AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)

Faculty of Engineering
Department of Electrical and Electronic Engineering
Undergraduate Program

PART A

1.	Course No/Course Code	COE 3201
2.	Course Title	Data Communication
3.	Course Type	Core Course for COE and CSE
4.	Year/Level/Semester/Term	Third year (7th Semester)
5.	Academic Session	Spring 2023-24
6.	Course Teachers/Instructors	Dr. Shuvra Mondal, Dr. Muhammad Morshed Alam, Mr. Sadman Shahriar Alam, Mr. Abrar Fahim Liaf, Ms. Nowshin Alam, **Dr. Amirul Islam**.
7.	Pre-requisite (If any)	EEE 2209: Analog Electronics
8.	Credit Value	3 credit hours
9.	Contact Hours	2 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 Electrical and Electronic Engineering program that presents basic tools for the design of power electronic circuits. It promotes the knowledge about the design and implementation of converters for practical engineering applications and formulating their solutions.
14.	Course Content	The course is designed to provide students with: - Basic concepts of Data Communication, Different types of networks, OSI and TCP/IP network models, Digital Transmission, Analog Transmission, Bandwidth Utilization, Switching. - Information regarding Transmission impairment, Protocols of different layers, Data encapsulation, Signal rate, Sampling, Quantization, Encoding. - Fundamentals of Different domains of signal representation, Frequency domain analysis of simple and composite signals. - Knowledge of Bandwidth, Attenuation, Distortion, Noise, Data rate, , Network Performance, Transmission medium. - Application of Nyquist's Data Rate, Shannon's Capacity, Line Coding Schemes, Shift Keying, Modulation, Multiplexing, Switching.

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 of data communication network, network models, protocols and data encapsulation, analog and digital signal, digital transmission, data rate to solve complex engineering problems with a range of conflicting requirements	K3	P1, P2, P6		P.a.3.C3	FS.1	Lecture	Quiz &Term Exam(Mid)
2	**Apply** information and concepts of switching and transmission medium, analog transmission, shift keying, modulation, multiplexing with the in-depth of analysis of a complex engineering problem	K4	P1, P3, P7		P.a.4.C3	FS.2	Lecture	Quiz &Term Exam(Final)
3	**Evaluate** solutions to line coding schemes that meet specified needs with appropriate environmental considerations	**K5**	**P1, P2, P6**		**P.c.3.C5**	**PS.2**	Lecture	**OBE Assignment (Mid)**
4	**Design** solution for frequency division multiplexing problems in accordance with professional practices	**K7**	**P1, P3, P7**		**P.f.2.C6**	**FS.4**	Lecture	**OBE Assignment (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			PS.2									
4						FS.4						

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, Data Communication meaning and objectives of this course. Data Communications Introduction: Components of Data Communication, Data Representation, LAN, WAN, MAN.	Lecture	*Calculation-based question: test/ mid-term exam *Theoretical-based question: test/ mid-term exam	1	Quiz, Term Exam
Week 2	Network Models: OSI Model, Layers in OSI Model, Basic Idea of Different Layers, TCP/IP Protocol.	Lecture		1	Quiz, Term Exam
Week 3	Network Models: Analog & Digital Signals: Bandwidth, Bit rate, Transmission Impairment: Attenuation, Distortion & Noise.	Lecture		1	Quiz, Term Exam
Week 4	Data rate limits: Nyquist bit rate, Shannon capacity Performance: Bandwidth, throughput, latency.	Lecture		1	Quiz, Term Exam
Week 5	Data & Signals: Digital to digital conversion, Signal element vs Data element	Lecture		1	Quiz, Term Exam
Week 6	Line Coding Schemes: Unipolar, Polar, Bi-polar, Multilevel, MLT-3	Lecture		1, 3	Quiz, Term Exam, Assignment
Week 7	Data & Signals: Pulse Code modulation	Lecture		1	Quiz, Term Exam
Week 8	**MID-TERM EXAM WEEK**				

Week 9	Analog Transmission: ASK, FSK, PSK & QPSK	Lecture	*Calculation-based question: test/final exam *Theoretical-based question: test/ final exam	2	Quiz, Term Exam
Week 10	Analog Transmission: QAM, AM, PM, FM.	Lecture		2	Quiz, Term Exam,
Week 11	Bandwidth Utilization: Multiplexing, FDM: Multiplexing and Demultiplexing Process, Analog Hierarchy	Lecture		2, 4	Quiz, Term Exam, Assignment
Week 12	Bandwidth Utilization: WDM Synchronous TDM: Time slots and Frame	Lecture		2	Quiz, Term Exam
Week 13	Continuation on Bandwidth Utilization: WDM Synchronous TDM: Time slots and Frame	Lecture		2	Quiz, Term Exam
Week 14	Interleaving, multilevel multiplexing, multiple-slot allocation, and pulse stuffing. Digital Hierarchy: T- Lines & E-Lines	Lecture		2	Quiz, Term Exam
Week 15	Transmission Media: Guided: Twisted pair, Co-Axial, Fiber Optic, Unguided, Switching: Circuit switching, Packet switching, Datagram network & Virtual Circuit Network, Network Topology.	Lecture		2	Quiz, Term Exam
Week 16	Data Link Layer: Nodes and Link, Addressing mechanism, Link layer Addresses, Address resolution protocol.	Lecture		2	Quiz, Term Exam
Week 17	**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)	CO/CLO 5 (marks)	Marks for Grading
Quiz 1 (Mid)	Q1(20)					20
Quiz 2 (Mid)	Q1(20)					20
Assignment (Mid)				Q1(30)		30
Mid-term Exam	Q1(10), Q2(10), Q3(10), Q4(10), Q5(10)					50
Quiz 3 (Final)		Q1(20)				20
Quiz 4 (Final)		Q1(20)				20
Assignment (Final)				Q1(30)		30
Final Exam		Q1(10), Q2(10), Q3(10), Q4(10), Q5(10)				50

2. Table of Specification (TOS)

Mid-Term Exam

Topics	CO No.	No. of Days	No. of Items	No. of COs	Remember			Understood			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	
Data Communication,Network Models, Data & Signals, Digital Transmission	CO1	7	5								1a	SQ	5										P.a.3.C3
											1b	SQ	5										
											2a	PS	5										
											2b	PS	5										
											3a	PS	5										
											3b	PS	5										
											4a	PS	5										
											4b	PS	5										
											5a	PS	5										
											5b	PS	5										
Total		7	5										50										

Final-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	
Transmission Medium, Switching, Analog Transmission & Bandwidth Utilization	CO2	8	5								1a	SQ	5										P.a.4.C3
											1b	SQ	5										
											2a	PS	5										
											2b	PS	5										
											3a	PS	5										
											3b	PS	5										
											4a	PS	5										
											4b	PS	5										
											5a	PS	5										
											5b	PS	5										
Total		8	5										50										

Level of Bloom's Taxonomy (spans Remember, Understand, Apply, Analyze, Evaluate, Create columns)

*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**:*

1. 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	20%
Continuous	Assignment	30%
Summative	Midterm/Final Exam	40%
	Total	100%

	Final Grade/ Grand Total	
Grand Total	Midterm:	40%
	Final Term:	60%

2. **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)

3. **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] Forouzan, B. A. "Data Communication and Networking", McGraw-Hill.
[2] Prakash C. Gupta, "Data communications", Prentice Hall India Pvt.
[3] William Stallings, "Data and Computer Communications", Pearson.

2. Supplementary Readings (Reference Book);

[1] Bellamy, John C. Digital Telephony (Wiley Series in Telecommunications and Signal Processing). Wiley-Interscience, 2000.
[2] Haykin, Simon. Communication systems. John Wiley & Sons, 2008.
[3] Frenzel, Louis E. "Communication electronics, principles and applications. Electrónica aplicada a los sistemas de las comunicaciones/." (2003).
[4] Viswanathan, Thiagarajan, and MANAV BHATNAGAR. Telecommunication switching systems and networks. PHI Learning Pvt. Ltd., 2015.
[5] Andrew Tanenbaum, Computer networks, Prentice Ha

PART E

Verification: **COE 3201: Data Communication**		
Prepared by: ……………………….…... Dr. Amirul Islam (Course Co-ordinator) Date: 24/01/2024	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: ………………………….