AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)

Faculty of Engineering
Department of Electrical and Electronic Engineering
Undergraduate Program

PART A

1.	Course No/Course Code	EEE 2103
2.	Course Title	Electronic Devices
3.	Course Type	Core Course
4.	Year/Level/Semester/Term	Second year (4th Semester)
5.	Academic Session	Summer 2022-23
6.	Course Teachers/Instructors	Dr. Mohammad Hasan Imam, Dr. Md. Kabiruzzaman, Dr. Mohammad Alif Arman, Ms. Sadia Yasmin, Ms. Nuzat Nuary Alam, Ms. Nowshin Alam, Mr. Abrar Liaf, Dr. Tanbir Ibne Anowar
7.	Pre-requisite (If any)	EEE 2101: Electrical Circuits 2 (AC)
8.	Credit Value	3 credit hours
9.	Contact Hours	4 hours of theory per week
10.	Total Marks	100
11.	Mission of EEE Department	• Educate young leaders for academia, industry, entrepreneurship, and public and private organization through theory and practical knowledge to solve engineering problems individually and in teams. • Create knowledge through innovative research and collaboration with multiple disciplines and societies. • Serve the communities at national, regional, and global levels with ethical and professional responsibilities.
12.	Vision of EEE Department	To become a front runner in preparing Electrical and Electronics Engineering graduates to be nationally and globally competitive and thereby contribute value for the knowledge-based economy and welfare for the people of the world.
13.	Rationale of the Course (Course Description)	This core course of Electrical and Electronic Engineering program explores principles, analysis and applications of different types of semiconductor devices such as diodes, BJTs and FETs. The knowledge and understanding of this course can be used in many advanced courses like analog electronics, VLSI circuits, micro-electronic devices etc.
14.	Course Content	The course is designed to provide students with: • Electronic Devices Semiconductors: electron and holes in an intrinsic semiconductor, donor and acceptor impurities. Introduction to solid state electronics: Energy band structure in solids, insulators, semiconductors and metals, Conductance and semiconductors, electrons and holes, Diodes: open circuit p-n junction, diode characteristics, small signal model of diode, and circuit applications of diode, rectifiers and Zener diode. • Bipolar junction transistors: characteristics, different configuration of transistor amplifiers, voltage, and current amplifiers small signal analysis (high input resistance transistor circuits, transistor biasing. • MOSFET: Introduction- PMOS, NMOS and CMOS transistors and their switching characteristics, depletion and enhancement MOSFET.

15. Course Outcomes (CO)/Course Learning Outcomes (CLOs):

By the end of this course, students should be able to –

COs/ CLOs Number	COs/CLOs Statements	K	P	A	Assessed Program Outcome Indicator	BNQF Indicator	Teaching - Learning Strategy	Assessment Strategy
1	**Identify the semiconductor diode principles with comparison to each other for practical application having different electronic arrangements.**	**1**			**P.b.1.C.4**	FS.1	Lecture Tutorial	**OBE Assignment (Mid)**
2	**Apply** information and concepts of mathematics to solve basic electronic circuits e.g., series, parallel, clipper, clamper, and Zener diode circuits and DC biasing of BJT circuits.	2			P.a.2.C3	FS.2	Lecture Tutorial	Quiz 1 & 2 and Term Exam (Mid)
3	Formulate solutions, procedure and methods of BJT circuits using AC analysis concepts.	2			P.b.2.C4	FS.1	Lecture Tutorial	Quiz-1and Term Exam (Final)
4	Formulate solutions, procedure and methods of FET circuits using DC and AC analysis concepts, Frequency response of FET and BJT	2			P.b.2.C4	FS.1	Lecture Tutorial	Assignment, Quiz-2 and Term Exam (Final)

16. Mapping with Course Learning Outcomes (CLOs) with Program Learning Outcomes (PLOs)

CLOs	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
1		FS.1										
2	FS.2											
3		FS.1										
4		FS.1										

PART B

17. Course plan:

By the end of this course, students should be able to –

Time Frame (Week)	Topics	Teaching Learning Strategy	Assessment Strategy	Corresponding COs /CLOs	Assessment Tools
Week 1	Mission & Vision of AIUB, Dept. of EEE; Semiconductor Materials, Energy Levels, Extrinsic Materials (n- and p-type), Biasing p-n junctions Semiconductor Diode, Zener Region, Resistance Levels, Diode equivalent circuits	Lecture Tutorial		**1**	**OBE Assignment**

Week 2	Load-Line Analysis, Diode-Approximations, Series Diode Configurations with DC Inputs, Parallel and Series-Parallel Diode Configurations, Diode applications: AND/OR Gates, Half-Wave Rectification, Full-Wave Rectification, Clipper and clamper circuits	Lecture Tutorial	Judging the skill of concepts and electronic designs through fundamental understanding and numerical problems using assignments, quizzes, and mid-term examination.	2	Quiz 1 (Mid-Term), Quiz 2 (Mid-Term) and Mid-Term Exam
Week 3	Zener diodes: voltage regulation with fixed and variable voltage, loads (Network Analysis), BJT: Construction, Operation,	Lecture Tutorial			
Week 4	BJT: Structure Characteristics of Common-Base (CB) and Common-Emitter (CE) Common-Collector (CC) Configuration, BJT DC biasing: Operating Point, Fixed-Bias Circuit,	Lecture Tutorial			
Week 5	BJT DC biasing: Emitter Bias Circuit, Voltage-Divider Bias Circuit and Collector Feedback configuration, Bias Stabilization, Emitter-Follower Configuration,	Lecture Tutorial			
Week 6	**MID-TERM EXAM WEEK**				
Week 7	BJT Small Signal Low Frequency AC Response: BJT transistor Modeling: re Transistor Model; CB and CE configurations, CE Fixed Bias, Voltage-Divider Bias, Emitter-Bias, Emitter-Follower, CB amplifier	Lecture Tutorial	Judging skill of concepts and electronic designs through critical understanding, numerical and analytical problems using assignments, quizzes and final examination.	3	Quiz 1 (Final Term) and Assignment (Final Term)
Week 8	JFET: Construction, Characteristics, Depletion- and Enhancement-Type MOSFET; Construction, Operation and Characteristics, Complementary MOSFET (CMOS), CMOS inverter JFET DC Biasing: Fixed-Bias Configuration and Self-Bias Configuration, Voltage-Divider Biasing D-MOSFET DC Biasing: Fixed Bias Configuration, Self-Bias Configuration	Lecture Tutorial		4	Quiz 2 (Final Term), and Final-Term Exam
Week 9	E-MOSFET DC Biasing: Feedback Biasing and Voltage Divider Biasing Configuration JFET small signal model, Graphical definition of g_m, plotting of g_m vs V_{GS}, effect of I_D on g_m, JFET input and output impedance, JFET AC equivalent circuit	Lecture Tutorial			
Week 10	JFET Amplifier: Fixed bias configuration, Self-bias configuration (bypass Rs and un-bypass Rs), Voltage divider configuration	Lecture Tutorial			

Week 11	JFET: Common-Gate configuration, Common-Drain configuration, D-MOSFET amplifiers, E-MOSFET amplifiers E-MOSFET amplifiers: Drain-Feedback configuration, Voltage-Divider configuration. Revision	Lecture Tutorial			
Week 12	**FINAL-TERM EXAM WEEK**				

* The faculty reserves the right to change, amend, add or delete any of the contents.

PART C

18. Assessment and Evaluation

1. Assessment Strategy:

	CO/CLO 1 (marks)	CO/CLO 2 (marks)	CO/CLO 3 (marks)	CO/CLO 4 (marks)	Marks for Grading
OBE Assignment (Mid)	**20**				
Quiz 1 (Mid)		**15**			
Quiz 2 (Mid)		**15**			
Quiz 1 (Final)			**15**		
Assignment (Final)				**20**	
Total	**20**	**30**	**15**	**20**	

2. Marks Distribution:

The evaluation system will be strictly followed as par the AIUB grading policy. The following grading system will be strictly followed in this class.

Assessment Type	Marking system For Theory Classes (Midterm and Final term)	
Continuous	Attendance + Performance	10%
Continuous	Quiz (Out of three, best two quizzes will be counted)	(15+15)%
Continuous	Assignment	20%
Summative	Midterm/Final Exam	40%
	Total	100%
	Final Grade/ Grand Total	
Grand Total	Midterm:	40%
	Final Term:	60%

3. Grading Policy

Letter	Grade Point	Numerical %
A+	4.00	90-100
A	3.75	85-<90
B+	3.50	80-<85
B	3.25	75-<80
C+	3.00	70-<75
C	2.75	65-<70
D+	2.50	60-<65
D	2.25	50-<60
F	0.00	<50(Failed)

4. Makeup Procedure:

Students who fail to maintain the requirements and deadlines needed to contact faculty with reasoning. Continuous assessments will be taken with agreement with the student and faculty. For the make up of Summative assessments students need to apply for SET – B exam according to the AIUB policy.

PART D

19. Learning Materials

Formal lectures will provide the theoretical base for the subject as well as covering its practical application. A set of lecture notes, tutorial examples, with subsequent discussion and explanation, together with suggested reading will support and direct the students in their own personal study.
Maximum topics will be covered from the textbook. For the rest of the topics, reference books will be followed. Some Class notes will be uploaded on the web. White board will be used for most of the time.
For some cases, multimedia projector will be used for the convenience of the students.
Students must study up to the last lecture before coming to the class and it is suggested that they should go through the relevant chapter before coming to the class. Just being present in the class is not enough- students must participate in classroom discussions.

Few assignments will be given to the students based on that class to test their class performance.

1. Recommended Readings (Textbook);

[1] Muhammad H. Rashid, "Power Electronics Circuits, devices and applications", Prentice Hall of India Pvt Ltd, 4th Edition, 2014.
[2] Ned Mohan, Tore M. Underland, William P. Robbins, " Power Electronics: A First Course ", John Wiley and Sons, 3rd Edition, 2003.

2. Supplementary Readings (Reference Book);

[1] Ned Mohan, " Power Electronics: A First Course ", John Wiley and Sons, 2012.
[2] R. S. Ramshaw, "Power Electronics - Thyristor Controlled Power for Electric Motors", Springer US, 2019.
[3] Barry W Williams, "Power Electronics: Devices, Drivers, Applications and Passive Components", McGraw-Hill, 2006. Available online: http://personal.strath.ac.uk/barry.williams/book.htm
[4] Charles A. Schuler and William L. McNamee, Industrial Electronics and Robotics, McGraw-Hill Book Company, Singapore, 1986.
[5] Cyril W. Lander, "Power Electronics", McGraw-Hill Book Company, (UK), London, 1981.

PART E

Verification: **EEE 2103: Electronic Devices**		
Prepared by: …….. Dr. Tanbir Ibne Anowar (Course Co-ordinator) Date: 15/06/2023	Checked and certified by: ..... Nafiz Ahmed Chisty Head (UG), Department of EEE, Faculty of Engineering Date:	Approved by: ..... Prof. Dr. A B M Siddique Hossain Dean, Faculty of Engineering Date: .....