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 2021-22
6.	Course Teachers/Instructors	Dr. Md. Kabiruzzaman, Dr. M. Tanseer Ali, Dr. Md. Rifat Hazari, Mr. Rabiul Islam, Ms. Tahmida Islam, Ms. Bismoy Jahan
7.	Pre-requisite (If any)	EEE 1201: Electrical Circuits 1 (DC)
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 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 Objectives	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 low frequency h parameter model analysis of transistor amplifier using h parameters, high input resistance transistor circuits, transistor biasing and thermal stabilization. • 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	Details	K	P	A	Assessed Program Outcome Indicator	BNQF Indicator	Assessment Techniques
1	**Apply and analyze the semiconductor diode principles in the practical application having different electronic arrangements**	1			**P.b.1.C4**	**N/A**	**OBE Assignment**
2	**Apply** information and concepts of mathematics used to solve basic electronic circuits e.g., series, parallel, clipper, clamper, and Zener diode circuits, DC biasing of BJT circuits	2			P.a.2.C3	N/A	Quiz/Term EXAM
3	AC **analysis** of BJT circuits with information and concepts of mathematics	2			P.b.2.C4	N/A	Quiz/Term EXAM
4	DC and AC **analysis** of FET circuits with information and concepts of mathematics.	2			P.b.2.C4	N/A	Quiz/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		X										
2	X											
3		X										
4		X										

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	Evidence
Week 1	Mission & Vision of AIUB, Dept. of EEE; Objective of Engineering Ethics course; 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	***Calculation-based question: test/project/ mid-term exam** ***Theoretical-based question: test/project/ mid-term exam**		

Week 2	Load-Line Analysis, Diode-Approximations, Series Diode Configurations with DC Inputs, Parallel and Series-Parallel Diode Configurations Half-Wave Rectification, Full-Wave Rectification	Lecture Tutorial		1	**OBE Assignment**
Week 3	Clipper and clamper circuits Zener diodes (Network Analysis)	Lecture Tutorial		1	**Quiz/ Assignment/Term Exam**
Week 4	BJT: Construction, Operation, Structure Characteristics of Common-Base (CB) Configuration, Common-Emitter (CE) and Common-Collector Configuration.	Lecture Tutorial		2	
Week 5	BJT DC biasing, Operating Point, Fixed-Bias Circuit, Emitter-Stabilized Bias Circuit, Voltage-Divider Bias Circuit	Lecture Tutorial		2	**Quiz/ Assignment/Term Exam**
Week 6	DC Bias with Voltage Feedback, Bias Stabilization Revision	Lecture Tutorial		2	
Week 7	**MID-TERM EXAM WEEK**				
Week 8	BJT Small Signal Low Frequency AC Response: BJT Transistor Modeling Two-port System Parameters, re Transistor Model; CB and CE configurations, CE Fixed Bias, Voltage-Divider Bias, Emitter-Bias, Emitter-Follower, CB amplifier Effects of RS and RL Cascaded Systems	Lecture Tutorial	***Calculation-based question: test/project/ final exam** ***Theoretical-based question: test/project/ final exam**	3	**Quiz/ Assignment/Term Exam**
Week 9	JFET; Construction, Characteristics and Transfer Characteristics Depletion- and Enhancement-Type MOSFET; Construction, Operation and Characteristics	Lecture Tutorial		4	
Week 10	JFET DC Biasing: Fixed-Bias Configuration, Self-Bias Configuration; Voltage-Divider Biasing	Lecture Tutorial		4	**Quiz/ Assignment/Term Exam**
Week 11	MOSFET DC Biasing: Fixed Bias Configuration, Self-Bias Configuration, Voltage Divider Biasing	Lecture Tutorial		4	

	Configuration for both Depletion Type MOSFET and Enhancement type MOSFET				
Week 12	FET Biasing: Fixed bias, Self-bias and Voltage divider bias for JFET and D-MOSFET Feedback bias and voltage divider bias for E-MOSFET	Lecture Tutorial		5	
Week 13	Common Gate configuration for JFET Small signal ac biasing of FET Revision	Lecture Tutorial		5	**Quiz/ Assignment/Term Exam**
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:**

COs/CLOs Assessment Tools for Mid-Term

Assessment Tools		**CO/CLO 1 Marks**	**CO/CLO 2 Marks**	**Marks for Grading**
Attendance + Performance		N/A	N/A	20
Quiz	Count Best 1 out of 2	N/A	N/A	20
OBE Assignment		**10**	N/A	10
Non-OBE Assignment		N/A	N/A	10
Mid-Term Exam		N/A	N/A	40
Total				**100**

COs/CLOs Assessment System for Final-Term

Assessment Tools		CO/CLO 4 Marks	CO/CLO 5 Marks	Marks for Grading
Attendance + Performance		N/A	N/A	20
Quiz	Count Best 1 out of 2	N/A	N/A	20
Assignment		N/A	N/A	20
Final Exam		N/A	N/A	40
Total				**100**

2. Table of Specification (TOS)

Mid-Term Exam

Topics	CO No.	No. of Days	No. of Items	No. of COs	Level of Bloom's Taxonomy																		POI
					Remember			Understand			Apply			Analyze			Evaluate			Create			
					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	
Diode fundamentals, applications-rectifiers, clippers	**CO2**	4	1								1	PS	8										P.a.2.C3
											2	PS	8										
Diode applications-clampers, Zener diodes	**CO2**	4	1								3	PS	8										P.a.2.C3
											4	PS	8										
BJT biasing	**CO2**	4	1								5	PS	8										P.a.2.C3
											6	PS	8										
Total		12	3										48										

Final Exam

Topics	CO No.	No. of Days	No. of Items	No. of COs	Level of Bloom's Taxonomy																		POI
					Remember			Understand			Apply			Analyze			Evaluate			Create			
					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	
AC analysis of BJT	CO3	4	1											1	PS	8							P.b.2.C4
														2	PS	8							
FET biasing	CO4	4	1											3	PS	8							P.b.2.C4
														4	PS	8							
AC analysis of FET	CO4	4	1											5	PS	8							P.b.2.C4
														6	PS	8							
Total		12	2													48							

***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	Performance	10%
Continuous	Quiz	20%
Continuous	Assignment	20%
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] Robert. L. Boylestad & Louis Nashelky, "Electronics Devices and Circuit Theory", 11th edition, Prentice Hall.

2. **Supplementary Readings (Reference Book);**

[1] Muhammad H. Rashid, "Microelectronic Circuits Analysis and Design", 2nd edition, CL Engineering, 2010
[2] Adel S. Sedra & Kenneth C. Smith, "Microelectronic Circuit", 5th edition, Oxford University press
[3] Jimmie J. Cathey, "Schaum's Outline of Electronic Devices and Circuits", 2nd Edition
[4] Richard S. Muller, Theodore I. Kamins & Mansun Chan, "Device Electronics for Integrated Circuits".
[5] John Henderson, "Electronic Devices: Concepts and Applications".
[6] Ali Aminian & Marian Kazimierczuk, "Electronic Devices: A Design Approach".
[7] Ben. G. Streetman & S.K. Banerjee, "Solid State Electronics", 6th edition, Prentice Hall
[8] Jacob Millman & Christos C. Halkias, "Integrated Electronics", Tata McGrew-Hill edition
[9] Paul Horowitz & Winfield Hill, "The Art of Electronics", 2nd Edition, Cambridge University Press

PART E

Appendix A

Table 1: Knowledge Profile (according to BAETE Manual 2nd Edition)

Verification: **EEE 2103: Electronic Device**		
Prepared by: ……... Dr. Md. Kabiruzzaman (Course Co-ordinator) Date: 25/05/2022	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: .....
	Moderated by: ……. Date: …….	Moderated by: ……. Date: …….

Attribute	
K1	A systematic, theory-based understanding of the natural sciences applicable to the discipline
K2	Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline
K3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
K4	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
K5	Knowledge that supports engineering design in a practice area
K6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
K7	Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability
K8	Engagement with selected knowledge in the research literature of the discipline

Table 2: Range of Complex Engineering Problem Solving (according to BAETE Manual 2nd Edition)

Attribute	**Complex Engineering Problems** have characteristic P1 and some or all of P2 to P7:

Depth of knowledge required	P1: Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach
Range of conflicting requirements	P2: Involve wide-ranging or conflicting technical, engineering and other issues
Depth of analysis required	P3: Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models
Familiarity of issues	P4: Involve infrequently encountered issues
Extent of applicable codes	P5: Are outside problems encompassed by standards and codes of practice for professional engineering
Extent of stakeholder involvement and conflicting requirements	P6: Involve diverse groups of stakeholders with widely varying needs
Interdependence	P7: Are high level problems including many component parts or sub-problems

Table 3: Range of Complex Engineering Activities (according to BAETE Manual 2nd Edition)

Attribute	**Complex activities** means (engineering) activities or projects that have some or all of the following characteristics:
Range of resources	A1: Involve the use of diverse resources (and for this purpose resources include people, money, equipment, materials, information and technologies)
Level of interaction	A2: Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
Innovation	A3: Involve creative use of engineering principles and research based knowledge in novel ways
Consequences for society and the environment	A4: Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation
Familiarity	A5: Can extend beyond previous experiences by applying principles-based approaches

Table 4: Learning Outcome Domains and Level Descriptors (as per BNQF)

Learning Outcome Domains
Fundamental Skills (FS): FS.1: demonstrate knowledge and critical understanding of the well-established principles of his/her field of study, and of the way in which those principles have developed; FS.2: apply underlying concepts and principles outside the context in which they were first studied, including, where appropriate, the application of those principles in an employment context; FS.3: apply knowledge and skills in addressing issues/solving problems with minimal supervision; FS.4: evaluate critically the appropriateness of different approaches to solving problems in his/her field of study; FS.5: support supervision of junior staff via a mentor or a leader/manager; and FS6: display advanced digital literacy which is adequate to perform complex tasks and bring about solutions.

Social Skills (SS):

SS.1: communicate and interact effectively and clearly, ideas, information, problems and solutions as a team to peers, experts and non-experts in Bangla and English;
SS.2: express her/himself fluently and spontaneously in English and Bangla;
SS.3: use language flexibly and effectively for social, academic and professional purposes;
SS.4: produce clear, well structured, detailed text on complex subjects, showing controlled use of organisational patterns, connectors and cohesive devices in advanced proficiency level of Bangla and English;
SS.5: demonstrate the ability to incorporate entrepreneurial skills in planning daily activities; and
SS.6: display advanced civic literacy and knowledge, exercising civic rights and obligations at all levels as well as participating in changes for the improvement of Bangladesh society.

Thinking Skills (TS):

TS.1: exercise very substantial degree of autonomy and often significant responsibility in making judgments/ decisions towards the management of self, others and for the allocation of substantial resources; and
TS.2: demonstrate professional knowledge and practical skills in both technical and management to lead a team in inexperienced environment.

Personal Skills (PS):

PS.1: engage in self-direction and self-enterprise skills;
PS.2: demonstrate social, professional, environmental and ethical practice/ values;
PS.3: show-case global knowledge and competencies to fulfil employment, entrepreneurial and lifelong learning skills; and
PS.4: contribute significantly to the society.

Detail Program Outcomes

PO-a/PLO 1: Engineering Knowledge

Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization as specified in K1 to K4 respectively to the solution of complex engineering problems.

Indicators ID	BNQF Indicator	Indicators Definition	Domain	W	Course 1	Course 2	K	P	A	Assessment Technique(s)
P.a.1.C3	N/A	Apply information and concepts in *natural science* with the familiarity of issues.	Cognitive Level 3 (Applying)	0.1	EEE1203: Electrical Circuits – 1 (DC)	EEE3213: Electrical Properties of Material	K1			Assignment
P.a.2.C3	N/A	Apply information and concepts of *mathematics* with the familiarity of issues.	Cognitive Level 3 (Applying)	0.1	EEE2209: Analog Electronics	EEE2213: Signals and Linear Systems	K2			Assignment
P.a.3.C3	**FS.1**	Apply information and concepts in *engineering fundamentals* to solve complex engineering problems with a range of conflicting requirements.	Cognitive Level 3 (Applying)	0.4	EEE2105: Electrical Machines 1	EEE3101: Digital Logic and Circuits	K3	P1, P2, P6		Assignment

P.a.4.C3	N/A	Apply information and concepts in *specialized engineering sciences* with the in-depth of analysis of a complex engineering problem.	Cognitive Level 3 (Applying)	0.4	EEE3105: Industrial Electronics and Drives	EEE4101: Modern Control Systems	K4	P1, P3, P7		Assignment

PO-b/PLO 2: Problem Analysis

Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. (K1 to K4).

Indicators ID	BNQF Indicator	Indicators Definition	Domain	W	Course 1	Course 2	K	P	A	Assessment Technique(s)
P.b.1.C4	N/A	Identify first principles of natural sciences and engineering sciences in practical applications.	Cognitive Level 4 (Analyze)	0.1	EEE2101: Electrical Circuits 2 (AC)	EEE2103: Electronic Devices	K1			Assignment
P.b.2.C4	N/A	Formulate solutions, procedures, and methods using first principles of mathematics for engineering sciences.	Cognitive Level 4 (Analyzing)	0.1	EEE3101: Digital Signal Processing	EEE3107: Electromagnetics Fields and Waves	K2			Assignment
P.b.3.C4	FS.3	Analyze solutions for complex engineering problem reaching substantiated conclusion.	Cognitive Level 4 (Analyze)	0.4	EEE3211: Power Systems Analysis	EEE2207: Electrical Machines 2	K3	P1, P3, P7		Assignment
P.b.4.C4	N/A	Research literature and analyze the validity and accuracy of existing solution for complex engineering problems.	Cognitive Level 4 (Analysis)	0.4	EEE2208: Electrical Machines 2 Lab	EEE4209: Telecommunications Engineering	K4	P1, P2, P6		Case Study

PO-c/ PLO 3: Design/ development of solutions

Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. (K5).

Indicators ID	BNQF Indicator	Indicators Definition	Domain	W	Course 1	Course 2	K	P	A	Assessment Technique(s)
P.c.1.C4	N/A	Design solutions for components of an engineering problem considering public health and safety.	Cognitive Level 4 (Analyzing)	0.2	BAE1201: Basic Mechanical Engineering	EEE2211: Electrical Power Transmission & Distribution	K5			Assignment
P.c.2.C6	N/A	Develop process for complex engineering problems considering cultural and societal	Cognitive Level 6 (Create)	0.4	EEE4000: Capstone Project	EEE2102: Electrical Circuits 2 (AC) Lab	K5	P1, P3, P7		Report

		factors.								
P.c.3.C5	N/A	Evaluate solutions that meet specified needs with appropriate environmental considerations.	Cognitive Level 5 (Evaluate)	0.4	EEE4211: Measurement and Instrumentation	EEE4213: Power Stations and Substations	K5	P1, P2, P6		Assignment

PO-d/ PLO 4: Investigation

Conduct investigations of complex problems using research-based knowledge (K8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

Indicators ID	BNQF Indicator	Indicators Definition	Domain	W	Course 1	Course 2	K	P	A	Assessment Technique(s)
P.d.1. C5	N/A	Investigate the design of experiments for complex engineering problem through appropriate research.	Cognitive Level 5 (Evaluating)	0.4	EEE4103: Microprocessor and Embedded System	EEE3215: Principles of Communication Lab	K8	P1, P3, P7		OEL lab/Project/Assignment
P.d.2. C4	N/A	Analysis and Interpretation of collected data to provide valid conclusion acknowledging the limitations.	Cognitive Level 4 (Analyzing)	0.2	EEE2104: Electronic Devices Lab	EEE3102: Digital Logic and Circuits Lab	K8			OEL
P.d.3. C5	FS. 2	Investigate solution of complex engineering problem by synthesis of information to provide valid conclusions.	Cognitive Level 5 (Evaluating)	0.4	EEE2106: Electrical Machines 1 Lab	EEE4102: Modern Control Systems Lab	K8	P1, P4, P5		Project/OEL

PO-e/PLO 5: Modern Tool Usage

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. (K6).

Indicators ID	BNQF Indicator	Indicators Definition	Domain	W	Course 1	Course 2	K	P	A	Assessment Technique(s)
P.e.1.C6	N/A	Select engineering tools and Apply appropriate techniques to solve complex engineering problems considering the limitations.	Cognitive Level 6 (Create)	0.4	BAE2101: Computer Aided Design and Drafting	EEE2210: Analog Electronics Lab	K6	P1, P4, P5		OEL/project
P.e.2.P4	N/A	Use tools for prediction and modeling of complex engineering problems considering the practice in electrical and electronic engineering discipline.	Psychomotor Level 4 (Articulation)	0.3	EEE4217: VLSI Circuit Design Lab	EEE4208: Electrical Services Design Lab		P1, P4, P5		OEL/project
P.e.3.P5	FS.6	Create relevant resources for complex engineering	Psychomotor Level 5 (Naturalization)	0.3	EEE3101: Digital Signal Processing	EEE4217: VLSI Circuit Design Lab		P1, P3, P7		OEL/project

		problems using modern engineering tools.								

PO-f/ PLO 6: The Engineer and Society

Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems. (K7)

Indicators ID	BNQF Indicator	Indicators Definition	Domain	W	Course 1	Course 2	K	P	A	Assessment Technique(s)
P.f.1.A3	PS.4	Accepts and Recognize the role of engineering in society, health, safety, legal and culture.	Affective Level 3 (Valuing)	0.3	EEE4208: Electrical Services Design Lab	BAE1201: Basic Mechanical Engineering				Project/Assignment
P.f.2.C6	FS.4	Design solution for complex engineering problem in accordance with professional practices	Cognitive Level 6 (Create)	0.7	EEE2215: Engineering Ethics and Environmental Protection	EEE4000: Capstone Project	K7	P1, P3, P7		Assignment/Report

PO-g/PLO 7: Environment and Sustainability

Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts. (K7)

Indicators ID	BNQF Indicator	Indicators Definition	Domain	W	Course 1	Course 2	K	P	A	Assessment Technique(s)
P.g.1.C5	N/A	Evaluate sustainability of complex engineering problems considering society and environment.	Cognitive Level 5 (Evaluating)	1.0	EEE4213: Power Stations and Substations	EEE4000: Capstone Project	K7	P1, P2, P6		Report

PO-h/ PLO 8: Ethics

Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (K7)

Indicators ID	BNQF Indicator	Indicators Definition	Domain	W	Course 1	Course 2	K	P	A	Assessment Technique(s)
P.h.1.C3	PS. 2	Apply professional codes of ethics and standards considering public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability.	Cognitive Level 3 (Applying)	0. 3	EEE2215: Engineering Ethics and Environmental Protection	EEE4000: Capstone Project	K 7			Presentation/Report
P.h.2.A 4	SS.6	Demonstrates individual responsibilities based on norms of engineering practice.	Affective Level 4 (Organization)	0. 7	EEE4001: Internship/ Seminar/ Workshop	EEE4000: Capstone Project				Report/Book

PO-i/ PLO 9: Individual Work and Teamwork

Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

Indicators ID	BNQF	Indicators Definition	Domain	W	Course 1	Course 2	K	P	A	Assessment

	Indicator									Technique(s)
P.i.1.A3	N/A	Function as effective team member in multi-disciplinary problems.	Affective Level 3 (Valuing)	0.5	EEE4000: Capstone Project	EEE4001: Internship/ Seminar/ Workshop				Peer Review Survey with rubrics and supervisor rubrics.
P.i.2.A5	FS.5	Demonstrate individual skills as a leader in solving multi-disciplinary problems.	Affective Level 5 (Characterization)	0.5	EEE4102: Modern Control Systems Lab	EEE3110: Engineering Shop				OEL/Project

PO-j/ PLO 10: Communication

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.

Indicators ID	BNQF Indicator	Indicators Definition	Domain	W	Course 1	Course 2	K	P	A	Assessment Technique(s)
P.i.1. A2	SS .1	Optimize engineering solution by giving and responding to clear instructions. (Communicate effectively by giving and responding to clear instructions to produce engineering solutions.)	Affective Level 2 (Responding)	0.4	EEE4000: Capstone Project	EEE4211: Measurement and Instrumentation Lab			A1, A3, A5	Viva/Presentation
P.i.2. P3	SS .4	Produce written engineering reports by applying principle-based approaches and design documentation on complex engineering activities for different stakeholders.	Psychomotor Level 3 (Precision)	0.25	EEE4000: Capstone Project	EEE4209: Telecommunications Engineering Lab			A1, A4	Report
P.i.3. A4	SS .2	Make and deliver effective presentation based on complex engineering activities.	Affective Level 4 (Organizing)	0.25	BAS 1204: Bangladesh Studies	EEE3110: Engineering Shop			A1, A2	Presentation
P.i.4. P5	SS .3	use language flexibly and effectively for social, academic and professional purposes	Psychomotor Level 5 (Naturalization)	0.1	EEE2215: Engineering Ethics and Environmental Protection	EEE4000: Capstone Project				Presentation/Report

PO-k/ PLO 11: Project Management and Finance

Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Indicators ID	BNQF Indicator	Indicators Definition	Domain	W	Course 1	Course 2	K	P	A	Assessment Technique(s)
P.k.1.P4	TS.1	Apply engineering management principles and economic decision making to solve engineering projects as a team.	Psychomotor Level 4 (Articulation)	0.3	EEE3106: Industrial Electronics and Drives Lab	EEE4000: Capstone Project				Project Report
P.k.2.P4	TS.2	Manage multi-disciplinary components of a project as a member/leader.	Psychomotor Level 4 (Articulation)	0.3	EEE3110: Engineering Shop	EEE4000: Capstone Project				Project Report
P.k.3.A5	SS.5	Demonstrate competency in completing individual engineering project based on relevant management principles and economic models.	Affective Level 5 (Characterization)	0.4	EEE4213: Power Stations and Substations	EEE4000: Capstone Project				Project Report

PO-l/ PLO 12: Lifelong learning

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.

Indicators ID	BNQF Indicator	Indicators Definition	Domain	W	Course 1	Course 2	K	P	A	Assessment Technique(s)
P.l.1.A1	N/A	Investigate and gather information on a given engineering issue beyond classroom learning.	Affective Level 1 (Receiving)	0.3	EEE4209: Telecommunications Engineering	EEE4000: Capstone Project				Assignment/Report
P.l.2.P5	PS.1	Seek and use resources in solving engineering problems.	Psychomotor Level 5 (Naturalization)	0.4	EEE4211: Measurement and Instrumentation Lab	EEE4000: Capstone Project				Report
P.l.3.A5	PS.3	Recognizing the need for continuing education and participation in professional societies and meetings.	Affective Level 5 (Characterization)	0.3	EEE4000: Capstone Project	EEE4001: Internship / Seminar/ Workshop				**Report**