University of Sana'a
Faculty of Engineering
Department: Biomedical Engineering
Title of the Program: Biomedical Engineering

Course Specification of

Microprocessor and Microcontrollers

Course Code (BE353)

I. Course Identification and General Information:						
1	**Course Title:**	Microprocessor and Microcontrollers				
2	**Course Code & Number:**	BE353				
3	**Credit hours:**	C.H				TOTAL
		Th.	Seminar	Pr	Tr.	
		2	--	2	--	3
4	**Study level/ semester at which this course is offered:**	4th Level / 1st Semester				
5	**Pre –requisite (if any):**	BE121 (Logic System Design) & BE151 (Computer Programming 1)				
6	**Co –requisite (if any):**	None				
7	**Program (s) in which the course is offered:**	Biomedical Engineering Program				
8	**Language of teaching the course:**	English				
9	**Location of Teaching the Course:**	Faculty of Engineering				
10	**Prepared by:**	Assoc. Prof. Dr. Farouk Al-Fahaidy				
11	**Reviewed by:**	Assoc. Prof. Dr. Radwan AL Bouthigy				
12	**Date of Approval:**					

Academy Development Center & Quality Insurance Dean of Engineering Quality Insurance Unite Prepared By

Assoc. Prof. Dr.
Farouk Al-Fahaidy

II. Course Description:

This course aims to provide the basic concepts and principles related to microprocessors and microcontrollers architectures, programming, and applications to the field of biomedical engineering. The MP/MC play the main processing & control unit in different biomedical instrument. Topics include, an introduction to MP/MC architectures, differences and applications, the 8086/8088-Mps internal architecture & IC interfacing, assembly programming, and an introduction to the 8051-MC interfacing, features, and assembly programming. Throughout practical Lab experiments & computer-based lab work as well as, course project work, students will reflect & develop their learned skills in the design, simulation, programming and implementation of real-world applications related to the MP/MC based systems.

III. Course Intended learning outcomes (CILOs) of the course (maximum 8CILOs)		**Referenced PILOs** (Only write code number of referenced Program Intended learning outcomes)
Knowledge and Understanding: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
a1	Describe the theories and internal architecture of the microprocessors/ microcontrollers as well as their differences, features & capabilities.	A1 Describe and explain the underlying mathematical methods and theories; life scientific-principles; and engineering core concepts related to the Biomedical Engineering context.
a2	Explain basic concepts and principles related to microprocessors/microcontrollers based systems design, programming and applications in the field of biomedical engineering.	A2 Clarify the design principles and techniques and the engineering materials characteristics and how these are relevant to the developments and technologies in a biomedical systems context.
B. Cognitive/ Intellectual Skills: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
b1	Solve biomedical domain problems	B2 Identify, formulate and solve the complex

	related to microcomputer-based systems using appropriate software packages, computer programming, and suitable electronical elements, devices & ICs.	problems related to the Biomedical Engineering fields in a creative and innovative manner by using a systematic and analytical thinking methods.
b2	Construct an expected MP/MC-based system solution for overcoming practical problems with consideration of safety, manufacturability and sustainability constraints.	B3 Design the biomedical systems or processes within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
C. Professional and Practical Skills: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
c1	Use programming environment & software packages to write & burn assembly programs and to simulate the suggested solutions for solving practical problems.	C2 Use a wide range of analytical tools, techniques, IT, modern engineering tools, software packages and develop required computer programs to solve, modeling and analyzing Biomedical Engineering problems.
c2	Carry-out lab & environmental experiments related to the design and implementation of microcomputer-based systems.	C3 Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design and conduct experiments, collect, analyse and interpret data and present results in the biomedical systems practice.
D. Transferable Skills: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
d1	Show the capability to work in stressful environments within different constraints	D1 Lead and motivate individuals, show capability to work in stressful environments and within constraints, collaborate effectively within multidisciplinary team.
d2	Communicate well in both orally	D5 Demonstrate efficient IT capabilities and

	and in written forms.	communicate effectively both orally and in writing technical reports.

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1. Describe the theories and internal architecture of the microprocessors/ microcontrollers as well as their differences, features & capabilities.	• Interactive lectures & examples, • Interactive class discussions, • Exercises and home works,	• Written tests (mid and final terms and quizzes), • Coursework activities assessment, • Home works and assignments,
a2. Explain basic concepts and principles related to microprocessors/microcontrollers-based systems design, programming and applications in the field of biomedical engineering.	• Interactive lectures & examples, • Interactive class discussions, • Case studies, • Exercises and home works, • Directed self- study, • Problem based learning,	• Written tests (mid and final terms and quizzes), • Coursework activities assessment, • Home works and assignments,

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies

b1. Solve biomedical domain problems related to microcomputer-based systems using appropriate software packages, computer programming, and suitable electronical elements, devices & ICs.	• Interactive lectures & examples, • Interactive class discussions, • Case studies, • Exercises and home works, • Computer laboratory-based sessions, • Directed self- study	• Written tests (mid and final terms and quizzes), • Short reports, • Lab\Project report • Practical lab performance assessment, • Coursework activities assessment, • Home works and assignments,
b2. Construct an expected MP/MC-based system solution for overcoming practical problems with consideration of safety, manufacturability and sustainability constraints.	• Interactive lectures & examples, • Interactive class discussions, • Case studies, • Exercises and home works, • Laboratory/Practical experiments based session, • Computer laboratory-based sessions, • Directed self- study,	• Written tests (mid and final terms and quizzes), • Short reports, • Lab\Project report • Practical lab performance assessment, • Coursework activities assessment, • Home works and assignments, • Presentations.

(C) Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1. Use programming	• Laboratory/Practical	• Lab\Project report

environment & software packages to write & burn assembly programs and to simulate the suggested solutions for solving practical problems.	experiments based session, • Computer laboratory-based sessions, • Directed self- study, • Problem based learning, • Team work (cooperative learning), • Mini/major project.	• Practical lab performance assessment, • Coursework activities assessment, • Home works and assignments, • Presentations.
c2. Carry-out lab & environmental experiments related to the design and implementation of microcomputer-based systems.	• Laboratory/Practical experiments based session, • Computer laboratory-based sessions, • Directed self- study, • Problem based learning, • Team work (cooperative learning), • Mini/major project.	• Lab\Project report • Practical lab performance assessment, • Coursework activities assessment, • Home works and assignments, • Presentations.

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1. Show the capability to work in stressful environments within different constraints	• Case studies, • Laboratory/Practical experiments based session, • Computer laboratory-based sessions, • Directed self- study,	• Lab\Project report • Practical lab performance assessment, • Coursework activities assessment,

	• Problem based learning, • Team work (cooperative learning), • Mini/major project.	• Presentations.
d2. Communicate well in both orally and in written forms.	• Laboratory/Practical experiments based session, • Directed self- study, • Problem based learning, • Team work (cooperative learning), • Mini/major project.	• Short reports, • Lab\Project report • Practical lab performance assessment, • Coursework activities assessment, • Presentations.

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
1	**Introduction to MP/MC & Computing**	**a2**	– Course Orientations, Aims & Objectives, – Introduction to Microprocessors & Microcontrollers, – Numbering & Coding Systems.	**1**	**2**
2	**Internal Organization of Computer**	**a1, a2**	– Introduction to Internal Organization of Computer, Relation between Internal organization, Internal	**1**	**2**

			working of computer, – Brief history of the 80x86 family, Inside the 8088/8086.		
3	**The 80x86 Microprocessor**	**a1, a2**	– Introduction to the Assembly Programming, Program Segments, – The 80x86-MP's Memory Addressing Modes, Logical, Offset & Physical Addresses Calculation, Demonstration with Examples.	**1**	**2**
4	**Assembly Language Programming**	**a1, a2, b1**	– Layout of Assembly Programs, Directives & A Sample Program, Assemble, link, and Run a Program, – Flag Register & Control Transfer Instructions, Data types and Definitions	**1**	**2**
5	**Arithmetic and Logic Instructions and Programs**	**a1, a2, b1**	– Unsigned Addition & Subtraction, – Unsigned Multiplication & Division, – Logical & Shift Instructions and Sample Programs.	**1**	**2**
6	**BCD, ASCII, Bios & Dos Programming**	**a1, a2, b1**	– BCD & ASCII operands and Instructions, – Bios INT 10H	**1**	**2**

	in Assembly		– Programming: using INT 10H, – Dos Interrupt INT 21H: using INT 21H with different I/O Functions.		
7	**Strings & Tables and Macros & Modular Programming**	**a1, a2, b1**	– String Instructions & Look-up Tables Programming, – Define Macro in Assembly, Define the Local Variable in Macro, and including the Macro in another File – Modular Programming, Advantages, Break a Large Program into Modules, Code the Modules and calling the Program, EXTRN Directive, PUBLIC Directive, Link a Subprograms into one Executable Program.	**1**	**2**
8	**Mid-Term Theoretical Exam**	**a1, a2, b1**	– ALL Previous Topics	**1**	**2**
9	**The 8086/8088 MP IC & Interfacing and The 8255-IC**	**a1, a2, b1, b2**	– The 8086/8088-MP IC, Pins Functions, Modes of Operations, Memory & I/O Ports Addressing & Address Decoding Circuits, – Interfacing & Programming of the	**2**	**4**

			8088-Mp with I/O peripherals such as, Switch, LEDs and Sensors – The 8255-PPI IC, IC Pins, Configuration and Interfacing with Keypad & LCD.		
10	**Introduction to the 8051 Microcontroller Family & Programming**	**a1, a2, b1**	– Introduction to 8051 family MCs, IC for 8051, features like ports, Timers, and Serial Modules, Internal RAM, General Purpose Registers (GPRs), Special Function Registers (SFRs), – Basic Assembly Programming Instructions, – Flowchart standard symbols.	**1**	**2**
11	**The 8051 Programming**	**a1, a2, b1**	– Assembly Programming, Data Transfer Instructions, Addressing Modes, Data Processing Instructions, Program Branching Instructions, and Stack, – TIME DELAY Generation in 8051 MC.	**1**	**2**
12	**The 8051 Interfacing with Assembly**	**a2, b1, b2**	– The 8051-MC Interfacing, I/O Ports,	**2**	**4**

	Programming		– LEDs, Seven-Segments, Switches, Keypad, PWM, DC-motor, Stepper motor & Alphanumeric LCD – ADC, DAC Modules.		
13	**The 8051-MC's Interrupts**	**a2, b1, b2**	– Interrupts Programming, Steps in executing an interrupt, Interrupt Sources, Interrupt Vectors, Interrupt Enable (IE) register, External interrupt, Interrupt Priorities.	**1**	**2**
14	**Final Theoretical Exam**	**a1, a2, b1, b2**	– ALL Topics	**1**	**2**
Number of Weeks /and Units Per Semester				**16**	**32**

B - Practical Aspect: (if any)

Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	– **MP Lab & Computer based Lab Orientation:** – Lap equipment and simulation Tools orientations – Installation of 8086/8088-Mps simulators and Proetus Simulator.	1	2	a2, c1
2	– MOV and ADD assembly instructions illustrating	1	2	b1, c1, d1

	memory addressing modes			
3	– Conditional Assembly Instructions, – Arithmetic, Shift & Logic & Shift Assembly Instructions.	2	4	b1, c1, d1
4	– BCD, ASCII, BIOS & Dos Assembly	1	2	b1, c1, d1
5	– String Assembly Instructions & Lookup Tables Programming	1	2	b1, c1, d1
6	– Assembly programming: Macros and Modular Programming , – Building Assembly Program with Subroutines in Modular Programming.	2	4	b1, c1, d1, d2
7	– **Midterm Practical Exam**	1	2	c1, c2
8	– The 8086/8088-Mps interfacing with Peripherals & Programming.	2	4	b1, b2, c1, c2, d1, d2
9	– The 8051-MC Interfacing and Programming with Peripherals, – Demonstrating Interrupts Programming with 8051-MC.	2	4	b1, b2, c1, c2, d1, d2

10	– **Projects Presentation**	1	2	a1, a2, b1, b2, c1, c2, d1, d2
11	– **Final Practical Exam**	**1**	2	c1, c2
Number of Weeks /and Units Per Semester			**15**	**30**

C. Tutorial Aspect:

No.	Tutorial	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	NONE			
Number of Weeks /and Units Per Semester				

V. Teaching Strategies of the Course:

- Interactive lectures & examples,
- Interactive class discussions,
- Case studies,
- Exercises and home works,
- Laboratory/Practical experiments based session,
- Computer laboratory-based sessions,
- Directed self- study,
- Problem based learning,
- Team work (cooperative learning),
- Mini/major project.

VI. Assessment Methods of the Course:

- Written tests (mid and final terms and quizzes),

VI. Assessment Methods of the Course:

- Short reports,
- Lab\Project report
- Practical lab performance assessment,
- Coursework activities assessment,
- Home works and assignments,
- Presentations.

VII. Assignments & Reports:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	– **Memory addressing modes and Assembly instructions (Arithmetic & Logic)**	a1, a2, b1, d2	4th & 5th	1
2	– **Modular Programming in assembly**	a1, a2, b1, d2	6th & 7th	1
3	– **Interfacing 8086/8088-Mps** – **Short Report on MP/MC-based Systems, Technologies, Programming and Simulation**	a1, a2, b1, b2, d1, d2	9th to 11th	3
4	– **Interfacing 8051-MC**	a1, a2, b1, b2, d1, d2	12th & 13th	1
5	– **Lab Reports**	a1, a2, b1, b2, c1, c2, d1, d2	4th to 12th	4
Total				10

VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	**Assignments & Reports**	4th to 13th	10	6.67%	a1, a2, b1, b2, c1, c2, d1, d2
2	**Quizzes**	6th & 12th	10	6.67%	a1, a2, b1, b2
3	**Midterm Theoretical Exam**	8th	20	13.33%	a1, a2, b1
4	**Midterm Practical Exam**	9th	20	13.33%	b1, c1, d1
5	**Final Practical Exam (including Project Evaluation)**	15th	30	20%	a1, a2, b1, b2, c1, c2, d1, d2
6	**Final Theoretical Exam**	16th	60	40%	a1, a2, b1, b2
Total			150	100%	

IX. Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

Example

1- Niku, Saeed B., 2011, **Introduction to Robotics: Analysis, Control, Applications**, 2nd Edition, USA, Wiley.

1- Required Textbook(s) (maximum two).

1. M. Mazidi, and J. Mazidi, 2002, **The 80x86 IBM PC and Compatible Computers Assembly Language, Design and Interfacing**, 4th Edition, UK, Prentice Hall
2. M. Mazidi, and J. Mazidi, 2002, **The 8051 Microcontroller, Design and Interfacing**, 4th Edition, UK, Prentice Hall.

2- Essential References.

1. Richard C. Detmer, 2014, **Introduction to 80x86 Assembly Language and Computer Architecture**, 3rd edition, UK, Jones & Bartlett Learning.
2. Lyla B Das, 2010, **The X86 Microprocessors: Architecture and Programming (8086 to Pentium)**, 2nd Edition, New Delhi india, Dorling Kindersley.
3. John E. Uffenbeck, **The 80x86 Family: Design, Programming, and Interfacing**.

3- Electronic Materials and Web Sites *etc*.

Websites:

Courses:

1. http://nptel.iitm.ac.in
2. https://ocw.mit.edu/courses.
3. Lectures that may be prepared by the lecturer

Journals

4. http://www.sciencedirect.com/
5. http://dl.acm.org/dl.cfm
6. http://ieeexplore.ieee.org/Xplore/guesthome.jsp
7. http://www.emeraldinsight.com
8. http://www.scopus.com/home.url
9. http://link.springer.com/

X. Course Policies:

1	**Class Attendance:** A student should attend not less than 75 % of total hours of the subject; otherwise he/she will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic. If the absent is more than 25% of a course total contact hours, student will be required to retake the entire course again.
2	**Tardy:** For late in attending the class, the student will be initially notified. If he repeated lateness in

	attending class, he/she will be considered as absent.
3	**Exam Attendance/Punctuality:** A student should attend the exam on time. He/she is permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam
4	**Assignments & Projects**: In general one assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time, mostly one week after given the assignment.
5	**Cheating**: For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he/she will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university or according to the university roles.
7	**Other policies**: - Mobile phones are not allowed to use during a class lecture. It must be closed; **otherwise** the student will be asked to leave the lecture room. - Mobile phones are not allowed in class during the examination. - Lecture notes and assignments might be given directly to students using soft or hard copy.

University of Sana'a
Faculty of Engineering
Department: Biomedical Engineering
Title of the Program: Biomedical Engineering

Template for Course Plan (Syllabus)

Microprocessor and Microcontrollers
EE353

I. Course Identification and General Information:						
1	**Course Title:**	Microprocessor and Microcontrollers				
2	**Course Code & Number:**	BE353				
3	**Credit Hours:**	**Credit Hours**	**Theory Hours**		**Lab. Hours**	
			Lecture	**Exercise**		
		3	2	--	2	
4	**Study Level/ Semester at which this Course is offered:**	4^{th} Level / 1^{st} Semester				
5	**Pre –Requisite (if any):**	BE121 (Logic System Design) & BE151 (Computer Programming 1)				
6	**Co –Requisite (if any):**	None				
7	**Program (s) in which the Course is Offered:**	Bachelor of Biomedical Engineering				
8	**Language of Teaching the Course:**	English				
9	**Location of Teaching the Course:**	Faculty of Engineering				
10	**Prepared by:**	Assoc. Prof. Dr. Farouk Al-Fahaidy				
11	**Reviewed by:**	Assoc. Prof. Dr. Radwan AL Bouthigy				
12	**Date of Approval:**					

II. Course Description:

This course aims to provide the basic concepts and principles related to microprocessors and microcontrollers architectures, programming, and applications to the field of biomedical engineering. The MP/MC play the main processing & control unit in different biomedical instrument. Topics include, an introduction to MP/MC architectures, differences and applications, the 8086/8088-Mps internal architecture & IC interfacing, assembly programming, and an introduction to the 8051-MC interfacing, features, and assembly programming. Throughout practical Lab experiments & computer-based lab work as well as, course project work, students will reflect & develop their learned skills in the design, simulation, programming and implementation of real-world applications related to the MP/MC based systems.

III. Course Intended Learning Outcomes (CILOs): (مخرجات تعلم المقرر)

A. Knowledge and Understanding: Upon successful completion of the course, students will be able to:	
a1	Describe the theories and internal architecture of the microprocessors/ microcontrollers as well as their differences, features & capabilities.
a2	Explain basic concepts and principles related to microprocessors/microcontrollers-based systems design, programming and applications in the field of biomedical engineering.
B. Intellectual Skills: Upon successful completion of the course, students will be able to:	
b1	Solve biomedical domain problems related to microcomputer-based systems using appropriate software packages, computer programming, and suitable electronical elements, devices & ICs.
b2	Construct an expected MP/MC based system solution for overcoming practical problems with consideration of safety, manufacturability and sustainability constraints.
C. Professional and Practical Skills: Upon successful completion of the course, students will be able to:	
c1	Use programming environment & software packages to write & burn assembly programs and to simulate the suggested solutions for solving practical problems.
c2	Carry-out lab & environmental experiments related to the design and implementation of microcomputer-based systems.
D. Transferable Skills: Upon successful completion of the course, students will be able to:	

III. Course Intended Learning Outcomes (CILOs): (مخرجات تعلم المقرر)	
d1	Show the capability to work in stressful environments within different constraints
d2	Communicate well in both orally and in written forms.

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1	**Introduction to MP/MC & Computing**	– Course Orientations, Aims & Objectives, – Introduction to Microprocessors & Microcontrollers, – Numbering & Coding Systems.	**1**	**2**
2	**Internal Organization of Computer**	– Introduction to Internal Organization of Computer, Relation between Internal organization, Internal working of computer, – Brief history of the 80x86 family, Inside the 8088/8086.	**1**	**2**
3	**The 80x86 Microprocessor**	– Introduction to the Assembly Programming, Program Segments, – The 80x86-MP's Memory Addressing Modes, Logical, Offset & Physical Addresses Calculation, Demonstration with Examples.	**1**	**2**
4	**Assembly Language Programming**	– Layout of Assembly Programs, Directives & A Sample Program, Assemble, link, and Run a Program,	**1**	**2**

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
		– Flag Register & Control Transfer Instructions, Data types and Definitions		
5	**Arithmetic and Logic Instructions and Programs**	– Unsigned Addition & Subtraction, – Unsigned Multiplication & Division, – Logical & Shift Instructions and Sample Programs.	**1**	**2**
6	**BCD, ASCII, Bios & Dos Programming in Assembly**	– BCD & ASCII operands and Instructions, – Bios INT 10H Programming: using INT 10H, – Dos Interrupt INT 21H: using INT 21H with different I/O Functions.	**1**	**2**
7	**Strings & Tables and Macros & Modular Programming**	– String Instructions & Look-up Tables Programming, – Define Macro in Assembly, Define the Local Variable in Macro, and including the Macro in another File – Modular Programming, Advantages, Break a Large Program into Modules, Code the Modules and calling the Program, EXTRN Directive, PUBLIC Directive, Link a Subprograms into one Executable Program.	**1**	**2**
8	**Mid-Term Theoretical**	– ALL Previous Topics	**1**	**2**

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
	Exam			
9	**The 8086/8088 MP IC & Interfacing and The 8255-IC**	– The 8086/8088-MP IC, Pins Functions, Modes of Operations, Memory & I/O Ports Addressing & Address Decoding Circuits, – Interfacing & Programming of the 8088-Mp with I/O peripherals such as, Switch, LEDs and Sensors – The 8255-PPI IC, IC Pins, Configuration and Interfacing with Keypad & LCD.	**2**	**4**
10	**Introduction to the 8051 Microcontroller Family & Programming**	– Introduction to 8051 family MCs, IC for 8051, features like ports, Timers, and Serial Modules, Internal RAM, General Purpose Registers (GPRs), Special Function Registers (SFRs), – Basic Assembly Programming Instructions, – Flowchart standard symbols.	**1**	**2**
11	**The 8051 Programming**	– Assembly Programming, Data Transfer Instructions, Addressing Modes, Data Processing Instructions, Program Branching Instructions, and Stack, – TIME DELAY Generation in 8051 MC.	**1**	**2**

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
12	**The 8051 Interfacing with Assembly Programming**	– The 8051-MC Interfacing, I/O Ports, LEDs, Seven-Segments, Switches, Keypad, PWM, DC-motor, Stepper motor & Alphanumeric LCD – ADC, DAC Modules.	**2**	**4**
13	**The 8051-MC's Interrupts**	– Interrupts Programming, Steps in executing an interrupt, Interrupt Sources, Interrupt Vectors, Interrupt Enable (IE) register, External interrupt, Interrupt Priorities.	**1**	**2**
14	**Final Theoretical Exam**	– ALL Topics	**1**	**2**
Number of Weeks /and Units Per Semester			**16**	**32**

B. Case Studies and Practical Aspect:

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
1	– **MP Lab & Computer based Lab Orientation:** – Lap equipment and simulation Tools orientations – Installation of 8086/8088-Mps simulators and Proetus Simulator.	1	2
2	– MOV and ADD assembly instructions illustrating memory addressing modes	1	2
3	– Conditional Assembly Instructions,	2	4

B. Case Studies and Practical Aspect:			
No.	**Tasks/ Experiments**	**Number of Weeks**	**Contact Hours**
	– Arithmetic, Shift & Logic & Shift Assembly Instructions.		
4	– BCD, ASCII, BIOS & Dos Assembly	1	2
5	– String Assembly Instructions & Lookup Tables Programming	1	2
6	– Assembly programming: Macros and Modular Programming , – Building Assembly Program with Subroutines in Modular Programming.	2	4
7	– **Midterm Practical Exam**	1	2
8	– The 8086/8088-Mps interfacing with Peripherals & Programming.	2	4
9	– The 8051-MC Interfacing and Programming with Peripherals, – Demonstrating Interrupts Programming with 8051-MC.	2	4
10	– **Projects Presentation**	1	2
11	**Final Practical Exam**	**1**	2
Number of Weeks /and Units Per Semester		**15**	**30**

C. Tutorial Aspect:			
No.	**Tutorial**	**Number of Weeks**	**Contact Hours**
1	– NONE		

C. Tutorial Aspect:			
No.	**Tutorial**	**Number of Weeks**	**Contact Hours**
Number of Weeks /and Units Per Semester			

V. Teaching Strategies of the Course:

- Interactive lectures & examples,
- Interactive class discussions,
- Case studies,
- Exercises and home works,
- Laboratory/Practical experiments based session,
- Computer laboratory-based sessions,
- Directed self- study,
- Problem based learning,
- Team work (cooperative learning),
- Mini/major project.

VI. Assessment Methods of the Course:

- Written tests (mid and final terms and quizzes),
- Short reports,
- Lab\Project report
- Practical lab performance assessment,
- Coursework activities assessment,
- Home works and assignments,
- Presentations.

VII. Assignments & Reports:

No.	Assignments	Week Due	Mark
1	– Memory addressing modes and Assembly instructions (Arithmetic & Logic)	4th & 5th	1
2	– Modular Programming in assembly	6th & 7th	1
3	– Interfacing 8086/8088-Mps – Short Report on MP/MC-based Systems, Technologies, Programming and Simulation	9th to 11th	3
4	– Interfacing 8051-MC	12th & 13th	1
5	– Lab Reports	4th to 12th	4
Total			**10**

VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1	**Assignments & Reports**	4th to 12th	10	6.67%
2	**Quizzes**	6th & 12th	10	6.67%
3	**Midterm Theoretical Exam**	8th	20	13.33%
4	**Midterm Practical Exam**	9th	20	13.33%
5	**Final Practical Exam (including Project**	15th	30	20%

VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
	Evaluation)			
6	**Final Theoretical Exam**	16th	60	40%
Total			**150**	**100%**

IX. Learning Resources:

- *Written in the following order:*

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

Example

1- Niku, Saeed B., 2011, **Introduction to Robotics: Analysis, Control, Applications**, 2nd Edition, USA, Wiley.

1- Required Textbook(s) (maximum two):

1. M. Mazidi, and J. Mazidi, 2002, **The 80x86 IBM PC and Compatible Computers Assembly Language, Design and Interfacing**, 4th Edition, UK, Prentice Hall
2. M. Mazidi, and J. Mazidi, 2002, **The 8051 Microcontroller, Design and Interfacing**, 4th Edition, UK, Prentice Hall

2- Essential References:

1- Richard C. Detmer, 2014, **Introduction to 80x86 Assembly Language and Computer Architecture**, 3rd edition, UK, Jones & Bartlett Learning.

2- Lyla B Das, 2010, **The X86 Microprocessors: Architecture and Programming (8086 to Pentium)**, 2nd Edition, New Delhi india, Dorling Kindersley

3- John E. Uffenbeck, **The 80x86 Family: Design, Programming, and Interfacing.**

3- Electronic Materials and Web Sites etc.:

Websites

IX. Learning Resources:

Courses

1. http://nptel.iitm.ac.in
2. https://ocw.mit.edu/courses.
3. Lectures that may be prepared by the lecturer

Journals

4. http://www.sciencedirect.com/
5. http://dl.acm.org/dl.cfm
6. http://ieeexplore.ieee.org/Xplore/guesthome.jsp
7. http://www.emeraldinsight.com
8. http://www.scopus.com/home.url

http://link.springer.com/

X. Course Policies:

1	**Class Attendance:** A student should attend not less than 75 % of total hours of the subject; otherwise he/she will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic. If the absent is more than 25% of a course total contact hours, student will be required to retake the entire course again.
2	**Tardy:** For late in attending the class, the student will be initially notified. If he repeated lateness in attending class, he/she will be considered as absent.
3	**Exam Attendance/Punctuality:** A student should attend the exam on time. He/she is permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam

4	**Assignments & Projects**: In general one assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time, mostly one week after given the assignment.
5	**Cheating**: For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6	**Plagiarism**: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he/she will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university or according to the university roles.
7	**Other policies**: - Mobile phones are not allowed to use during a class lecture. It must be closed; **otherwise** the student will be asked to leave the lecture room. - Mobile phones are not allowed in class during the examination. - Lecture notes and assignments might be given directly to students using soft or hard copy.