INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

COURSE OUTLINE

1. Course Title: Electronic Circuits

2. Course Code: EECE 2313

3. Credit Value: 3

4. MQF Level: 6

5. Affected Batch: Semester 2, 2020/2021

6. Centre of Studies: Kulliyyah of Engineering

7. Department/Unit: Electrical and Computer Engineering

8. Course Synopsis:
RC-coupled amplifiers frequency response analysis and design, Bode plots, high frequency transistor model and Miller's equivalent circuits analysis, Integrated circuit biasing techniques, analysis and design of amplifier's feedback topologies and oscillators.

9. Course Classification within the Curriculum: Core course

10. Prerequisite(s) (if any): EECE 1312 Electronics

11. Course Learning Outcomes

No.	Outcomes	Bloom's Taxonomy			Soft skills (KI)	Programme Outcomes (PO)
		C	A	P		
1	Analyze the transfer function a RC circuits and Bode plots.	C1			CS8, CT2	PO1
2	Analyze frequency responses of small-signal amplifiers	C4			CS8, CT2	PO1
3	Analyze Miller's theorem in analyzing the frequency response of amplifiers.	C4			CS8, CT2	PO1
4	Analyze integrated electronic circuits biasing.	C5			CS8, CT2	PO2
5	Identify and analyze different types of feedback amplifiers and oscillators	C5			CS8, CT2	PO2

Knowledge Profile and Complex Mapping (*Tick* (✔) *in the appropriate box*)

a. Knowledge Profile

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8
	✓	✓	✔				

b. Complex Engineering Problem

WP1	WP2	WP3	WP4	WP5	WP6	WP7
✓	✓					

c. Complex Engineering Activities

EA1	EA2	EA3	EA4	EA5
✓	✓			

12. LO - Instruction Method - Assessment Alignment:

Outcomes	Teaching-Learning Methods	Assessment Methods
LO1	Lectures, e-learning	Exam, Quiz, Assignment
LO2	Lectures, e-learning	Exam, Quiz, Assignment
LO3	Lectures, e-learning	Exam, Quiz, Assignment
LO4	Lectures, e-learning	Exam, Quiz, Assignment
LO5	Lectures, e-learning	Exam, Quiz, Assignment

13. Assessment Methods Weightage:

Methods	Percentage
Quiz, Assignment	15
Midterm	25
Final Exam	60
TOTAL	100

14. Student Learning Time:

1. Instruction Component	**Total Allocated Hours**
1.1. Teacher-oriented methods	
Lecture	34
1.2. Student-oriented methods	
Problem-based learning	8
Total Instructor Contact Hours: 42	
2. Independent Learning Component	**Total Estimated Hours**
2.1. Reading and revision	
Self-study	42
2.2. Estimated hours for preparation toward assessments	
Assignment	10
Midterm test/ Quizzes/ Final examination	23
3. Assessment Outside Instruction Hours	**Total Allocated Hours**
Final examination	3
TOTAL SLT	**120**

15. Course Contents and Related SLT:

Week	Topics	Face to Face Hours	Self-Learning Hours
1, 2	**Frequency response:** The general frequency response characteristics of amplifiers.	6	10
3, 4	**System transfer function and Bode plots:** Derive the system transfer functions of R-C circuits, develop the Bode plots for the magnitude and phase of the transfer functions, and become familiar with sketching the Bode diagram.	6	10
5, 6	**Low frequency response of an amplifier:** Coupling capacitances and bypass capacitor effects on the frequency response of the amplifier.	6	10
7, 8	**High frequency response of an amplifier:** High frequency transistor model and Miller effect, load and device capacitances effects on high frequency response of the amplifier.	6	12
9, 10	**Integrated Circuit Biasing:** Different types of BJT and MOSFET current sources and their analysis.	6	12
11-12	**Feedback**: Basic concepts of feedbacks, feedback topologies, different types of feedback networks design and analysis.	6	12
13, 14	Oscillators: Principle of oscillators, RC, LC and relaxation oscillator and design and analysis.	6	12
	TOTAL	**42**	**78**

16. References:

16.1 Required:

Neamen, D., Meehan, K. (2019) *Microelectronic Circuit Analysis and Design*. McGraw-Hill.

16.2 Recommended:

Jaeger, R.C. & Blalock T. N., (2016). *Microelectronic Circuit Design 5th Edition.* McGraw Hill. Sedra, A.S, Smith, K.C., Carusone, T.C., Gaudet, V. (2019) *Microelectronic Circuit*. Oxford.

Rashid, M. H., (2011). *Microelectronic circuits - Analysis and Design*. PWS Publishing.

Prepared by:	Checked by:	Approved by:
	Signature: 	Signature: 

Signature: Asoc Prof. Dr. S. M. A. Motakabber Electrical and Computer Engineerng Engineering Date: 20/11/2020	Prof. Dr. Mohammed Hadi Habaebi Head of Electrical and Computer Engineering Department Date: 23/11/2020	Assoc. Prof. Dr. Sany Izan Ihsan Dean Kulliyah of Engineering Date: 3 Dec 2020

ANNEX

I. Course Instructor Details

Semester: 2 **Academic Year:** 2020/2021

No.	Name	Email	Department
1	Dr. S. M. A. Motakabber		Electrical and Computer Engineering Department

II. Programme Learning Outcomes

At the end of the programme, students are expected to be able to:

No	KOE PO	EAC	MQF	MOHE	Soft Skills
1	**Engineering Knowledge (T)** - Apply knowledge of mathematics, sciences, engineering fundamentals and an engineering specialization to the solution of complex engineering problems;	1	1 & 2	1	-
2	**Problem Analysis (T)** – Identify, formulate, research relevant literature and analyze complex engineering problems, and reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences;	2	1 & 2	1	1
3	**Design/Development of Solutions (A)** – Design solutions, exhibiting innovativeness, for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, economical, ethical, environmental and sustainability issues;	3	2 & 3	2	1
4	**Investigation (D)** - Conduct investigation into complex problems, displaying creativeness, using research-based knowledge, and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions;	4	2 & 3	2, 3	1
5	**Modern Tool Usage (A & D)** - Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations;	5	2 & 3	7	
6	**The Engineer and Society (ESSE)** - Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the	6	3 & 5	5	4

	consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems;				
7	**Environment and Sustainability (ESSE)** - Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts;	7	3 & 5	5	4
8	**Ethics (ESSE)** – Apply professional ethics with Islamic values and commit to responsibilities and norms of professional engineering code of practices;	8	3 & 5	6	4
9	**Individual and Team Work (S)** - Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings;	9	3 & 4	5, 8	3
10	**Communication (S)** - Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;	10	3	4, 7	2
11	**Project Management and Finance (S)** - Demonstrate knowledge and understanding of engineering management and financial principles and apply these to one's own work, as a member and/or leader in a team, to manage projects in multidisciplinary settings, and identify opportunities of entrepreneurship.	11	4	5, 8, 9	6, 7
12	**Life Long Learning (S)** - Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change	12	3	7	5

The program learning outcomes (PO) are grouped into 5 general areas to identify the nature of the skills and capability involved. These groups are:

1. Technical (T) – essential capabilities related to traditional scientific and engineering knowledge
2. Analysis (A) – creatively working with available data and engineering tools and fundamental knowledge to correctly solve basic problem
3. Design (D) – being able to perceive the best solution for both small scale and large scale project by involving all required basic problems
4. Ethics, Safety, Society and Environment (ESSE) - giving appropriate consideration to matters pertaining to professionalism and ethics, safety, local and global society and the environment
5. Work skills (S) – being and effective communicator and effective member of a team and to appreciate the need to continuously acquired skills and abilities.

III. Knowledge Profile, and Complex Engineering Problems and Activities

a. Knowledge Profile

	Description
WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline (e.g. calculus-based physics)
WK2	Conceptually-based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to the discipline.
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5	Knowledge that supports engineering design in a practice area.
WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
WK7	Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to the public safety; the impacts of engineering activity: economic, social, cultural, environmental and sustainability.
WK8	Engagement with selected knowledge in the research literature of the discipline.

b. Complex Engineering Problem

	Attribute	Description
WP1	Depth of knowledge required	Cannot be resolved without in-depth engineering knowledge at the level of one or more of WK3, WK4, WK5 or WK8 which allows a fundamentals-based, first principles analytical approach.
WP2	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering and other issues.
WP3	Depth of analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models.
WP4	Familiarity of issues	Involve infrequently encountered issues
WP5	Extent of applicable codes	Are outside problems encompassed by standards and codes of practice for professional engineering
WP6	Extent of stakeholder involvement and conflicting requirements	Involve diverse groups of stakeholders with widely varying needs
WP7	Interdependence	Are high level problems including many component parts or sub-problems.

c. Complex Engineering Activities

	Attribute	Description
EA1	Range of resources	Involve the use of diverse resources (and for this purpose resources include people, money, equipment, materials, information and techniques)
EA2	Level of interactions	Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
EA3	Innovation	Involve creative use of engineering principles and research-based knowledge in novel ways
EA4	Consequences to society and the environment	Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation
EA5	Familiarity	Can extend previous experiences by applying principles-based approaches