



**Course Outline**  
**CSE 321 – Microprocessor and Interfacing**

<b>Instructor</b>	<b>Course Overview</b>
Shahadat Hussain Parvez	This course is designed for the student to understand the basic of Microprocessor: their internal structure, how they operate, evolution over the past, interfacing of microprocessor with external world, etc.
<b>Email</b>	

shparvez@neub.edu.bd

**Text Books:**

**Class Schedules:**

Monday & Thursday

8:30 AM – 10:00 AM

1. Microprocessors and interfacing by Douglas V hall
2. Microprocessors, PC Hardware and interfacing by N. Mathivanan
3. Assembly Language Programming and Organization for the IBM PC by Ytha Yu and Charles Marut [For Lab]

**Course Materials**

**Consultation Hours**

11:30 AM – 01:00 PM,  
Saturday at Room 303

10:00 AM – 2:30 PM,  
Thursday at Room 303

All the course materials (Including name for any new books) will be available at

- <http://www.neub.shparvez.net/cse-321/>
- <http://www.neub.shparvez.net/cse-322/>

You are encouraged to follow the website, as I will be updating about assignments and tutorials there.

**Course Learning Outcomes**

After completing this course students should be able to:

- Interpret and explain how full microcomputer system works including the memory organization in a microcomputer system
- Interpret microprocessor's and microcontroller's internal architecture and their operation.
- Interpret how low-level programming language such as assembly language works.
- Understand and evaluate various types of interfacing devices with other peripheral devices.
- Design microprocessor/microcontroller based projects from practical requirements.





Course Schedule

Week	Topic to be Covered	Learning Outcomes
Week 1	Lecture 1: Introduction <ul style="list-style-type: none"><li>• Introduction to Microprocessor</li><li>• Difference between Microprocessor and Microcontroller</li><li>• Classification of Microprocessor</li><li>• Moore's Law</li></ul>	Students should be able to <ul style="list-style-type: none"><li>• Understand the difference between Microprocessor and Microcontroller.</li><li>• Choose between Microprocessor and Microcontroller based on requirements.</li><li>• Choose between different types of microprocessor based on usage.</li><li>• Understand the impact of Moore's law in modern computational hardware.</li></ul>
	Lecture 2: Microcomputer System <ul style="list-style-type: none"><li>• Introduction to Microcomputer System</li><li>• Components of Microcomputer System</li><li>• Common Microprocessor architecture</li></ul>	Students should be able to <ul style="list-style-type: none"><li>• Identify different components of microcomputer system.</li><li>• Identify different microprocessor architecture and choose between architecture on the basis of pros and cons of different architecture.</li><li>• Identify the uses of different features of 8086 microprocessor.</li><li>• Understand and explain the functions of all pins in 8086.</li></ul>
Week 2	Lecture 3: Introduction to 8086 <ul style="list-style-type: none"><li>• 8086 features</li><li>• 8086 microprocessor pin out and pin functions</li></ul>	Students should be able to <ul style="list-style-type: none"><li>• Explain the functionalities of different block in 8086.</li><li>• Identify the components of and functionalities of ALU in 8086.</li><li>• Identify the uses of different flags in 8086.</li><li>• Identify the changes in flag resulting from different mathematical operations done by 8086.</li><li>• Detect overflow by observing the change in flags.</li></ul>
	Lecture 3: Introduction to 8086 <ul style="list-style-type: none"><li>• Input and output characteristics of 8086</li><li>• Internal structure of 8086</li><li>• ALU in 8086</li></ul>	
Week 3	Lecture 4: Flags and their uses <ul style="list-style-type: none"><li>• Flags in 8086</li><li>• Uses of flag to detect overflow</li><li>• Other uses of flag</li></ul>	Students should be able to <ul style="list-style-type: none"><li>• Identify the necessity of bus buffering and latching of 8086 bus.</li><li>• Design a fully buffered and latched 8086.</li><li>• Use 8084 to generate clock for 8086.</li><li>• Generate wait state for 8086 operation.</li></ul>
	Lecture 5: Interfacing 8086 <ul style="list-style-type: none"><li>• Bus buffering and latching</li><li>• Timing in 8086</li><li>• Functionalities of 8084A</li><li>• 8086 Bus timing</li><li>• Generating wait states in 8086</li><li>• Minimum mode Vs Maximum mode of</li></ul>	
Week 4		





Week	Topic to be Covered	Learning Outcomes
	8086 <ul style="list-style-type: none"><li>8288 Bus Controller</li></ul>	<ul style="list-style-type: none"><li>Identify the difference between minimum mode and maximum mode of operation of 8086.</li><li>Identify the uses of 8288 bus controller in maximum mode.</li></ul>
Week 5	Lecture 6: Memory Organization <ul style="list-style-type: none"><li>Memory Segmentation</li><li>Physical address generation in Segmented memory</li><li>Memory Hierarchy</li><li>DMA Operation</li></ul> Tutorial 1 Topic: Lecture 1-4	Students should be able to <ul style="list-style-type: none"><li>Understand and explain the purpose and necessity of memory segmentation.</li><li>Explain the different types of memory segmentation.</li><li>Generate physical address from segment:offset notation</li><li>Identify the advantages and disadvantages of different types of memory.</li><li>Understand the necessity and use of DMA operation.</li></ul>
Week 6	Lecture 7: 8086 Addressing Modes <ul style="list-style-type: none"><li>Addressing modes of 8086</li><li>Register Addressing</li><li>Immediate Addressing</li><li>Direct Addressing</li><li>Register Indirect Addressing</li><li>Based Relative Addressing</li><li>Indexed Relative Addressing</li><li>Based Indexed Relative Addressing</li><li>String addressing</li><li>I/O addressing</li><li>Relative addressing</li><li>Implied addressing</li></ul> Lecture 8: Interrupts in 8086 <ul style="list-style-type: none"><li>Introduction to different types of data transfer</li></ul>	Students should be able to <ul style="list-style-type: none"><li>Understand and explain different addressing modes in 8086.</li><li>Choose different addressing modes based on need.</li><li>Understand and explain different data transfer techniques.</li></ul>
Week 7	Lecture 8: Interrupts in 8086 <ul style="list-style-type: none"><li>Introduction to different types of interrupts</li><li>Response of microprocessor to interrupts</li><li>Uses of interrupts</li></ul> Revision and Solve class in preparation for Mid semester examination.	Students should be able to <ul style="list-style-type: none"><li>Understand and explain how interrupts work in computing system.</li><li>Understand and explain the response of 8086 to different interrupts.</li><li>Identify uses of interrupts.</li></ul>





Week	Topic to be Covered	Learning Outcomes
Week 8	<p>Lecture 9: 8085 Microprocessor</p> <ul style="list-style-type: none"><li>• Introduction to 8085</li><li>• Pin diagram of 8085<ul style="list-style-type: none"><li>◦ Function of each pins of 8085</li></ul></li><li>• Internal block diagram of 8085<ul style="list-style-type: none"><li>◦ Function of each blocks</li></ul></li><li>• Addressing Modes in 8085</li><li>• Interrupts in 8085</li><li>• 8085 Instruction Set</li></ul>	<p>Students should be able to</p> <ul style="list-style-type: none"><li>• Identify the uses of different features of 8085 microprocessor.</li><li>• Understand and explain the functions of all pins in 8085.</li><li>• Explain the functionalities of different block in 8085.</li><li>• Identify the components of and functionalities of ALU in 8085.</li><li>• Identify the uses of different flags in 8085.</li><li>• Understand and explain different addressing modes in 8085.</li><li>• Understand and explain how interrupts work in 8085.</li></ul>
Week 9	<p>Lecture 10: Interfacing with Analog world</p> <ul style="list-style-type: none"><li>• Introduction to Analog-Digital Interfacing</li><li>• Digital to Analog Converters (DAC)</li><li>• Weighted resistor network DAC</li><li>• R-2R ladder network DAC</li><li>• Current output DAC</li><li>• DAC Characteristics</li><li>• AD558 DAC</li></ul>	<p>Students should be able to</p> <ul style="list-style-type: none"><li>• Understand and explain the necessity for ADC and DAC.</li><li>• Explain how DAC works.</li><li>• Design and analyze different types of DACs like Weighted resistor network DAC, R-2R ladder network DAC, and Current output DAC.</li><li>• Understand and explain different characteristics of DACs.</li><li>• Choose DACs based on different characteristics.</li><li>• Identify the uses of AD558 DAC.</li></ul>
Week 10	<p>Lecture 10: Interfacing with Analog world</p> <ul style="list-style-type: none"><li>• Analog to Digital Converters (ADC)</li><li>• General steps in analog to digital conversion</li><li>• Parallel conversion / Flash ADC</li><li>• Digital Ramp ADC</li><li>• Single slope Integrating ADC</li><li>• Dual slope integrating ADC</li><li>• Successive approximation ADC</li><li>• ADC Characteristics</li></ul> <p><b>Tutorial 2</b> <b>Topic:</b> Lecture 9-10</p>	<p>Students should be able to</p> <ul style="list-style-type: none"><li>• Explain how ADC works.</li><li>• Understand and explain the general steps necessary for analog to digital conversion.</li><li>• Design and analyze different types of ADCs like Flash ADC, Digital Ramp ADC, Single slope Integrating ADC, Dual slope integrating ADC, and Successive approximation ADC</li><li>• Understand and explain different characteristics of ADCs.</li><li>• Choose ADCs based on different characteristics.</li></ul>





Week	Topic to be Covered	Learning Outcomes
Week 11	Lecture 11: I/O, Communication and Multitasking <ul style="list-style-type: none"><li>• Interfacing I/O Devices in 8086</li><li>• Interfacing Stepper Motors</li><li>• Serial I/O communication</li><li>• Multitasking</li><li>• Multiprocessing</li><li>• 8087 Arithmetic Co processor</li></ul>	Students should be able to <ul style="list-style-type: none"><li>• Understand different techniques of interfacing peripherals with 8086.</li><li>• Interface stepper motor with 8086.</li><li>• Understand and explain different communication techniques.</li><li>• Understand and explain how multitasking and multiprocessing works.</li><li>• Understand and explain functionalities of 8087.</li><li>• Use 8087 to design multiprocessor computing system.</li></ul>
Week 12	Lecture 12: Introduction to Embedded System Design <ul style="list-style-type: none"><li>• Design Process for embedded system</li><li>• Design Philosophies</li><li>• Requirement Analysis</li><li>• Specification preparation</li><li>• Examples of Embedded project design</li></ul>	Students should be able to <ul style="list-style-type: none"><li>• Understand the design steps necessary for embedded system projects.</li><li>• Generate requirement form, specification form, architecture design, etc based on requirements.</li></ul>
Week 13	Lecture 12: Introduction to Embedded System Design <ul style="list-style-type: none"><li>• Microcontroller</li><li>• Types of Microcontrollers</li><li>• General architecture of microcontroller</li><li>• Components of Microcontroller</li><li>• General architecture of AVR microcontroller</li><li>• ATmega328 features, pinout, and internal architecture</li></ul>	Students should be able to <ul style="list-style-type: none"><li>• Understand and explain the general architecture of microcontroller.</li><li>• Understand and explain the general architecture of AVR microcontroller.</li><li>• Explain the functions of different block of AVR microcontroller.</li><li>• Understand and explain the features, pinouts, and internal architecture of ATmega328 microcontroller.</li></ul>
Week 14	Lecture 12: Introduction to Embedded System Design <ul style="list-style-type: none"><li>• Functionalities and uses of different types of sensors</li></ul> Revision and Solve class in preparation for Mid semester examination.	Students should be able to <ul style="list-style-type: none"><li>• Explain the working principles of different sensors like Temperature sensor, Humidity sensor, Ambient light sensor, Optical sensors, Magnetic sens etc</li><li>• Design embedded projects incorporating multiple sensors.</li></ul>
Week 15	<b>Tutorial 3</b> <b>Topic:</b> Lecture 11-12 Revision and Solve class in preparation for Mid semester examination.	





# North East University Bangladesh

## Department of Computer Science and Engineering

### Assignments

Several assignments (Up to 10) will be given during the course of the semester. Due dates and syllabus will be announced in the class

### Assignment Policy

Assignments Must be submitted within due dates. No excuse or requests will be considered regarding late submission.

### Grading Policy

Attendance	: 10 marks
Tutorial	: 10 marks
Assignment + Presentation	: 10 marks
Mid Semester Examination	: 30 marks
Semester Final Examination	: 40 marks

Grades and grades point will be based on the following criteria.

Marks Range	Letter Grade	Grade Point
80% and Above	A+	4.00
75% - 79%	A	3.75
70% - 74%	A-	3.50
65% - 69%	B+	3.25
60% - 64%	B	3.00
55% - 59%	B-	2.75
50% - 54%	C+	2.50
45% - 49%	C	2.25
40% - 44%	D	2.00
Less than 40%	F	0.00

### Attendance Policy

Attendance will be taken based on the following criteria:

- Students who are on time will get full attendance without any penalty.
- Students who are no more than 30 minutes late will get 50% attendance penalty (Meaning half of the attendance will be accounted).
- Students who are more than 30 minutes late will get 90% attendance penalty.

Mark for attendance will be awarded as follows.

Level of Attendance	Mark
96% to 100%	10
91% to 95%	9
86% to 90%	8
81% to 85%	7
76% to 80%	6

Level of Attendance	Mark
71% to 75%	5
66% to 70%	4
61% to 65%	3
60%	2
Below 60%	0





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**Exam Schedule**

Exam	Schedule
Tutorial Exam #1	TBA
Mid Semester Examination	Announced by the Controller of Examination Office
Tutorial Exam #2	TBA
Tutorial Exam #3	TBA
Semester Final Examination	Announced by the Controller of Examination Office

**Other policies**

Bunking of class will be severely penalized. Mass bunking during tutorials will result in zero marks for all students. Other than bunking, unusual distractions during lectures by any students will also be severely penalized.

**Uses of online tools**

Google Classroom may also be used to share materials and assign assignments

- Class Code - **2anlwat**

Apart from scheduled tutorials, some quizzes may also be conducted online.