



Course Objective and Outcome Form

Department of Electrical and Computer Engineering

School of Engineering and Physical Sciences

North South University, Bashundhara, Dhaka-1229, Bangladesh

1. **Course Number and Title:** CSE331 Microprocessor Interfacing and Embedded Systems
CSE331L Microprocessor Interfacing and Embedded Systems Lab
2. **Number of Credits:** 3 + 0 = 3 Credits
3. **Type:** Required, Engineering, Lecture + Lab
4. **Prerequisites:** CSE332 Computer Architecture and Organization
5. **Contact Hours:** Lecture – 3.0 Hours/Week, Lab - 2.5 Hours/Week
6. **Instructor:**
Dr. Sakhawat Hussain
Faculty initial: SkH1
Office: SAC 1140
Email: 1. sakhawat.hussain01@northsouth.edu
2. sakhawat@du.ac.bd
Office Hour: RA (Thursday-Saturday)
09.45 am – 11.10 am /(Appointment basis)
7. **Class schedule:**

Days	Time	Section	Location
RA (Thursday-Saturday)	08.00 AM- 09.30 AM	8	SAC 310
RA (Thursday-Saturday)	11.20 AM- 12.50 PM	9	NAC 992

8. Course Summary:

This course provides an introduction to the fundamental concept of microprocessor interfacing and microprocessor based embedded systems. A basic idea of the internal and external architecture of a modern microprocessor will be studied followed by the interface mechanisms for such microprocessors. The course will also cover the common peripheral devices for microprocessor-based systems. The course will then cover the programming languages for interfacing such as C or Assembly language that implements interrupt, data conversion algorithms, and inter-chip communications. A brief introduction to a modern Microcontroller will also be provided. Software Development Kits (SDKs) for embedded systems will be introduced in the laboratory classes for performing both simulation-based and hardware-based projects. This course has separate mandatory laboratory sessions every week as CSE 331L.

9. Course Objectives:

The objectives of this course are -

- a. to introduce the internal and external architecture of a modern microprocessor
- b. to explain the interconnection of microprocessor and different peripheral devices
- c. to introduce Assembly language for direct manipulation of a microprocessor
- d. to introduce to SDKs for embedded systems for both simulation and hardware-based works

10. Course Outcomes (COs):

Upon Successful completion of this course, students will be able to:

Sl.	CO Description	Weightage (%)
1	identify the building blocks of microprocessor based systems	20%
2	construct code in Assembly language for microprocessors and microcontrollers	30%
3	Use Software Development Kits (SDK) to program embedded systems	30%
4	design microprocessor or microcontroller-based embedded systems using hardware and software interface	20%

11. Mapping of CO-PO:

Sl.	CO Description	POs	KP	Bloom's taxonomy domain/level	Delivery methods and activities	Assessment tools
CO1	identify the building blocks of microprocessor-based systems	a	K4	Cognitive/ Understand	Lectures	Exam
CO2	construct code in Assembly language for microprocessors and microcontrollers	a	K4	Cognitive/ Apply	Lectures, Lab Class	Exam, Demonstration
CO3	Use Software Development Kits (SDK) to program embedded systems	e	K6	Psychomotor/ Precision	Lab Class	Lab Demonstration
CO4	design microprocessor or microcontroller-based embedded systems using hardware and software interface	c	KS	Cognitive/ Create	Lecture, Lab class	Assignment and demonstration

12. Resources

Text books:

No	Name of Author(s)	Year of Publication	Title of Book	Edition	Publisher's Name	ISBN
1	Yifeng Zhu	2017	<i>Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C</i>	Third	E-Man Press	978-0982692660
2	Joseph Yiu	2014	The definitive guide to ARM® Cortex®- M3 and Cortex®- M4 Processors	Third	Newnes Publisher	9780124080829

Reference books:

No	Name of Author(s)	Year of Publication	Title of Book	Edition	Publisher's Name	ISBN
1	Jonathan W. Valvano	2013	Real-Time Interfacing to ARM® Cortex™-M Microcontrollers	Third	Create Space	9781463590154
2	William Hohl, Christopher Hinds	2014	ARM Assembly Language: Fundamentals and Techniques	Second	CRC Press	9781482229851

Software resources:

CPULator Web based Simulator (<https://cpulator.OIxz.net/>)
STM CubeMX1.12.1
Windows Command-line or Ubuntu
Bash Keil uVision 5.0

10. Weightage Distribution among Assessment Tools

Theory: Attendance –10%,
Assignment/Homework – 5%
Quizzes – 15 %,
Midterms - 20%,
Final - 30%
Lab and project - 20%

Lab: Assignment/Homework - 10%
Attendance and Lab assessment - 25%,
Midterm Exam - 20%
Project - 20%,
Final Exam - 25%

11. Topics covered and level of coverage (Topic/Hours):

Course Topics	Coverage
ARM Architecture	2.5hrs
ARM Memory	2.5hrs
ARM Instruction Set Architecture (ISA) or Assembly Language	1.25hrs
ARM ISA: Arithmetic	1.25hrs
ARM ISA: Load and Store	1.25hrs
ARM ISA: Branch and Conditional Execution	1.25hrs
ARM ISA: Structural Programming	1.25hrs
ARM ISA: Passing Parameters to Subroutine	2.5hrs
ARM ISA: Subroutines Stack Preserve Environment	2.5hrs
C Programming for ARM	1.25hrs
Mixing C and Assembly for ARM	1.25hrs
General Purpose Input and Output (GPIO)	2.5hrs
Interrupts	2.5hrs
Direct Memory Access (DMA)	1.25hrs
ADC and DAC	1.25hrs
General-Purpose Timers	1.25hrs
Serial Communication Protocols- I2C	1.25hrs
Serial Communication Protocols- SPI	1.25hrs
UART, USART	1.25hrs
Controller-Area Network (CAN)	1.25hrs
Advanced Topics	1.25hrs

12. Grading policy: As per NSU grading policy available in

<http://www.northsouth.edu/academic/grading-policy.html>

13. Attendance policy:

As per university attendance policy, a student may be dropped from a course for absence in three consecutive classes. If a student needs to miss a class, they are advised to e-mail the instructor prior to the class. Students are requested not to enter the class after 10 minutes (Maximum) of the starting time. The attendance mark will be provided depending on students' percentage of attendance.

14. Make-up policy:

A student who failed to attend any class is responsible for obtaining the knowledge of what happened in the class, especially information about announced tests, home-work/assignments. A student who is absent on the day of a previously announced examination/quizzes, including the mid-term and final examination is not entitled, as a matter of right, to make up what was missed.

15. Exam rules:

- Any attempt to cheat such as looking at other's exam papers, copying from cheat sheet or other sources are strictly prohibited. If cheating of any form is caught, the exam will be cancelled straight away. No excuse will be accepted.
- Student must obey the standard rules of examination of the university.
- NO MAKE UP EXAMINATION will be arranged.

16. General rules:

- Use of cell phone in the class or lab is strictly prohibited. Phone must be in 'silent' mood during the class period.
- Extra class will be given if there is a need
- The teacher has the right to modify, add or remove topics in the mentioned topic list

Google classroom code: ybgatcse