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

Course Specification of Electronics 1

Course Code (BE122)

I. Course Identification and General Information:						
1	Course Title:	Electronics 1				
2	Course Code & Number:	BE122				
3	Credit hours:	C.H				TOTAL
		Th.	Seminar	Pr	Tr.	
		2	--	2	--	3
4	Study level/ semester at which this course is offered:	Second Level /Second Semester				
5	Pre –requisite (if any):	Electrical Circuits 1(BE111)				
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. Radwan ALBouthigy				
11	Reviewed by:	Assoc. Prof. Dr. Farouk Al-Fahaidy				
12	Date of Approval:					

II. Course Description:

This course presents fundamental principles and concepts of electronic devices and their applications in the design and construction of electronic circuits for solving practical problems in biomedical engineering. Course covers the main principles of formatting semiconductor devices, such as Diodes and Bipolar Junction Transistors (BJT). Also focus on formation of the different types of the Field Effect Transistors (FET) & their DC/AC analyses. Laboratory experiments and MATLAB simulation work are carried for different types of analog electronic elements to verify the theoretical concepts and to develop problem-solving skills related to electronic circuits and systems design and implementation.

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	Understand the basic concepts of electronic devices: Fabrication, characteristics and operation.	A1 Describe and explain the underlying mathematical methods and theories; life scientific-principles; and engineering core concepts related to the Biomedical Engineering context.
a2	Appreciate the properties and fundamental lows of electronic materials and devices.	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	Have sufficient skills in both theoretical and practical sides in order to be able to use electronic	B1 Apply engineering principles; basic of life-science; mathematical theories; and modern tools professionally in modelling, analyzing, designing, and constructing physical digital

	circuits in typical engineering applications.	systems; devices and/or processes relevant to Biomedical Engineering fields.
b2	Analyze of electronic circuits containing: diode, bipolar and FET transistors and test them.	B2 Identify, formulate and solve the complex problems related to the Biomedical Engineering fields in a creative and innovative manner by using a systematic and analytical thinking methods.
C. Professional and Practical Skills: Upon successful completion of the undergraduate Biomedical Engineering Program, the graduates will be able to:		
c1	Build simple electronics circuits using Lab and modern electronic software simulation tools.	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	Conduct experiments for evaluating the performance of electronic components or systems with respect to specification, as well as to analyze and interpret data.	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	Work effectively as a member of a group or individually to accomplish a common goal.	D1 Lead and motivate individuals, show capability to work in stressful environments and within constraints, collaborate effectively within multidisciplinary team.
d2	Purchase transferable skills of finding root causes and alternative solutions of problems.	D2 Acquire entrepreneurial skills and effectively manage tasks, time, processes and resources.

(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. Understand the basic concepts of electronic devices: Fabrication, characteristics and operation	• Staff-led lectures, • Interactive class discussions, • Exercises and home works.	• Written tests (mid and final terms and quizzes), • Home works and assignments, • Design and problem solving exercises, • Coursework activities assessment.
a2. Appreciate the properties and fundamental lows of electronic materials and devices.	• Staff-led lectures, • Interactive class discussions, • Problem based learning, • Exercises and home works,	• Written tests (mid and final terms and quizzes), • Home works and assignments, • Design and problem solving exercises, • Coursework activities assessment,

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1. Have sufficient skills in both theoretical and practical sides in order to be able to use electronic circuits in typical engineering applications.	• Staff-led lectures, • Interactive class discussions, • Problem based learning, • Exercises and home works, • Computer laboratory-based sessions.	• Written tests (mid and final terms and quizzes), • Home works and assignments, • Design and problem solving exercises,

		• Computer Lab performance assessment, • Coursework activities assessment.
b2. Analyze of electronic circuits containing: diode, bipolar and FET transistors and test them.	• Staff-led lectures, • Interactive class discussions, • Problem based learning, • Individual design projects, • Exercises and home works, • Computer laboratory-based sessions.	• Written tests (mid and final terms and quizzes), • Home works and assignments, • Design and problem solving exercises, • Computer Lab performance assessment, • Coursework activities assessment.

(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. Build a simple electronics circuits using Lab and modern software simulation tools.	• Laboratory/Practical experiments based session, • Computer laboratory-based sessions, • Team work (cooperative learning).	• Computer Lab performance assessment, • Project work assessment, • Project reports (individual and group) assessment.
c2. Conduct experiments for evaluating the performance of electronic components or systems with respect to specification, as well as to analyze and interpret data.	• Directed self- study, • Problem based learning, • Individual design projects, • Laboratory/Practical experiments based session, • Computer laboratory-based sessions,	• Design and problem solving exercises, • Essay and report writing assessment, • Computer Lab performance assessment, • Project work assessment,

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1. Work effectively as a member of a group or individually to accomplish a common goal.	• Laboratory/Practical experiments based session, • Computer laboratory-based sessions, • Team work (cooperative learning),	• Essay and report writing assessment, • Computer Lab performance assessment, • Coursework activities assessment, • Oral and visual presentations, • Project work assessment, • Project reports (individual and group) assessment.
d2. Purchase transferable skills of finding root causes and alternative solutions of problems.	• Directed self- study, • Student-led seminars and presentations, • Individual design projects, • Computer laboratory-based sessions, • Team work (cooperative learning)	• Essay and report writing assessment, • Computer Lab performance assessment, • Oral and visual presentations, • Project work assessment, • Project reports (individual and group) assessment.

IV. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	contact hours
1	**Introduction**	a1,a2	– History of electronics, classification, specification and utilization. – Atomic structure. – Energy bands. – Reverse recovery time – Resistances and Capacitances – Zener and light emitting diode	**1**	**2**
2	**P-N Junction Diode**	a1,a2,b1,b2	– Operation and biasing. – Series – parallel configuration – Half-wave and full-wave rectifiers. – Filtration. – Clippers circuit – Clampers circuits – Zener diode circuits – Multiplier voltage circuits	**2**	**4**
3	**Bipolar Junction Transistor**	a1,a2,b1	– Types. – Symbols.	**2**	**4**

			– Configurations. – DC Biasing. – Characteristics. – Determining of Q-Point.		
4	**Bipolar Junction Transistor (BJT).**	a1, b1,b2	– Modelling. – AC Analysing – re – Model. – Hybrid equivalent model (h-Parameters – Two port parameters	**2**	**4**
5	**Mid-Term Theoretical Exam**	a1,a2,b1,b2	– All Topics	**1**	**2**
6	**Field Effect transistor (FET) Type: JFET.**	a2,b1	– Types. – Symbols. – Construction. – DC Biasing.	**1**	**2**
7	**Field Effect Transistor (FET)Types: DMOSFET and EMOSFET.**	a2,b1	– Types. – Symbols. – Construction. – DC Biasing.	**2**	**4**
8	**Field Effect transistor (FET) Type: JFET.**	a2,b1,b2	– AC analysis	**2**	**4**
9	**Field Effect Transistor (FET)Type: MOSFET.**	a2,b1,b2	– AC analysis	**2**	**4**
10	**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	- **Safety regulations and requirements in electrical laboratories.** - **Introduction to main laboratory devices and instrumentations.** - **Introduction to main measurement devices.** - **Reporting format.**	1	2	a1
2	- **Diode in DC & AC circuits.**	1	2	a2,c1,c2,d1
3	- **Diode characteristics (conventional and Zener diode)**	1	2	b1, c1,c2,d1,d2
4	- **Single phase half wave rectification**	1	2	c1,c2,d1,d2
5	- **Single phase full wave rectification**	1	2	b2,c1,c2 ,d2
6	- **BJT transistor check** - **input characteristics & output characteristics**	1	2	c1,c2,d1,d2
7	- **BJT Transistor in common emitter**	1	2	c1,c2,d1,d2

	– **voltage amplification** – **phase shift** – **input and output resistance** – **current amplification** – **power amplification**			
8	- **BJT Transistor in common base** – **voltage amplification** – **phase shift** – **input and output resistance** – **current amplification** – **Power amplification.**	1	2	c1,c2,d1,d2
9	- **Mid-Term Practical Exam**	1	2	c1,c2,d1,d2
10	- **JFET Transistor characteristics**	1	2	c1,c2,d1,d2
11	- **DMOSFET Transistor characteristics**	1	2	c1,c2,d1,d2
12	- **EMOSFET Transistor characteristics**	1	2	c1,c2,d1,d2
13	**Course-Project Evaluation & Presentation:** Students in groups of 2 - 3 are asked from week 3 to design, simulate, program, and build a simple biomedical system using electronics1. The Project is evaluated according to in-lab circuit testing, students' analytical thinking, and report writing.	2	4	c1,c2,d1,d2

14	- Final Practical Exam	1	2	c1,c2,d1,d2
Number of Weeks /and Units Per Semester			15	30

C. Tutorial Aspect:

No.	Tutorial	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	None….it's wrong			
2	Must be Tutorial			
3				
Number of Weeks /and Units Per Semester		--	--	

V. Teaching Strategies of the Course:

- Staff-led lectures,
- Interactive class discussions,
- Directed self- study,
- Problem based learning,
- Individual design projects,
- Exercises and home works,
- Laboratory/Practical experiments based session,
- Computer laboratory-based sessions,
- Team work (cooperative learning).

VI. Assessment Methods of the Course:

- Written tests (mid and final terms and quizzes),
- Home works and assignments,
- Design and problem solving exercises,
- Essay and report writing assessment,
- Computer Lab performance assessment,
- Coursework activities assessment,
- Oral and visual presentations,
- Project work assessment,
- Project reports (individual and group) assessment.

VII. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	**Comparison between types of diodes**	a1, a2, b1, b2	4	2
2	**Design and implementation of Multiplier circuits using MATLAB tools**	a2, c2,d1	7	2
3	**Design and implementation of BJT circuits using MATLAB tools**	a2, c2,d1	9	2
4	**Design and implementation of JFET Transistor circuits using MATLAB tools**	a1, a2, b1	11	2

5	**Design and implementation MOSFET Transistor circuits using MATLAB tools**	a1, a2,c1, c2	13	2
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**	4,7, 9,11,13	10	6.67%	a1,a2, b1,b2,c2,d1,d2
2	**Quizzes 1 & 2**	6, 12	10	6.67%	a1, a2, b1,b2
3	**Mid-Term Theoretical Exam**	8	20	13.33%	a1, a2, b1,b2
4	**Mid-Term Practical Exam**	9	20	13.33%	c1,c2
5	**Final Practical Exam (including course project evaluation)**	13, 14 & 15	30	20%	c1,c2
	Final Theoretical Exam	16	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. Robert Boylestad & Louis Nashelsky – 2015- "Electronic Devices and Circuit Theory" Prentice Hall.

	2. Thomas Floyd -2018 -" Electronic Devices", 10th edition, Pearson
2- Essential References.	
	1. Robert Boylestad & Louis Nashelsky – 2009 - "Electronic Devices and Circuit Theory " Prentice Hall Higher Education – USA. 2. Richard C. Jaeger and Travis N. Blalock – 2011 – Microelectronic – 1 NIC circuit Design – 4/Edition – McGraw Hill Companies, USA – New York.
3- Electronic Materials and Web Sites *etc*.	
	Websites: 1- Electronics book https://www.amazon.com/Electronics-Electrical-Engineering-Books/b?ie=UTF8&node=13707 https://www.elprocus.com/basic-electronic-books/ https://ocw.mit.edu/courses. Board and Data Show projector. Computer with software. http://www.ocw.mit.edu/courses. http://nptel.iitm.ac.in 2- Journals: IEEE Transactions on Electronics: Peer reviewed academic journal in the field of electronics, with emphasis on mathematical and theoretical approaches. http://www.ieee-ies.org/pubs/transactions-on-industrial-electronics. IEEE Transactions on Industrial Electronics (IEEE T IND ELECTRON) https://www.researchgate.net/journal/02780046_IEEE_Transactions_on_Industrial_Electronics.

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)

Electronics 1-BE122

I. Course Identification and General Information:					
1	**Course Title:**	Electronics 1			
2	**Course Code & Number:**	BE122			
3	**Credit Hours:**	**Credit Hours**	**Theory Hours**		**Lab. Hours**
			Lecture	**Exercise**	
		3	2	--	2
4	**Study Level/ Semester at which this Course is offered:**	Second Level / Second Semester			
5	**Pre –Requisite (if any):**	Electrical Circuits 1(BE111)			
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. Radwan AL Bouthigy			
11	**Reviewed by:**	Assoc. Prof. Dr. Farouk Al-Fahaidy			
12	**Date of Approval:**				

II. Course Description:

This course presents fundamental principles and concepts of electronic devices and their applications in the design and construction of electronic circuits for solving practical problems in biomedical engineering. Course covers the main principles of formatting semiconductor devices, such as Diodes and Bipolar Junction Transistors (BJT). Also focus on formation of the different types of the Field

Effect Transistors (FET) & their DC/AC analyses. Laboratory experiments and MATLAB simulation work are carried for different types of analog electronic elements to verify the theoretical concepts and to develop problem-solving skills related to electronic circuits and systems design and implementation.

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	Understand the basic concepts of electronic devices: Fabrication, characteristics and operation
a2	Appreciate the properties and fundamental lows of electronic materials and devices.
B. Intellectual Skills: Upon successful completion of the course, students will be able to:	
b1	Have sufficient skills in both theoretical and practical sides in order to be able to use electronic circuits in typical engineering applications.
b2	Analyze of electronic circuits containing: diode, bipolar and FET transistors and test them.
C. Professional and Practical Skills: Upon successful completion of the course, students will be able to:	
c1	Build a simple electronics circuits using Lab and modern software simulation tools.
c2	Conduct experiments for evaluating the performance of electronic components or systems with respect to specification, as well as to analyze and interpret data.
D. Transferable Skills: Upon successful completion of the course, students will be able to:	
d1	Work effectively as a member of a group or individually to accomplish a common goal.
d2	Purchase transferable skills of finding root causes and alternative solutions of problems.

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1	**Introduction**	– History of electronics, classification, specification and utilization. – Atomic structure. – Energy bands. – Reverse recovery time – Resistances and Capacitances – Zener and light emitting diode	**1**	**2**
2	**P-N Junction Diode**	– Operation and biasing. – Series – parallel configuration – Half-wave and full-wave rectifiers. – Filtration. – Clippers circuit – Clampers circuits – Zener diode circuits – Multiplier voltage circuits	**2**	**4**
3	**Bipolar Junction Transistor**	– Types. – Symbols. – Configurations. – DC Biasing. – Characteristics. – Determining of Q-Point.	**2**	**4**
4	**Bipolar Junction**	– Modelling.	**2**	**4**

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
	Transistor (BJT).	– AC Analysing – re – Model. – Hybrid equivalent model (h-Parameters – Two port parameters		
5	**Mid-Term Theoretical Exam**	– All Topics	**1**	**2**
6	**Field Effect transistor (FET) Type: JFET.**	– Types. – Symbols. – Construction. – DC Biasing.	**1**	**2**
7	**Field Effect Transistor (FET)Types: DMOSFET and EMOSFET.**	– Types. – Symbols. – Construction. – DC Biasing.	**2**	**4**
8	**Field Effect transistor (FET) Type: JFET.**	– AC analysis	**2**	**4**
9	**Field Effect Transistor (FET)Type: MOSFET.**	– AC analysis	**2**	**4**
10	**Final Theoretical Exam**	– All Topics	**1**	**2**

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
Number of Weeks /and Units Per Semester			16	32

B. Case Studies and Practical Aspect:

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
1	- Safety regulations and requirements in electrical laboratories. - Introduction to main laboratory devices and instrumentations. - Introduction to main measurement devices. - Reporting format.	1	2
2	- Diode in DC & AC circuits.	1	2
3	- Diode characteristics (conventional and Zener diode)	1	2
4	- Single phase half wave rectification	1	2
5	- Single phase full wave rectification	1	2
6	- BJT transistor check - input characteristics & output characteristics	1	2
7	- BJT Transistor in common emitter – voltage amplification	1	2

B. Case Studies and Practical Aspect:			
No.	**Tasks/ Experiments**	**Number of Weeks**	**Contact Hours**
	– **phase shift** – **input and output resistance** – **current amplification** – **power amplification**		
8	- **BJT Transistor in common base** – **voltage amplification** – **phase shift** – **input and output resistance** – **current amplification** – **Power amplification.**	1	2
9	- **Mid-Term Practical Exam**	1	2
10	- **JFET Transistor characteristics**	1	2
11	- **DMOSFET Transistor characteristics**	1	2
12	- **EMOSFET Transistor characteristics**	1	2
13	**Course-Project Evaluation & Presentation:** Students in groups of 2 - 3 are asked from week 3 to design, simulate, program, and build a simple biomedical system using electronics1. The Project is evaluated according to in-lab circuit testing, students' analytical thinking, and report writing.	2	4
14	- **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		
Number of Weeks /and Units Per Semester			

V. Teaching Strategies of the Course:

- Staff-led lectures,
- Interactive class discussions,
- Directed self- study,
- Problem based learning,
- Individual design projects,
- Exercises and home works,
- Laboratory/Practical experiments based session,
- Computer laboratory-based sessions,
- Team work (cooperative learning).

VI. Assessment Methods of the Course:

- Written tests (mid and final terms and quizzes),
- Home works and assignments,
- Design and problem solving exercises,
- Essay and report writing assessment,
- Computer Lab performance assessment,
- Coursework activities assessment,
- Oral and visual presentations,
- Project work assessment,
- Project reports (individual and group) assessment.

VII. Assignments:

No.	Assignments	Week Due	Mark
1	**Comparison between types of diodes**	4	2
2	**Design and implementation of Multiplier circuits using MATLAB tools**	7	2
3	**Design and implementation of BJT circuits using MATLAB tools**	9	2
4	**Design and implementation of JFET Transistor circuits using MATLAB tools**	11	2
5	**Design and implementation MOSFET Transistor circuits using MATLAB tools**	13	2
Total			**10**

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

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1	**Assignments**	4,7, 9,11,13	10	6.67%
2	**Quizzes 1 & 2**	6, 12	10	6.67%
3	**Mid-Term Theoretical Exam**	8	20	13.33%
4	**Mid-Term Practical Exam**	9	20	13.33%
5	**Final Practical Exam (including course project evaluation)**	13, 14 & 15	30	20%
6	**Final Theoretical Exam**	16	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).*

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

1- Robert Boylestad & Louis Nashelsky – 2015- "Electronic Devices and Circuit Theory" Prentice Hall.

1- Thomas Floyd -2018 -" Electronic Devices", 10th edition, Pearson

2- Essential References:

1- Robert Boylestad & Louis Nashelsky – 2009 - "Electronic Devices and Circuit Theory" – Prentice Hall Higher Education – USA.

2- Richard C. Jaeger and Travis N. Blalock – 2011 – Microelectronic – 1 NIC circuit Design – 4/Edition – McGraw Hill Companies, USA – New York..

3- Electronic Materials and Web Sites etc.:

Websites:

1- Electronics book

https://www.amazon.com/Electronics-Electrical-Engineering-Books/b?ie=UTF8&node=13707

https://www.elprocus.com/basic-electronic-books/

https://ocw.mit.edu/courses.

Board and Data Show projector.

Computer with software.

http://www.ocw.mit.edu/courses.

http://nptel.iitm.ac.in

3- Journals:

IEEE Transactions on Electronics: Peer reviewed academic journal in the field of electronics, with emphasis on mathematical and theoretical approaches.

http://www.ieee-ies.org/pubs/transactions-on-industrial-electronics.

IX. Learning Resources:

IEEE Transactions on Industrial Electronics (IEEE T IND ELECTRON)
https://www.researchgate.net/journal/02780046_IEEE_Transactions_on_Industrial_Electronics.

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
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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.