Department of Electrical and Computer Engineering

North South University

Course Syllabus

1	**Course Title**	Analog Electronics-I
2	**Course Code**	EEE 111
3	**Semester and Year**	Summer-2023
4	**Pre-requisites**	EEE141/ETE141 – Electrical Circuits I
5	**Credit Hours**	3.00
6	**Session**	
7	**Class Hours**	2.5 hours per week
8	**Class Room**	SAC205
9	**Instructor's Name**	Professor Dr. Monir Morshed
10	**Email**	monirmorshed.ict@mbstu.ac.bd
11	**Office**	SAC11101
12	**Counseling Hours**	Day: Saturday — Time: 11.00 PM-12.15 PM Day: Thursday — Time: 11.00 PM-12.15 PM
13	**Text Book**	1. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 11th Edition, Prentice Hall of India Private Limited. ISBN 81-203-2064-6
14	**Reference**	1. Albert Malvino and David J. Bates, "Electronic Principles", 7th Edition, McGraw Hill. ISBN 978–0– 07–297527–7. 2. Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits", 5th/6th Edition, Oxford University Press. ISBN 0-19-514252-7.
15	**Course Description**	A variety of electronic devices used in the design of analog electronics are studied. Basic understanding of semiconductor devices is covered. Emphasis is placed on diodes, BJT, and FET. Small and large signal characteristics and models of electronic devices, analysis and design of elementary electronic circuits are also included. This course has a mandatory laboratory session (EEE111L/ETE111L – Analog Electronics I Lab) every week.
16	**Course Overview**	The concepts and principles of semiconductor devices and circuits are covered in this course. Apply the characteristics of diodes, bipolar, uni-polar transistors and operational amplifiers for designing rectifiers, clippers, clampers, amplifiers, oscillators and waveform generators. It teaches the abilities necessary to analyze amplifier circuits using the hybrid pi model and the small signal model.

	Course Objective	1. Acquire knowledge of electrical characteristics of ideal and practical diodes under forward and reverse bias to analyze and design diode application circuits such as rectifiers and voltage regulators. 2. Utilize operational principles of bipolar junction transistors and field effect transistors to derive appropriate small-signal models and use them for the analysis of basic amplifier circuits. 3. Perform DC analysis (algebraically and graphically using current voltage curves with super imposed load line) and design of CB, CE and CC transistor circuits. 4. Compare and contrast different biasing and compensation techniques and functioning as amplifier.
17	**Course Outcomes (COs)**	

SI	CO Description	Weightage (%)
CO1	explain the characteristics of diode, BJT and FET	40
CO2	analyze simple electronic circuits using diodes and transistors.	40
CO3	apply simple models of BJT and FET for analyzing the small signal behavior of BJT and FET.	20
CO4	conduct experiments, as well as to analyze and interpret data	Lab experiment

17	**Teaching Methods**	Power Point Presentations, Chalk and Talk, Assignments, Group discussion, etc.
18	**CO with Assessment Methods**	

CO	Assessment Method	(%)
-	Attendance	10%
CO1-CO3	Class Test/Quiz	20%
CO1-CO3	Final Exam	30%
C01-C03	Mid Exam	20%
C01-C03	Assignment/Presentation	20%

19 Mapping of COs and Program outcomes

CO	Statement	Bloom's Domain	Program Outcome	Knowledge Profile	Complex Problem	Engineering Activities
CO1	Explain the characteristics of diode, BJT and FET	Understand	PO1, PO2, P10	Natural Sciences (K1) Engineering	Depth of Knowledge (P1)	

CO2	Analyze simple electronic circuits using diodes and transistors.	Cognitive /Analyze	PO1, PO2, P03, P10	Fundamentals (K3) Engineering Design (K5)	Depth of Analysis Required (P3)		
CO3	Apply simple models of BJT and FET for analyzing the small signal behavior of BJT and FET.	Cognitive /Apply	PO1, PO2, P10				
CO4	Conduct experiments, as well as to analyze and interpret data	Psychomotor /Precision	PO4				

20 Lecture Outlines

Week	Topics/Assignments	COs	Reading Reference	Lecture Outcomes/Activities
0	Course Description on Outcome Based Education (OBE): Course Objectives, Course Outcomes (CO), Program Outcomes (PO) and CO-PO Mapping	CO1	See OBE Syllabus	Lecture Exercise
1	Fundamentals of electronics, pn Junction Formation	CO1	Lecture Slides and Text/ Ref. Book	Lecture Exercise
2	Biasing of pn Junction and its characteristics, Diode Resistances, Equivalent circuit	C01	Lecture Slides and Text/ Ref. Book	Lecture Exercise
3	Load Line Analysis, Diode Approximations, Series Diode Configuration with DC inputs, Parallel and Series Parallel Configurations, AND/OR Gates	CO1	Lecture Slides and Text/ Ref. Book	Lecture Exercise
4	Sinusoidal inputs: Half-Wave Rectification, Full-Wave Rectification,	CO2	Lecture Slides and Text/ Ref. Book	Lecture Exercise

5	Clippers, Clampers Quiz-01	CO2	Lecture Slides and Text/ Ref. Book	Lecture Exercise
6	Application of Zener Diodes, Zener Diode - Characteristics, Voltage Regulator	C02	Lecture Slides and Text/ Ref. Book	Lecture Exercise
7	Transistor Constructions, Transistor Operation, Common-Base Configuration, Common-Emitter Configuration, Common-Collector Configuration, Limits of Operation, Quiz-02	CO1	Lecture Slides and Text/ Ref. Book	Lecture Exercise
8	Operating Point, Fixed Bias Circuit, Emitter-Stabilized Bias Circuit, Voltage Divider Bias Circuit	C02	Lecture Slides and Text/ Ref. Book	Lecture Exercise
9	DC Bias with Voltage Feedback, Transistor Hybrid parameter model	C03	Lecture Slides and Text/ Ref. Book	Lecture Exercise
10	Exact Analysis of transistor amplifier using low frequency model, Approximate Analysis of transistor amplifier using low frequency model	C03	Lecture Slides and Text/ Ref. Book	Lecture Exercise
11	Analysis of CE amplifier with emitter resistance using low frequency model, Effect of coupling and bypass capacitors on CE Amplifier Quiz-03	C03	Lecture Slides and Text/ Ref. Book	Lecture Exercise
12	Construction, Principle of Operation of JFET, Comparison of BJT and FET, Volt- Ampere Characteristic of JFET, Pinch-Off Voltage, Biasing of FET	C01	Lecture Slides and Text/ Ref. Book	Lecture Exercise
13	MOSFET Construction and its Characteristics in Enhancement mode, MOSFET Construction and its Characteristics in Depletion mode, Quiz-04	C01	Lecture Slides and Text/ Ref. Book	Lecture Exercise
14	**FINAL EXAM**			

Assignment: Assignment will be given throughout the semester Plagiarism is strictly prohibited. Plagiarized assignment will be graded as zero. Late submission will result a 40%

deduction in score.

Lab: Lab Outline and Manuals will be provided separately

Grades:

Letter grades indicating the quality of course work completed is interpreted as follows

Numerical Scores	Letter Grade	Grade Points Per Credit
93 and above	A Excellent	4.0
90 - 92	A-	3.7
87 - 89	B+	3.3
83 - 86	B Good	3.0
80 - 82	B-	2.7
77 - 79	C+	2.3
73 - 76	C Average	2.0
70 - 72	C-	1.7
67 - 69	D+	1.3
60 - 66	D Poor	1.0
Below 60	F* Failure	0.0
	I** Incomplete	0.0
	W** Withdrawal	0.0
	R** Retaken	0.0

Attendance Policy: Attendance in classes is integral to the success of a student in this course. Nevertheless, if a student needs to miss a class for unavoidable reasons, the student must e-mail the instructor prior to the class period stating the reason for being absent. In case the student fails to notify the instructor because of illness or other unavoidable reasons, certification such as a doctor's certificate may be necessary to get the absence excused. A partial unexcused absence may result from the following behaviors:

- A weak excuse for missing the class for which a prior e-mail message was sent
- Coming late or leaving early
- Disruptive behavior that results in instructor asking the student to leave for the rest of the period.

General Rules:

1. Mobiles phones must be put away in a bag before the class starts. No student is allowed to keep a phone in his/her pocket or hand during the class.
2. The instructor has the right to modify, add, or remove topics in the syllabus.
3. No one is exempt from any test, homework, quiz, and final exam.
4. A student who is absent from a class is responsible for obtaining knowledge of what happened in the class, especially information about announced tests, papers, or other assignments.
5. If a student misses a previously announced examination without valid reason and prior written notification to the instructor, is not entitled to make up the exam.

6. Students are expected to be honest and forthright in their academic endeavors. Academic dishonesty includes cheating, inventing false information or citations, plagiarism, tampering with computers, destroying other people's property, or academic misconduct.
7. Extra class will be given if there is a need.

Abandoning Course:

Grades F will be recorded for students who have not fulfilled academic obligations and have not obtained a grade, and for students who abandon their courses without officially withdrawing from a course.

Exam Rules:

1. Any attempt to cheat such as looking at others' exam papers or copying from other sources will be strictly handled. If cheating is caught, the exam may be canceled right away.
2. Unless otherwise instructed, during each exam a student may use a calculator (traditional one having no wireless communication abilities).
3. Mobiles phones must be put away in a bag away from the student before the exam starts. If you do not have a bag, you must hand in the phone to the instructor/proctor before taking the exam.

Appendix-3: Program outcomes

POs	Program Outcomes
PO1	An ability to apply knowledge of mathematics, science, and engineering
PO2	An ability to identify, formulate, and solve engineering problems
PO3	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
PO4	An ability to design and conduct experiments, as well as to analyze and interpret data
PO5	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
PO6	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
PO7	A knowledge of contemporary issues
PO8	An understanding of professional and ethical responsibility
PO9	An ability to function on multidisciplinary teams
PO10	An ability to communicate effectively
PO11	Project Management and Finance
PO12	A recognition of the need for, and an ability to engage in life-long learning