AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)
Faculty of Engineering
Department of Electrical and Electronic Engineering
Undergraduate Program

PART A

1.	Course No/Course Code	COE 2101
2.	Course Title	Introduction to Electrical Circuits
3.	Course Type	Core Course
4.	Year/Level/Semester/Term	First year (2nd Semester)
5.	Academic Session	Fall 2022-23
6.	Course Teachers/Instructors	Dr. Mohammad Abdul Mannan, Dr. Md. Kamrul Hassan, Dr. Mohammad Nasir Uddin, Dr. Tanbir Ibne Anowar, Ms. Susmita Ghosh, Ms. Tahmida Islam, Ms. Sadia Yasmin, Mr. Raja Rashidul Hasan, Mr. Abir Ahmed, Mr. Md. Ashiquzzaman, Mr. Bishwajit Banik Pathik
7.	Pre-requisite (If any)	PHY 1101: Physics 1 & PHY 1102: Physics 1 Lab
8.	Credit Value	3 credit hours
9.	Contact Hours	3 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 is a core course of Computer Science Engineering program that presents an introduction to simple electrical circuits as well as the skills to analyze simple circuits.
14.	Course Content	The course is designed to provide students with: - Familiarizing with different components: resistor, capacitor, inductor, voltage source, etc. - Basic concepts of DC circuit such as Ohm's law; total resistance of series and parallel circuits, Kirchoff's Voltage Law (KVL); Kirchoff's Current Law (KCL). - Laws of electrical circuits and methods of network analysis; different network theorems (Superposition, Thevenin's, Norton's, maximum power transfer). - Analysis of energy storage devices (capacitor, inductor) - Equation of instantaneous voltage, current and power of an R branch, L branch, C branch, RL, RC and RLC circuits. Impedance of R, L and C, total impedances of their series or parallel combinations, calculation of power and power factor and brief study of transients in capacitive and inductive networks.

- Working principles and applications of DC generator and DC motor, transformer, induction motor, synchronous generator, alternator, stepper motor, induction motor,

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	**Apply** information and concepts in basic electrical properties and atomic structure of materials, flow of charge, effects of temperature on resistance of a material, basic of different AC waves etc. with the familiarity of issues to calculate different electrical parameters in circuits containing both DC and AC sources.	K1			P.a.1.C3	FS.1		Mid-Quiz 1, Mid-Term Exam
2	**Apply** different laws, rules, methods of analysis, and theorems for the calculation of several electrical parameters in **DC circuits.**	K2			P.a.2.C3	FS.2		Mid-Quiz 2, Mid-Quiz 3, Mid-Assignment, Mid-Term Exam
3	**Apply** basics formulas of sinusoidal waves, laws, rules, methods of analysis, and theorems for the calculation of several electrical parameters in **AC circuits**	K2			P.a.2.C3	FS.2		Final-Quiz 1, Final-Quiz 2, Final-Assignment Final-Term Exam
4	**Apply** information and concepts of **electrical machines** in solving problems relating with voltage, current, frequency, speed, torque, power, efficiency, and flux.	K2			P.a.2.C3	FS.2		Final-Quiz 3, Final-Term Exam

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.2										
4		FS.2										

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	Powers of ten, Conversion between levels of powers of ten, Voltage, Current, Voltage sources, Resistance, Temperature effects, Conductance, Ohm's Law, Power, Energy, Efficiency, Series resistors, Series circuits, Power distribution in series circuits, Voltage sources in series, Kirchoff's voltage law (KVL).	Lecture Tutorial	*Calculation-based question: test/ mid-term exam *Theoretical-based question: test/ mid-term exam	1	Mid-Quiz 1, Mid-Term
Week 2	Voltage division in a series circuit, Parallel resistors, parallel circuits, parallel circuits, power distribution in a parallel circuit, Kirchoff's current law, Current divider rule, Voltage sources in parallel circuit, Analysis of series parallel circuit.	Lecture Tutorial		2	Mid-Quiz 2, Mid-Term
Week 3	Mesh analysis (Either General or Format Approach) Nodal analysis (Either General or Format Approach)	Lecture Tutorial		2	
Week 4	Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power theorem	Lecture Tutorial		2	Mid-Assignment, Mid-Term
Week 5	Transient in capacitive network, Transient in inductive network.	Lecture Tutorial		2	Mid-Quiz 3, Mid-Term
Week 6	Sinusoidal AC voltage definition and characteristic, general format for sinusoidal voltage and current, Phase relationship. Review and problem-solving class	Lecture Tutorial		1	
Week 7	MID-TERM EXAM WEEK				

Week	Topic			Hours	Assessment
Week 8	Average value, Effective value, Complex number, Impedance and the phasor diagram, Series configuration (RL, RC and RLC), Voltage divider rule, Admittance, and susceptance,	Lecture Tutorial	*Calculation-based question: test/ final exam *Theoretical-based question: test/ final exam	3	Final-Quiz 1, Final-Term
Week 9	Parallel AC network (RL, RC and RLC) with power distribution, Current divider rule.	Lecture Tutorial		3	Final-Quiz 2, Final-Term
Week 10	Revision of superposition, Thevenin's, Norton's theorem for AC signals. Explanation of maximum power theorem.	Lecture Tutorial		3	Final-Assignment, Final-Term
Week 11	Electromagnetism and fundamental laws, DC generator, DC motor, Introduction to transformer, alternator, induction motor, synchronous generator, stepper motor.	Lecture Tutorial		4	Final-Quiz 3, Final-Term Assignment
Week 12	Introduction to Universal Motor, Servo Motor, governor	Lecture Tutorial		4	
Week 13	Brief discussion on permanent-magnet synchronous motor, Hysteresis motor, Reluctance motor, Linear motor.	Lecture Tutorial		4	
Week 14	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
Quiz 1 (Mid)	(20)				20
Quiz 2/3 (Mid)		(20)			20
Assignment (Mid)		(10)			10
Mid-term Exam	Q1(10)	Q2~Q5 [any 3] (30)			40
Quiz 1/2 (Final)			(20)		20
Quiz 3 (Final)				(20)	20
Assignment (Final)			(10)		10
Final Exam			Q1~Q4 [any 3] (30)	Q5~Q6 [any 1] (10)	40

| Total | 30 | 60 | 60 | 30 | |

2. Table of Specification (TOS)

Mid-Term Exam

Topics	CO No.	No. of Days	No. of Items	No. of COs	Remember			Understand			Apply			Analyze			Evaluate			Create			POI
					Item No.	Test Type	Marks	Item No.	Test Type	Marks	Item No.	Test Type	Marks	Item No.	Test Type	Marks	Item No.	Test Type	Marks	Item No.	Test Type	Marks	
Basics of DC Circuits	CO1	3	5	1							1(a)	PS	5										P.a.1.C3
DC Series Circuit, DC Parallel Circuit, DC Series-parallel Circuit	CO2	3	3	2							2(a) 3(b) 5(b)	PS PS PS	5 5 5										P.a.2.C3
Methods of Circuit Analysis (Mesh, Nodal)	CO2	1.5	2	1							2(b)	PS	5										P.a.2.C3
Network Theorem		2	2	1							4(a) 5(a)	PS PS	5 5										P.a.2.C3
Transient in Capacitive and Inductive Network	CO2	1.5	2	1							3(a) 4(b)	PS PS	5 5										P.a.2.C3
Basics of AC signal	CO1	1	1	1							1(b)	PS	5										P.a.2.C3
Total		12	10	2							10		50										

Final-Exam

Topics	CO No.	No. of Days	No. of Items	No. of COs	Remember			Understand			Apply			Analyze			Evaluate			Create			POI
					Item No.	Test Type	Marks	Item No.	Test Type	Marks	Item No.	Test Type	Marks	Item No.	Test Type	Marks	Item No.	Test Type	Marks	Item No.	Test Type	Marks	
Basics of AC circuits,	CO3	2		1							1	PS	10										P.a.2.C3
AC Series Circuit, AC Parallel Circuit, AC Series-parallel Circuit, Methods of AC Circuit Analysis	CO3	3									2 3	PS PS	10 10										P.a.2.C3
Network Theorem in AC circuits	CO3	2		1							4	PS	10										P.a.2.C3
Concepts of rotating electrical machines	CO4	5		1							5 6	PS PS	10 10										P.a.2.C3
Total				2							8		60										

Test Type Legend: *AS*: *Assignment*; *BQ*: *Broad question*; *SQ*: *Short question*; *D*: *Derivation*; *ES*: *Essay*; *EX*: *Exercise*; *GE*: *Group Exercise*; *ID*: *Identification*; *MC*: *Multiple Choice*; *MT*: *Matching Type*; *OB*: *Observation*; *PS*: *Problem Solving*; *SA*: *Short Answer*; *TF*: *True or False*; *VV*: *Viva Voce*; *Other please specify*:

3. 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	10%
Continuous	Quiz	40%
Continuous	Assignment	10%
Summative	Midterm/Final Exam	40%
	Total	100%
	Final Grade/ Grand Total	
Grand Total	Midterm:	40%
	Final Term:	60%

4. 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)

5. 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] R. L. Boylestad, "Introductory Circuit Analysis", 12th Edition, Pearson Education, Inc.
[2] B. L. Theraja, A. K. Theraja, "A Textbook of ELECTRICAL TECHNOLOGY in SI Units Volume II, AC & DC Machines", S. Chand & Company Ltd., (Multicolor illustrative Edition).
[3] V.K. Mehta, Rohit Mehta, "Principles of Electrical Machines", 2nd Edition, S. Chand & Company Ltd.

2. Supplementary Readings (Reference Book);

[1] Robert P. Ward, "Introduction to Electrical Engineering", 3rd Edition, Prentice Hall Inc.
[2] Charles K. Alexander & Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", 3rd edition, The McGraw-Hill companies.
[3] Stephen J. Chapman, "Electric Machinery Fundamentals" - 3rd Edition, McGraw- Hill International Editions
[4] Irving L. Kosow, "Electrical Machinery and Transformers"- Second Edition, Prentice –Hall India Pvt. Limited.
[5] Nilsson, James W., Riedel, Susan A.