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

Course Specification of Electronics 2

Course Code (BE223)

I. Course Identification and General Information:

1	**Course Title:**	Electronics 2				
2	**Course Code & Number:**	BE223				
3	**Credit hours:**	C.H				TOTAL
		Th.	Seminar	Pr	Tr.	
		2	--	2	--	3
4	**Study level/ semester at which this course is offered:**	Third Level / First Semester				
5	**Pre –requisite (if any):**	Electronics 1 (BE122)				
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 AL Bouthigy				
11	**Reviewed by:**	Dr. ----				
12	**Date of Approval:**					

II. Course Description:

This course provides students the concepts, theories and practical skills to be applied to the design & implementation of electronics2, to meet higher requirements of electronics systems as an essential-part to different biomedical arrangement & devices, automation & control systems, and smart devices. Course topics include: Amplifier frequency response, amplifiers and filters, bio – potential

amplifiers, design of power system in medical electronics, oscillator circuits, analog and to digital converter (ADC), and digital to analog converter (DAC). Through hands-on practical & computer-based labs works, students will verify the learned theoretical concepts and develop their problem-solving & design skills related to electronics systems based on real platforms and simulation environments.

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	Explain principles and theories concepts related to the design of electronics systems and their applications to the Biomedical Engineering context.	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 the operation and characteristics of amplifiers and filters elements and their functionalities to the design of biomedical systems.	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 domain problems related to biomedical engineering creatively, using electronics devices.	B1 Apply engineering principles; basic of life-science; mathematical theories; and modern tools professionally in modelling, analyzing, designing, and constructing physical digital systems; devices and/or processes relevant to Biomedical Engineering fields.
b2	Design an electronics system with interfacing capability within realistic constraints such as, environmental, safety, manufacturability and sustainability.	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	Practice professional and modern software packages, to write and develop desired computer programs, for modeling & solving Biomedical Engineering 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	Conduct lab & practice experiments related to electronics devices development and implementation.	C3 Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design and conduct experiments, collect, analyze 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	Function effectively while carrying out lab experiments within teams and	D1 Lead and motivate individuals, show capability to work in stressful environments

	in individual asked tasks.	and within constraints, collaborate effectively within multidisciplinary team.
d2	Engage in life-long self-learning by, following new technologies and tools applied in electronics systems solutions related to biomedical engineering.	D3 Recognize the needs for, and engage in life-long self-learning.

(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. Explain principles and theories concepts related to the design of electronics systems and their applications to the Biomedical Engineering context.	• 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. Explain the operation and characteristics of amplifiers and filters elements and their functionalities to the design of biomedical systems.	• 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. Solve domain problems related to biomedical engineering creatively, using electronics devices.	• 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. Design an electronics system with interfacing capability within realistic constraints such as, environmental, safety, manufacturability and sustainability.	• 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. Practice professional and modern software packages, to write and	• Laboratory/Practical experiments based session,	• Computer Lab performance assessment,

develop desired computer programs, for modeling & solving Biomedical Engineering problems.	• Computer laboratory-based sessions, • Team work (cooperative learning).	• Project work assessment, • Project reports (individual and group) assessment.
c2. Conduct lab & practice experiments related to electronics devices development and implementation.	• 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. Function effectively while carrying out lab experiments within teams and in individual asked tasks.	• 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. Engage in life-long self-learning by, following new technologies and tools applied in electronics systems solutions related to biomedical engineering.	• 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	**Amplifier Frequency Response**		– Logarithms and decibel – Low, mid and high-Frequency Range. – Typical Frequency Response. – Low-Frequency analysis—bode plot – Low-Frequency Response—BJT Amplifier with RL – Impact of R s on the BJT Low-Frequency Response – Low-Frequency	**2**	**4**

			Response—FET Amplifier – Miller Effect Capacitance – High-Frequency Response—BJT Amplifier – High-Frequency Response—FET Amplifier		
2	**Operational Amplifier**		– Differential Amplifier Circuit. – BiFET, BiMOS, and CMOS Differential Amplifier Circuits. – Op-Amp Basics. – Practical Op-Amp Circuits – Op-Amp Specifications—DC Offset Parameters – Op-Amp Specifications—Frequency Parameters. – Op-Amp Unit Specifications. – Differential and Common-Mode Operation.	**2**	**4**
3	**Basic Op-Amp Circuits**		– Comparator. – Summing amplifier	**1**	**2**

			– Integrators and Differentiators.		
4	**Special-Purpose Op-Amp Circuits**		– Instrumentation amplifiers – Isolation amplifiers – Operational trans conductance. – Converters and other Op. Amp. Circuits.	**2**	**4**
5	**Mid-Term Theoretical Exam**		– All Topics	**1**	**2**
6	**Active Filters**		– Basic filter response. – Filter response characteristics. – Active low pass filter. – Active high pass filter. – Active band pass filter – Active band stop filter – Filter response measurement.	**2**	**4**
7	**Oscillators**		– The oscillator – Feedback oscillator principle. – Oscillators with RC feedback circuits. – Oscillators with LC feedback circuits. – Relaxation oscillators. – The 555timer as an	**2**	**4**

			oscillator.		
8	**Power Supplies (Voltage Regulators)**		– Voltage regulation. – Basic series regulators. – Basic shunt regulator. – Basic switching regulators. – Integrated circuit voltage regulators. – Applications of IC voltage regulators.	**2**	**4**
9	**Analog to Digital & Digital to Analog Converters**		– Sample & Hold circuit. – Stair-Case (Ramp) A/D Converter. – Flash A/D converter. – Successive A/D converter. – Binary-Weighted D/A converter. – Ladder type D/A converter.	1	2
10	**Final Theoretical Exam**		– 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	– An Experiment to be familiarize with Measuring Instruments and Tools.	1	2	c1, d2
2	– Low, mid and high Frequency Response—BJT Amplifier	1	2	c1,c2,d1
3	– Low, MID AND HIGH Frequency Response—FET Amplifier	1	2	c2,d1,d2
4	– Inverting and non-inverting Op-Amp.	1	2	c1,c2,d1,d2
5	– Differentiator and integrator Op-Amp.	1	2	c1,c2,d1,d2
6	– An applications of Differential Op-Amp.	1	2	c1,c2,d1,d2
7	– Active low pass filter. – Active high pass filter.	1	2	c1,c2,d1,d2
8	– Active band pass filter – Active band stop filter.	1	2	c1,c2,d1,d2
9	– Mid-Term Practical	1	2	c1,c2

	Exam			
10	– Oscillators with RC feedback circuits. – Oscillators with LC feedback circuits.	1	2	c1,c2,d1,d2
11	– Relaxation oscillators. – The 555timer as an oscillator.	1	2	c1,c2,d1,d2
12	– Basic series regulators. – Basic shunt regulator. – Basic switching regulators.	1	2	c1,c2,d1,d2
13	– Analog/Digital Converters: Counting A/D Converter, Tracking A/D converter, Flash A/D converter, and Successive A/D converter.	1	2	c1,c2
14	**Course Project:** – Design and implementation of any circuit related to course. A report must be prepared and a presentation must be delivered. Students work in groups of two	Starts from week 3	2	c1, c2 d1, d2

	or three.			
15	**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:

- 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,

VI. Assessment Methods of the Course:

- 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	**Design Low, mid and high Frequency Response—BJT Amplifier**	a1, a2, b1, b2	4	2
2	**Applications of O.P-amp**	a2, c2,d1,D2	7	2
3	**Design and implementation of active band pass filter and active band stop filter using software tools.**	a2,c1, c2,d1	9	2
4	**Design and implementation of 555timer as an oscillator using software tools.**	a1, a2, b1	11	2

5	**Design and implementation basic series an shunt regulators 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**	15	30	20%	c1,c2
6	**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://www.pearsoned.co.in/MMorrisMano/

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-BE223

I. Course Identification and General Information:					
1	**Course Title:**	Electronics 2			
2	**Course Code & Number:**	BE223			
3	**Credit Hours:**	**Credit Hours**	**Theory Hours**		**Lab. Hours**
			Lecture	**Exercise**	
		3	2	--	2
4	**Study Level/ Semester at which this Course is offered:**	Third Level / First Semester			
5	**Pre –Requisite (if any):**	Electronics 1(BE122)			
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:**	Dr. ----			
12	**Date of Approval:**				

II. Course Description:

This course provides students the concepts, theories and practical skills to be applied to the design & implementation of electronics2, to meet higher requirements of electronics systems as an essential-part to different biomedical arrangement & devices, automation & control systems, and smart

devices. Course topics include: Amplifier frequency response, amplifiers and filters, bio – potential amplifiers, design of power system in medical electronics, oscillator circuits, analog and to digital converter (ADC), and digital to analog converter (DAC). Through hands-on practical & computer-based labs works, students will verify the learned theoretical concepts and develop their problem-solving & design skills related to electronics systems based on real platforms and simulation environments.

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	Explain principles and theories concepts related to the design of electronics systems and their applications to the Biomedical Engineering context.
a2	Explain the operation and characteristics of amplifiers and filters elements and their functionalities to the design of biomedical systems.
B. Intellectual Skills: Upon successful completion of the course, students will be able to:	
b1	Solve domain problems related to biomedical engineering creatively, using electronics devices.
b2	Design an electronics system with interfacing capability within realistic constraints such as, environmental, safety, manufacturability and sustainability.
C. Professional and Practical Skills: Upon successful completion of the course, students will be able to:	
c1	Practice professional and modern software packages, to write and develop desired computer programs, for modeling & solving Biomedical Engineering problems.
c2	Conduct lab & practice experiments related to electronics devices development and implementation.
D. Transferable Skills: Upon successful completion of the course, students will be able to:	
d1	Function effectively while carrying out lab experiments within teams and in individual asked

III. Course Intended Learning Outcomes (CILOs): (مخرجات تعلم المقرر)	
	tasks.
d2	Engage in life-long self-learning by, following new technologies and tools applied in electronics systems solutions related to biomedical engineering.

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1	**Amplifier Frequency Response**	– Logarithms and decibel – Low, mid and high-Frequency Range. – Typical Frequency Response. – Low-Frequency analysis—bode plot – Low-Frequency Response—BJT Amplifier with RL – Impact of R s on the BJT Low-Frequency Response – Low-Frequency Response—FET Amplifier – Miller Effect Capacitance – High-Frequency Response—BJT Amplifier – High-Frequency Response—FET Amplifier	**2**	**4**
2	**Operational Amplifier**	– Differential Amplifier Circuit. – BiFET, BiMOS, and CMOS Differential Amplifier Circuits.	**2**	**4**

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
		– Op-Amp Basics. – Practical Op-Amp Circuits – Op-Amp Specifications—DC Offset Parameters – Op-Amp Specifications—Frequency Parameters. – Op-Amp Unit Specifications. – Differential and Common-Mode Operation.		
3	**Basic Op-Amp Circuits**	– Comparator. – Summing amplifier – Integrators and Differentiators.	**1**	**2**
4	**Special-Purpose Op-Amp Circuits**	– Instrumentation amplifiers – Isolation amplifiers – Operational trans conductance. – Converters and other Op. Amp. Circuits.	**2**	**4**
5	**Mid-Term Theoretical Exam**	– All Topics	**1**	**2**
6	**Active Filters**	– Basic filter response. – Filter response characteristics. – Active low pass filter. – Active high pass filter. – Active band pass filter	**2**	**4**

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
		– Active band stop filter – Filter response measurement.		
7	**Oscillators**	– The oscillator – Feedback oscillator principle. – Oscillators with RC feedback circuits. – Oscillators with LC feedback circuits. – Relaxation oscillators. – The 555timer as an oscillator.	**2**	**4**
8	**Power Supplies (Voltage Regulators)**	– Voltage regulation. – Basic series regulators. – Basic shunt regulator. – Basic switching regulators. – Integrated circuit voltage regulators. – Applications of IC voltage regulators.	**2**	**4**
9	**Analog to Digital & Digital to Analog Converters**	– Sample & Hold circuit. – Stair-Case (Ramp) A/D Converter. – Flash A/D converter. – Successive A/D converter. – Binary-Weighted D/A converter. – Ladder type D/A converter.	1	2

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
10	**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	– An Experiment to be familiarize with Measuring Instruments and Tools.	1	2
2	– Low, mid and high Frequency Response—BJT Amplifier	1	2
3	– Low, MID AND HIGH Frequency Response—FET Amplifier	1	2
4	– Inverting and non-inverting Op-Amp.	1	2
5	– Differentiator and integrator Op-Amp.	1	2
6	– An applications of Differential Op-Amp.	1	2
7	– Active low pass filter. – Active high pass filter.	1	2
8	– Active band pass filter – Active band stop filter.	1	2
9	– Mid-Term Practical Exam	1	2

B. Case Studies and Practical Aspect:			
No.	**Tasks/ Experiments**	**Number of Weeks**	**Contact Hours**
10	– Oscillators with RC feedback circuits. – Oscillators with LC feedback circuits.	1	2
11	– Relaxation oscillators. – The 555timer as an oscillator.	1	2
12	– Basic series regulators. – Basic shunt regulator. – Basic switching regulators.	1	2
13	– Analog/Digital Converters: Counting A/D Converter, Tracking A/D converter, Flash A/D converter, and Successive A/D converter.	1	2
14	**Course Project:** – Design and implementation of any circuit related to course. A report must be prepared and a presentation must be delivered. Students work in groups of two or three.	Starts from week 3	2
15	**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			
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	**Design Low, mid and high Frequency Response—BJT Amplifier**	4	2

VII. Assignments:

No.	Assignments	Week Due	Mark
2	**Applications of O.P- amp**	7	2
3	**Design and implementation of active band pass filter and active band stop filter using software tools.**	9	2
4	**Design and implementation of 555timer as an oscillator using software tools.**	11	2
5	**Design and implementation basic series an shunt regulators 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**	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).*

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.

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.

IX. Learning Resources:

http://www.pearsoned.co.in/MMorrisMano/

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.

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.