Republic of Yemen

Ministry of Higher Education & Scientific Research

21 SEPTEMBER UNIVERSITY for MEDICALS &

APPLIEED SCIENCES

Engineering and Computer

Department of Biomedical Engineering

Course Specification of Electronics 1

Course No. (07.12.712)

2023/2024

Prepared by:	Reviewed by:	Head of the Department:	Quality Unit:	Dean:
Dr. Abdulrahman Obaid	Dr. -----	Dr. Awadh Al-Kubati	Dr. Mohammed Al-shamahi	Dr. Abdulrahman Obaid

I. Course Identification and General Information:

1	Course Title:	Electronics 1			
2	Course Code & Number:	07.12.712			
3	Credit Hours:	Credit Hours	Theory Hours		Lab. Hours
			Lecture	Exercise	
		3	2	--	2
4	Study Level/ Semester at which this Course is offered:	2 Level / 2 Semester			
5	Pre –Requisite (if any):	Fundamental of Electrical Circuits			
6	Co –Requisite (if any):	Advance Electrical Circuits			
7	Program (s) in which the Course is Offered:	Biomedical Engineering Technology			
8	Language of Teaching the Course:	English - Arabic			
9	Study System:	Regular Semester system (full-time)			
10	Mode of Delivery:	Regular, minimum attendance 75%			
11	Location of Teaching the Course:	University Campus			
12	Prepared by:	Dr. Abdulrahman Mohammed Obaid			
13	Date of Approval:				

II. Course Description:

This course introduces students to the fundamental principles and concepts of electronic devices and their applications that are required in the design and implementation of biomedical instrumentation.
The course covers the concept of semiconductor materials and electronic devices, characteristics of different type of diodes, bipolar junction transistors. States/modes of operation of such devices, small signal circuit models, are also covered. Applications of these devices in basic electronic circuits: rectifiers, limiting and climbing circuits, regulated power supplies, electronic switches, and amplifiers are covered as well.
Material will be introduced through textbook readings, then expanded upon in lecture.
Student will learn to design, simulate, using Multisim Electronics Workbench, and

implemented by building and testing small electronic circuits.

III. Course Intended Learning Outcomes (CILOs) : (مخرجات تعلم المقرر)		Referenced PILOs (مخرجات تعلم البرنامج)	
A. Knowledge and Understanding: Upon successful completion of the course, students will be able to:			
a1	Demonstrate an understanding of terminology and concepts of electronic devices and circuits.	A1	Demonstrate an understanding of appropriate models, theories, mathematical foundations, and techniques related to biomedical engineering technology disciplines.
a2	Explain the role of electronic components in the design of electronic systems to meet desired needs within realistic constraints.	A2	Demonstrate a profound knowledge in maintenance, troubleshooting, tools, techniques, practices, and methods, utilizing and adapting biomedical engineering technology for solving biomedical devices and equipment's problems in health environment.
a3	Describe the electronic components characteristic and analyze its operation	A3	Identify user and healthcare needs to provide biomedical engineering technology maintenance based solutions to real-world problem.
a4	Demonstrate an understanding of concepts of electronic devices and circuits.	A4	Demonstrate a sound understanding the biomedical engineering technology concept related to maintenance, troubleshooting, programming, utilizing, analysis, design, implementation, and evaluation of biomedical equipment's, devices and systems.
B. Intellectual Skills: Upon successful completion of the course, students will be able to:			
b1	Analyze and investigate electronic circuits to judge the performance of electronic systems that meet desired applications	B1	Critically analyze complex biomedical devices and equipment's problems, faults and propose appropriate biomedical devices maintenance based solutions and integrate them effectively into the uses and healthcare

			organizations.
b2	Depict how electronic components are modeled and how the models are used in the design and analysis of electric and electronic circuits.	**B2**	Analyze the impacts of biomedical devices and equipment's problems and faults on health objectives, customer needs and consider them during the purchasing, maintenance, selection, integration, configuration and administration of biomedical devices, equipment's and systems.
b3	Analyze and measure electronics circuits	**B3**	Explore variety of challenges and problems related to maintenance, troubleshooting and performance of biomedical devices to select the optimal solution.
b4	Evaluate the extent of electronic technologies and what kind of effect they have on Bio-medical engineering problems solutions	**B4**	Evaluate biomedical engineering based solution to meet a given set of health requirements in the context of biomedical engineering technology discipline.
C. Professional and Practical Skills: Upon successful completion of the course, students will be able to:			
c1	build small projects using electrical and electronic circuit components	**C1**	Employ effectively the biomedical engineering technology concepts, principles of engineering, maintenance, evaluation tools and techniques used for the analysis and troubleshooting of medical devices faults of varying complexity.
c2	Design, simulate, and implement simple electronic systems using electronic components and computer simulation package	**C2**	Design, implement, and test of biomedical devices and equipment's maintenance based solution to meet a given set of engineering requirement in the context of biomedical engineering technology.
c3	Use electronic device models and mathematic knowledge in solving and analyzing electronic circuits	**C3**	Use systematic approaches to maintenance, select, develop and administrate biomedical devices and equipment’s to accomplish user and health goals.

c4	Use electronic computers software in simulating and analyzing electronic circuits as a verification tool.	C4	Use the techniques, skills, and necessary tools for biomedical engineering practices.
D. Transferable Skills: Upon successful completion of the course, students will be able to:			
d1	Develop student's cooperative work though efficient team works.	D1	Function effectively as an individual, as a member, or leader of a team engaged in appropriate activities to the biomedical engineering technology disciplines to accomplish a common goal.
d2	Commit to professional ethics, responsibilities, and norms of professional biomedical engineering practices.	D2	Commit to professional ethics, responsibilities, and norms of professional biomedical engineering practices.
d3	Communicate effectively in writing and orally in a variety of professional contexts.	D3	Communicate effectively in writing and orally in a variety of professional contexts.
d4	Engage in continuing professional development and lifelong learning as an biomedical engineering technology professional.	D4	Engage in continuing professional development and lifelong learning as an biomedical engineering technology professional.

	(A) Alignment of Course Intended Learning Outcomes (Knowledge and Understanding) to Teaching Strategies and Assessment Methods:		
	Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
a1	Demonstrate an understanding of terminology and concepts of electronic devices and circuits.	▪ The lecture method ▪ The discussion method ▪ The method of cooperative learning	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ The guidance and ▪ leadership of the ▪ educational process

			▪ Notes & observation
a2	Explain the role of electronic components in the design of electronic systems to meet desired needs within realistic constraints.	▪ The lecture method ▪ The discussion method ▪ The method of cooperative learning	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ The guidance and ▪ leadership of the ▪ educational process ▪ Notes & observation
a3	Describe the electronic components characteristic and analyze its operation	▪ The lecture method ▪ The discussion method ▪ The method of cooperative learning	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ The guidance and ▪ leadership of the ▪ educational process ▪ Notes & observation
a4	Demonstrate an understanding of concepts of electronic devices and circuits.	▪ The lecture method ▪ The discussion method ▪ The method of cooperative learning	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ The guidance and ▪ leadership of the ▪ educational process ▪ Notes & observation

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

	Course Intended Learning	Teaching Strategies	Assessment Strategies

	Outcomes		
b1	Analyze and investigate electronic circuits to judge the performance of electronic systems that meet desired applications	▪ lectures ▪ discussion ▪ cooperative learning ▪ Assignments	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ The guidance and ▪ leadership of the ▪ educational process ▪ Notes & observation
b2	Depict how electronic components are modeled and how the models are used in the design and analysis of electric and electronic circuits.	▪ lectures ▪ discussion ▪ cooperative learning ▪ Assignments	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ The guidance and ▪ leadership of the ▪ educational process ▪ Notes & observation
b3	Analyze and measure electronics circuits	▪ lectures ▪ discussion ▪ cooperative learning ▪ Assignments	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ The guidance and ▪ leadership of the ▪ educational process ▪ Notes & observation
b4	Evaluate the extent of electronic technologies and what kind of effect they have on Bio-medical engineering problems	▪ lectures ▪ discussion ▪ cooperative learning ▪ Assignments	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ The guidance

	solutions		and ▪ leadership of the ▪ educational process ▪ Notes & observation

	(C) Alignment of Course Intended Learning Outcomes (Professional and Practical Skills) to Teaching Strategies and Assessment Methods:		
	Course Intended Learning Outcomes	**Teaching Strategies**	**Assessment Strategies**
c1	build small projects using electrical and electronic circuit components	▪ Interactive class ▪ Discussions ▪ Directed self-study ▪ Demonstration	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ Notes & observation ▪ Rev homework
c2	Design, simulate, and implement simple electronic systems using electronic components and computer simulation package	▪ Interactive class ▪ Discussions ▪ Directed self-study ▪ Group lab	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ Notes & observation ▪ Rev homework
c3	Use electronic device models and mathematic knowledge in solving and analyzing electronic circuits	▪ Interactive class ▪ Discussions ▪ Directed self-study ▪ Group lab	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ Notes & observation ▪ Rev homework
c4	Use electronic computers software in simulating and analyzing electronic circuits as a verification tool.	▪ Interactive class ▪ Discussions ▪ Directed self-study ▪ Group lab	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ Notes & observation ▪ Rev homework ▪ lab evaluation

	(D) Alignment of Course Intended Learning Outcomes (Transferable Skills) to Teaching Strategies and Assessment Methods:		
	Course Intended Learning	**Teaching Strategies**	**Assessment Strategies**

	Outcomes		
d1	Develop student's cooperative work though efficient team works.	▪ Interactive class ▪ discussions, ▪ work lab	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ Notes & observation ▪ Solve th.lab
d2	Commit to professional ethics, responsibilities, and norms of professional biomedical engineering practices.	▪ Interactive class ▪ discussions, ▪ work lab	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ Notes & observation ▪ Solve th.lab
d3	Communicate effectively in writing and orally in a variety of professional contexts.	▪ Interactive class ▪ discussions, ▪ self -study ▪ work lab	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ Notes & observation ▪ Solve theor. lab
d4	Engage in continuing professional development and lifelong learning as an biomedical engineering technology professional.	▪ Interactive class ▪ discussions, ▪ presentation	▪ Written tests(mid ▪ And final terms and ▪ quizzes), ▪ Notes & observation ▪ presentation

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	➤ Introduction ➤ Electronic materials	➤ introduction to the course, ➤ Conductors, ➤ Insulators,	1	3	a1,a2,b1,b2,d1, d4

		➤ Intrinsic and extrinsic semiconductors, ➤ Semiconductors doping, n-type and p-type			
2	P-N Junction Diode	➤ p-n junction physics ➤ Diode Biasing, Diode I-V characteristics ➤ Diode models and diode dc circuit analysis	1	3	a1,a2,b1,b2c3,c4,d2,d3
3	Diode Applications	➤ Half wave and full wave rectifiers (center tape and bridge rectifier circuits) ➤ Rectifier circuits analysis	1	3	a1,a2,b1,b2,d2,d3
4	Diode Applications	➤ Diode limiters and clampers ➤ Voltage multipliers ➤ Diode datasheet ➤ Troubleshooting	1	3	a1,a2,b1,b2,d2,d3
5	Special-Purpose Diodes (Zener diodes)	➤ Breakdown Characteristics ➤ equivalent circuits ➤ Temperature coefficient ➤ power dissipation and derating ➤ datasheet	1	3	a1,a2,b1,b2c3,c4,d2,d3
6	Special-Purpose Diodes (Zener diodes)	➤ applications ➤ Troubleshooting	1	3	a1,a2,b1,b2c3,c4,d2,d3
7	**Midterm Exam**	**Midterm Exam** theory	1	3	a1, a2, a3, b1, b2, c1, c2, d2
8	Special-Purpose Diodes (Other Types of Diodes)	➤ Varactor diodes, ➤ tunnel diodes ➤ optical diodes (LED, photo diode) ➤ Schottky Diode	1	3	a1,a2,b1,b2c3,c4,d2,d3
9	BJT and its characteristics	➤ Structure ➤ Basic BJT Operation	1	3	a1,a2,b

		(Biasing, operation)			1,b2c3,c4,d2,d3
10	BJT and its characteristics	➤ BJT I-V Characteristics and Parameters ➤ Mode of operation: BJT as an amplifier, BJT as a Switch ➤ The Phototransistor ➤ Transistor Categories and	1	3	a1,a2,b1, b2c3,c4,d2,d3
11	➤ BJT and its characteristics • Transistor Bias Circuits	➤ Packaging ➤ Troubleshooting • The DC operating Point: DC • Bias, DC Load Line • Linear Operation and waveform distortion	1	3	a1,a2,b1, b2c3,c4,d2,d3
12	**Transistor Bias Circuits**	➤ Voltage-Divider Bias ➤ Other Bias Methods: Base Bias, Emitter Bias, Collector Bias ➤ Q-Point Stability	1	3	a1,a2,b1,b2c3,c4,d2,d3
13	**Final Practical Exam**	➤ All tops	1	6	a1, a2, a3, b1, b2, c1, c2, d2
14	**BJT Amplifiers**	➤ Amplifier Operation ➤ Linear Amplifier ➤ Transistor AC Models ➤ CE Amplifier ➤ CC Amplifier	1	3	a1,a2,b1,b2c3,c4,d2,d3
15	**BJT Amplifiers**	➤ CB Amplifier ➤ Multistage Amplifiers ➤ The Differential Amplifier ➤ Troubleshooting	1	3	a1,a2,b1, b2c3,c4,d2,d3
16	**Final Theoretical Exam**	All topics	1	2	al,a2, a3 a4, b1,b2, b3,b4, c1,c2, c3,c4, d3,d4

Number of Weeks /and Units Per Semester	16	50	

B. Case Studies and Practical Aspect:

No.	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	Diode DC circuit analysis	1	2	
2	Rectifier circuit analysis	1	2	
3	Analysis of ➤ Limiting and clamping circuits ➤ Voltage multipliers **circuits** ➤ Diode datasheet	2	4	
4	Zener Regulation circuits analysis Zener Limiter circuits analysis	2	4	
5	BJT Dc biasing circuits	1	2	
6	BJT I-V characteristic analysis Load line, Q point	1	2	
7	BJT biasing circuit analysis	2	4	
8	BJT Amplifire circuit analysis	2	4	
9	HOMEWORK	1	2	
10	- PROJECT	1	2	
11	-			
12	-			
13	-			
14	-			
15	-			
16				

Number of Weeks /and Units Per Semester	15	30	

C. Tutorial Aspect:

No.	Tutorial	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	Diode DC circuit analysis	1	2	
2	Rectifier circuit analysis	1	2	
3	Analysis of ➤ Limiting and clamping circuits ➤ Voltage multipliers circuits ➤ Diode datasheet	2	4	
4	Zener Regulation circuits analysis Zener Limiter circuits analysis	2	4	
5	BJT Dc biasing circuits	1	2	
6	BJT I-V characteristic analysis Load line, Q point	1	2	
7	BJT biasing circuit analysis	2	4	
	Review	2	4	
Number of Weeks /and Units Per Semester		8		

V. Teaching Strategies of the Course:

- Lectures
- Tutorials
- laboratory works

- Self-learning
- Dialogue and discussion
- Analysis and Problem solving .
- Project work
- Design exercises
- Simulation tools
- Discussion
- Brainstorming

VI. Assessment Methods of the Course:

- Written tests (mid and final terms and quizzes),
- Class discussions,
- Presentations.
- Experiment lab theory.
- project
- Home work

VII. Assignments:

No.	Assignments	Week Due	Mark	Aligned CILOs (symbols)
1				
2				
3				
Total				

Prepared by:	Reviewed by:	Head of the Department:	Quality Unit:	Dean:
Dr. Abdulrahman Obaid	Dr. -----	Dr. Awadh Al-Kubati	Dr. Mohammed Al-shamahi	Dr. Abdulrahman Obaid

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	Homework/Tasks/Assignments	2,4,6,8 ,10	5	10%	a2, a3, b1, b2, c1, c2, d1, d2
2	Practical final exam	13	15	15%	a2, a3, b1, b2, c1, c2, d1, d2
3	Midterm Exam **theoretical**	7	10	10%	a1, a2, a3, b1, b2, c1, c2, d2
4	project	14	15	15%	a1, a2, a3, b1, b2, c1, c2, d2
5	Oral and discussion notices	weekl y	5	5%	a1, a2, a3, b1, b2, c1, c2, d2
6	Final Exam	16	50	50%	a2, a3, b1, b2, c1, c2, d1, d2
Total			**100**	**100%**	

IX. Learning Resources:

1. Floyd TL, Electronic Devices, 8th/7thed. Pearson/Prentice Hall. 2008/2005.
2. R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 10th Edition, Prentice Hall, 2009.

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

1. Reddy SR. Electronic Devices and Circuits, Pangbourne: Alapha Science International, 2004.
2. J. D. Irwin, Basic Engineering Circuit Analysis, 7th Edition, Prentice-Hall, 2002.
3. R. C. Dorf and J. A. Svoboda, Introduction to Electric Circuit, 3rd Edition, John Wiley & Sons, 1996.
4. N. R. Malik, Electronic Circuit Analysis, Simulation and Design, Prentice-Hall, 1995.
5. D. Comer and D. Comer, Fundamentals of Electronic Circuit Design, John Wiley &

Sons, 2003.

2- Essential References:

1. Reddy SR. Electronic Devices and Circuits, Pangbourne: Alapha Science International, 2004.
2. J. D. Irwin, Basic Engineering Circuit Analysis, 7th Edition, Prentice-Hall, 2002.
3. R. C. Dorf and J. A. Svoboda, Introduction to Electric Circuit, 3rd Edition, John Wiley & Sons, 1996.
4. N. R. Malik, Electronic Circuit Analysis, Simulation and Design, Prentice-Hall, 1995.
5. D. Comer and D. Comer, Fundamentals of Electronic Circuit Design, John Wiley & Sons, 2003.

3-Electronic Materials and Web Sites etc.:

X. Course Policies: (Based on the Uniform Students' By law (2007) تترك كما هي

1	**Class Attendance:** Class Attendance is mandatory. A student is considered absent and shall be banned from taking the final exam if his/her absence exceeds 25% of total classes.
2	**Tardiness:** A student will be considered late if he/she is not in class after 10 minutes of the start time of class.
3	**Exam Attendance/Punctuality:** No student shall be allowed to the exam hall after 30 minutes of the start time, and shall not leave the hall before half of the exam time has passed.
4	**Assignments & Projects:** Assignments and projects must be submitted on time. Students who delay their assignments or projects shall lose the mark allocated for the same.

5	**Cheating:** Cheating is an act of fraud that results in the cancelation of the student's exam or assignment. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
6	**Forgery and Impersonation:** Forgery/Impersonation is an act of fraud that results in the cancelation of the student's exam, assignment or project. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
7	**Other policies:** The University official regulations in force will be strictly observed and students shall comply with all rules and regulations of the examination set by the Department, Faculty and University Administration.

Second Part of Course Specification

Faculty of Medical Technology

Department of Biomedical Engineering

Course Specification of Electronics 1

Course No. (07.12.712)

2023/2024

Prepared by:	Reviewed by:	Head of the Department:	Quality Unit:	Dean:
Dr. Abdulrahman Obaid	Dr. -----	Dr. Awadh Al-Kubati	Dr. Mohammed Al-shamahi	Dr. Abdulrahman Obaid

Course Plan (Syllabus) of Biomedical Electronics 1

Course No.(07.02.721)

I. Information about Faculty Member Responsible for the Course:							
Name of Faculty Member:							
Location& Telephone No.:							
E-mail:		SAT	SUN	MON	TUE	WED	THU
Office Hours							

2022/2023

Prepared by:	Reviewed by:	Head of the Department:	Quality Unit:	Dean:
Dr. Abdulrahman Obaid	Dr. -----	Dr. Awadh Al-Kubati	Dr. Mohammed Al-shamahi	Dr. Abdulrahman Obaid

I. Course Identification and General Information:

1	Course Title:	Electronics 1			
2	Course Code & Number:	07.12.712			
3	Credit Hours:	Credit Hours	Theory Hours		Lab. Hours
			Lecture	Exercise	
		3	2	--	2
4	Study Level/ Semester at which this Course is offered:	2 Level / 2 Semester			
5	Pre –Requisite (if any):	Fundamentals of Electrical Circuits			
6	Co –Requisite (if any):	Advance Electrical Circuits			
7	Program (s) in which the Course is Offered:	Biomedical Engineering Technology			
8	Language of Teaching the Course:	English - Arabic			
9	Study System:	Regular Semester system (full-time)			
10	Mode of Delivery:	Regular, minimum attendance 75%			
11	Location of Teaching the Course:	University Campus			
12	Prepared by:	Dr. Abdulrahman Mohammed Obaid			
13	Date of Approval:				

II. Course Description:

This course introduces students to the fundamental principles and concepts of electronic devices and their applications that are required in the design and implementation of biomedical instrumentation.
The course covers the concept of semiconductor materials and electronic devices, characteristics of different type of diodes, bipolar junction transistors. States/modes of operation of such devices, small signal circuit models, are also covered. Applications of these devices in basic electronic circuits: rectifiers, limiting and climbing circuits, regulated power supplies, electronic switches, and amplifiers are covered as well.

Material will be introduced through textbook readings, then expanded upon in lecture. Student will learn to design, simulate, using Multisim Electronics Workbench, and implemented by building and testing small electronic circuits..

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	Demonstrate an understanding of terminology and concepts of electronic devices and circuits.
a2	Explain the role of electronic components in the design of electronic systems to meet desired needs within realistic constraints.
a3	Describe the electronic components characteristic and analyze its operation
a4	Demonstrate an understanding of concepts of electronic devices and circuits.
B. Intellectual Skills: Upon successful completion of the course, students will be able to:	
b1	Analyze and investigate electronic circuits to judge the performance of electronic systems that meet desired applications
b2	Depict how electronic components are modeled and how the models are used in the design and analysis of electric and electronic circuits.
b3	Analyze and measure electronics circuits
b4	Evaluate the extent of electronic technologies and what kind of effect they have on Bio-medical engineering problems solutions
C. Professional and Practical Skills: Upon successful completion of the course, students will be able to:	
c1	build small projects using electrical and electronic circuit components
c2	Design, simulate, and implement simple electronic systems using electronic components and computer simulation package
c3	Use electronic device models and mathematic knowledge in solving and analyzing electronic circuits
c4	Use electronic computers software in simulating and analyzing electronic circuits as a verification tool.
D. Transferable Skills: Upon successful completion of the course, students will be able to:	

d1	Develop student's cooperative work though efficient team works.
d2	Commit to professional ethics, responsibilities, and norms of professional biomedical engineering practices.
d3	Communicate effectively in writing and orally in a variety of professional contexts.
d4	Engage in continuing professional development and lifelong learning as an biomedical engineering technology professional.

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1	Introduction	➤ introduction to the course, ➤ Conductors, ➤ Insulators, ➤ Intrinsic and extrinsic semiconductors, ➤ Semiconductors doping, n-type and p-type	1	3
2	P-N Junction Diode	➤ p-n junction physics ➤ Diode Biasing, Diode I-V characteristics ➤ Diode models and diode dc circuit analysis	1	3
3	Diode Applications	➤ Half wave and full wave rectifiers (center tape and bridge rectifier circuits) ➤ Rectifier circuits analysis	1	3
4	Diode Applications	➤ Diode limiters and clampers ➤ Voltage multipliers ➤ Diode datasheet ➤ Troubleshooting	1	3
5	Special-Purpose Diodes (Zener diodes)	➤ Breakdown Characteristics ➤ equivalent circuits ➤ Temperature coefficient ➤ power dissipation and derating ➤ datasheet	1	3
6	Special-Purpose Diodes (Zener	➤ applications ➤ Troubleshooting	1	3

	diodes)			
7	**Midterm Exam**	**Midterm Exam** theory	1	3
8	Special-Purpose Diodes (Other Types of Diodes)	➤ Varactor diodes, ➤ tunnel diodes ➤ optical diodes (LED, photo diode) ➤ Schottky Diode	1	3
9	BJT and its characteristics	➤ Structure ➤ Basic BJT Operation (Biasing, operation)	1	3
10	BJT and its characteristics	➤ BJT I-V Characteristics and Parameters ➤ Mode of operation: BJT as an amplifier, BJT as a Switch ➤ The Phototransistor ➤ Transistor Categories and	1	3
11	➤ BJT and its characteristics • Transistor Bias Circuits	➤ Packaging ➤ Troubleshooting • The DC operating Point: DC • Bias, DC Load Line • Linear Operation and waveform distortion	1	3
12	**Transistor Bias Circuits**	➤ Voltage-Divider Bias ➤ Other Bias Methods: Base Bias, Emitter Bias, Collector Bias ➤ Q-Point Stability	1	3
13	**Final Practical Exam**	➤ All tops	1	6
14	**BJT Amplifiers**	➤ Amplifier Operation ➤ Linear Amplifier ➤ Transistor AC Models ➤ CE Amplifier ➤ CC Amplifier	1	3
15	**BJT Amplifiers**	➤ CB Amplifier ➤ Multistage Amplifiers ➤ The Differential Amplifier ➤ Troubleshooting	1	3
16	**Final Theoretical Exam**	All topics	1	2

Number of Weeks /and Units Per Semester	16	50

B. Case Studies and Practical Aspect:

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
1	Diode DC circuit analysis	1	2
2	Rectifier circuit analysis	1	2
3	Analysis of ➤ Limiting and clamping circuits ➤ Voltage multipliers **circuits** ➤ Diode datasheet	2	4
4	Zener Regulation circuits analysis Zener Limiter circuits analysis	2	4
5	BJT Dc biasing circuits	1	2
6	BJT I-V characteristic analysis Load line, Q point	1	2
7	BJT biasing circuit analysis	2	4
8	BJT Amplifire circuit analysis	2	4
9	Review	1	2
10	HOMEWORK	1	2
11	- PROJECT	1	2
12	-		
13	-		
14	-		
15	-		
16			

Prepared by:	Reviewed by:	Head of the Department:	Quality Unit:	Dean:
Dr. Abdulrahman Obaid	Dr. -----	Dr. Awadh Al-Kubati	Dr. Mohammed Al-shamahi	Dr. Abdulrahman Obaid

Number of Weeks /and Units Per Semester	15	30

C. Tutorial Aspect:

No.	Tutorial	Number of Weeks	Contact Hours
1	Diode DC circuit analysis	1	2
2	Rectifier circuit analysis	1	2
3	Analysis of ➤ Limiting and clamping circuits ➤ Voltage multipliers **circuits** ➤ Diode datasheet	2	4
4	Zener Regulation circuits analysis Zener Limiter circuits analysis	2	4
5	BJT Dc biasing circuits	1	2
6	BJT I-V characteristic analysis Load line, Q point	1	2
7	BJT biasing circuit analysis	2	4
8	BJT Amplifire circuit analysis	2	4
9	Review	1	2
10			
11			
12			
Number of Weeks /and Units Per Semester			

V. Teaching Strategies of the Course:

- Lectures
- Tutorials

- laboratory works
- Self-learning
- Dialogue and discussion
- Analysis and Problem solving .
- Project work
- Design exercises
- Simulation tools
- Coursework
- Discussion
- Brainstorming

VI. Assessment Methods of the Course:

- Written tests (mid and final terms and quizzes),
- Class discussions,
- Presentations.
- experiment lab theory.
- project
- Review home work

VII. Assignments:

No.	Assignments	Week Due	Mark
1			
2			
Total			

VIII. Schedule of Assessment Tasks for Students During the

Prepared by:	Reviewed by:	Head of the Department:	Quality Unit:	Dean:
Dr. Abdulrahman Obaid	Dr. -----	Dr. Awadh Al-Kubati	Dr. Mohammed Al-shamahi	Dr. Abdulrahman Obaid

Semester:				
No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1	Homework/Tasks/Assignments	2,4,6,8 ,10	5	10%
2	Practical final exam	13	15	15%
3	Midterm Exam **theoretical**	7	10	10%
4	project	14	15	15%
5	Oral and discussion notices	weekl y	5	5%
6	Final Exam	16	50	50%
Total			**Total**	**100**

IX. Learning Resources:

1- *Floyd TL, Electronic Devices, 8th/7thed. Pearson/Prentice Hall. 2008/2005.*

2- *R. L. Boylestad and L. Nashelsky, Electronic Devices and Circuit Theory, 10th Edition, Prentice Hall, 2009.*

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

6. Reddy SR. Electronic Devices and Circuits, Pangbourne: Alapha Science International, 2004.
7. J. D. Irwin, Basic Engineering Circuit Analysis, 7th Edition, Prentice-Hall, 2002.
8. R. C. Dorf and J. A. Svoboda, Introduction to Electric Circuit, 3rd Edition, John Wiley & Sons, 1996.
9. N. R. Malik, Electronic Circuit Analysis, Simulation and Design, Prentice-Hall, 1995.
10. D. Comer and D. Comer, Fundamentals of Electronic Circuit Design, John Wiley & Sons, 2003.

2- Essential References:

6. Reddy SR. Electronic Devices and Circuits, Pangbourne: Alapha Science International, 2004.
7. J. D. Irwin, Basic Engineering Circuit Analysis, 7th Edition, Prentice-Hall, 2002.
8. R. C. Dorf and J. A. Svoboda, Introduction to Electric Circuit, 3rd Edition, John Wiley & Sons, 1996.
9. N. R. Malik, Electronic Circuit Analysis, Simulation and Design, Prentice-Hall,

1995.
10. D. Comer and D. Comer, Fundamentals of Electronic Circuit Design, John Wiley & Sons, 2003.

3- Electronic Materials and Web Sites etc.:

Websites:

Journals:

1-

Other Web Sources:

X. Course Policies: (Based on the Uniform Students' By law (2007) تترك كما هي

1	**Class Attendance:** Class Attendance is mandatory. A student is considered absent and shall be banned from taking the final exam if his/her absence exceeds 25% of total classes.
2	**Tardiness:** A student will be considered late if he/she is not in class after 10 minutes of the start time of class.
3	**Exam Attendance/Punctuality:** No student shall be allowed to the exam hall after 30 minutes of the start time, and shall not leave the hall before half of the exam time has passed.
4	**Assignments & Projects:** Assignments and projects must be submitted on time. Students who delay their assignments or projects shall lose the mark allocated for the same.
5	**Cheating:** Cheating is an act of fraud that results in the cancelation of the student's exam or assignment. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
6	**Forgery and Impersonation:** Forgery/Impersonation is an act of fraud that results in the cancelation of the

	student's exam, assignment or project. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
7	**Other policies:** The University official regulations in force will be strictly observed and students shall comply with all rules and regulations of the examination set by the Department, Faculty and University Administration.