4 Application Software, Communication Software, Development/Testing Tools  
4.5 Communication Software

**Chapter 5. Programming for embedded systems [6 hrs]**

5.1 Overview of C  
5.2 Memory Management  
5.3 Device Drivers   
5.4 Code Optimization

5.4 Programming in Java

**Chapter 6. The Process of Embedded System Development [8 hrs]**

6.1 Development Process Model  
6.2 Requirements Engineering  
6.3 Design  
6.4 Implementation  
6.5 Integration and Testing

**Chapter 7. Communication Interfaces [7 hrs]**

7.1 Need for Communication Interfaces

7.2 RS232/UART

7.3 UART

7.4 USB

7.5 Infrared

7.6 IEEE 1394 Firewire

7.7 Ethernet

7.8 IEEE 802.11

7.9 Bluetooth

**Chapter 8. Embedded Operating systems. [2 hrs]**

8.1 Overview of the Operating Systems  
8.2 Operating Systems Types

**Chapter 9. Hardware Platforms Types [1 hrs]**

**Chapter 10. Representative Embedded Systems [ 3 hrs]**

**Further Discussion about the course**

The entire course will have Lecture and Lab (per each group). Several categories that will be practiced in the course are discussed below.

**Lab Work**

In this course, there will be lab work in which student needs to simulate different embedded projects with the help of simulation software **(Proteus, Edsim 8051,etc)** feasible in the lab.

Evaluated will be accordingly mentioned below.

* 5 Labs: 10 marks
* Lab Project: 10 marks
  + 5 marks : Project Output.
  + 5 marks: Presentation and Final Report.

**Research Lab Project**

In this course, there will be research project in which student needs to go through the existing real world project by using single board microcontrollers like **8051**, **Arduino, Raspberry Pi**, etc of Embedded System in depth. Evaluation will be done according to performance of each student in the group.

**Assignment:** There will be several assignments in which 2 of them will be group assignment and remaining will be individual assignment. In group assignment, small presentation of 5-7 min is mandatory from the group.

**Demonstration/Field Visits**

If possible one day field visits will be organized to observe the implemented Embedded System in Industry. Also, the promising group and innovative projects will be highlighted to the departments to discuss for its potential and any further opportunities.

**Note**: All students should follow department guidelines related with attendance. In present pandemic situation the aforementioned mentioned plan may change. Students will be notified about the changes ASAP.

**Plagiarism, cheating, and other forms of academic dishonesty will not be tolerated. If such activities are found; it affects in the grading.**