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

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| **PART A** |

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| 1. Course No/Course Code | EEE 2104 | |
| 1. Course Title | Electronic Devices Lab | |
| 1. Course Type | Core Course | |
| 1. Year/Level/Semester/Term | Second year (4th Semester) | |
| 1. Academic Session | Spring 2022-23 | |
| 1. Course Teachers/Instructors | Prof. Dr. Munshi Mahbubur Rahman, Dr. Md. Kamrul Hassan, Dr. Md. Humayun Kabir, Dr. A. A. Mohammad Monzur-Ul-Akhir, Dr. Md. Kabiruzzaman, Dr. Mohammad Alif Arman, Dr. Tanbir Ibne Anowar, Mr. Bishwajit Banik Pathik, Ms. Sadia Yasmin, Mr. Nirjhor Rouf, Mr. Mehedi Hasan, Mr. Abrar Fahim Liaf, Ms. Nowshin Alam, Mr. Mohammad Zohurul Islam, Mr. Joheb Muhammad Tanzeer Sayeed | |
| 1. Pre-requisite (If any) | EEE 2103: Electronic Devices | |
| 1. Credit Value | 1 credit hours | |
| 1. Contact Hours | 3 hours of laboratory per week | |
| 1. Total Marks | 100 | |
| 1. 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. | |
| 1. 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. | |
| 1. Rationale of the Course (Course Description) | This is 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. | |
| 1. Course Content | The course is designed to provide students with:   * Basic concepts of semiconductor devices: types, parameters, and characteristics such as p-n junction and Zener diode. * The physical principles, construction, characteristics, modelling and limitations of diodes, field-effect and bipolar junction transistors. * The analysis of different applications of diode as rectifiers, clippers, clampers and voltage regulator. * The analysis of the performance of transistor circuits and single stage transistor amplifiers. * The introduction of digital circuits based on FET. * The use of a circuit simulation package to model circuits. | |
| **15. Course Outcomes (CO)/Course Learning Outcomes (CLOs):** | |

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

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| **COs/**  **CLOs Number** | **COs/CLOs Statements** | **K** | **P** | **A** | **Assessed Program Outcome Indicator** | **BNQF Indicator** | **Teaching-Learning Strategy** | **Assessment Strategy** |
| **1** | **Analyze and justify the experimental and simulated outcome using modern engineering tool (MULTISIM/PSIM) to reach substantiated conclusion such as performance of amplifier circuit, recognizing the constraints.** | **K8** |  |  | **P.d.2.C4** | **FS.6** |  | **OEL Report (Final)** |
| 2 | Select engineering tools (e.g., MULTISIM) to simulate different electronic circuit problems considering the limitations. | K6 | P1  P4 P5 |  | P.e.1.C6 | FS.6 |  | Lab Report OEL report (Mid) |
| 3 | Communicate effectively by giving and responding to clear instructions to produce engineering solutions | K4 |  | A1  A3 A5 | P.j.1. A3 | SS.1 |  | Project presentation,Performance, Viva |
| 4 | Deduceand formulate solutions, procedures, and methods for the working principle of different electronic circuits using first principles of mathematics for engineering sciences. | K2 |  |  | P.b.2.C4 | FS.1 |  | Mid and Final Quiz |

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

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| **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.6 |  |  |  |  |  |  |  |  |
| **2** |  |  |  |  | FS.6 |  |  |  |  |  |  |  |
| **3** |  |  |  |  |  |  |  |  |  | SS.1 |  |  |
| **4** |  | FS.1 |  |  |  |  |  |  |  |  |  |  |

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| **PART B** |

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| **17. Course plan:** |

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

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| **Time Frame (Week)** | **Topics** | **Teaching Learning Strategy** | **Assessment Strategy** | **Corresponding COs /CLOs** | **Assessment Tools** |
| **Week 1** | Mission & Vision of AIUB, Dept. of EEE, introduction of equipment and tools to be used and objectives of this course.  Familiarization with course outline and in- detail of course outcomes, CO.  **Experiment-1 Experiment name-** Determination of characteristic curve of a diode | Brief theoretical description, teaching circuit implementation and use of different tools, computer simulation and hardware implementation. | **Lab report including simulation must be submitted** | 2 | Lab Report |
| **Week 2** | **Experiment-2 Experiment name-**  Study of diode rectifiers | 2 | Lab Report |
| **Week 3** | **Experiment-3 Experiment name-** Study of diode clipping and  clamping circuits | 2 | Lab Report |
| **Week 4** | **Experiment-4 Experiment name-** Study of Zener Diodes | 2 | Lab Report |
| **Week 5** | **Experiment-5 Experiment name-**  Study of transistor characteristics in common emitter  amplifier | 2 | Lab Report |
| **Week 6** | **Open Ended Lab 1 (OEL1) Based on Mid Term Labs** |  |  | 2 | OEL Report |
| **Week 7** | **Performance, viva & Quiz** |  |  | 3, 4 | Performance ,viva + Quiz |
| **Week 8** | **MID-TERM EXAM WEEK** | | | | |
| **Week 9** | **Experiment-6 Experiment name-**  Study of BJT Biasing Circuit – Fixed bias and Self-bias circuits | Brief theoretical description, teaching circuit implementation and use of different tools, computer simulation and hardware implementation. | **Lab report including simulation must be submitted** | 2 | Lab Report |
| **Week 10** | **Experiment-7 Experiment name-**  Study of BJT Biasing – Voltage Divider Circuit | 2 | Lab Report |
| **Week 11** | **Experiment-8 Experiment name-**  Study of single stage transistor common emitter amplifier | 2 |  |
| Lab Report |
| **Week 12** | **Experiment-9 Experiment name-** Study of JFET and MOSFET characterization | 2 | Lab Report |
| **Week 13** | **Experiment-10**  **Experiment name-**  Study of Inverter Circuits using MOSFET and BJT | 2 | Lab Report |
| **Week 14** | Open Ended Lab 2 (OEL2) Based on Final Term Labs | 1 | OEL Report |
| **Week 15** | Presentation of Project including Hardware and Viva | Lecture Tutorial |  | 3 | Project presentation |
| **Week 16** | **Quiz** |  |  | 4 | Quiz |
| **Week 17** | **FINAL-TERM EXAM WEEK** | | | | |

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

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| **PART C** |

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| **18. Assessment and Evaluation** |

1. **Assessment Strategy:**

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|  | **CO/CLO 1**  **(marks)** | **CO/CLO 2**  **(marks)** | **CO/CLO 3**  **(marks)** | **CO/CLO 4**  **(marks)** | | **Marks for Grading** | |
| **Lab Report (Mid)** |  | **(Exp. 1-5) 30** |  | |  | | **30** |
| **OEL report (Mid)** |  | **20** |  | |  | | **20** |
| **Quiz 1 (Mid)** |  |  |  | | **20** | | **20** |
| **Performance, viva** |  |  | **20** | |  | | **20** |
| **Lab Report (Final)** |  | **(Exp. 6-10) 30** |  | |  | | **30** |
| **OEL Report (Final)** | **20** |  |  | |  | | **20** |
| **Project Presentation, viva** |  |  | **20** | |  | | **20** |
| **Quiz (Final)** |  |  |  | | **20** | | **20** |

1. **Table of Specification (TOS)**

**Mid-Term Quiz**

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|  | | | | | **Level of Bloom’s Taxonomy** | | | | | | | | | | | | | | | | | |  |
| **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** |
| **Exp. 1-5** | **CO2** | **5** | **5** |  |  |  |  |  |  |  | **1** | **PS** | **5** |  |  |  |  |  |  |  |  |  | **P.b.2.C4** |
|  |  |  |  |  |  |  | **2** | **PS** | **5** |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  | **4** | **PS** | **5** |  |  |  |  |  |  |  |  |  |
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| **Total** |  | **5** | **5** |  |  |  |  |  |  |  |  |  | **20** |  |  |  |  |  |  |  |  |  |  |

**Final-Term Quiz**

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|  | | | | | **Level of Bloom’s Taxonomy** | | | | | | | | | | | | | | | | | |  |
| **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** |
| **Exp. 6-10** | **CO2** | **5** | **5** |  |  |  |  |  |  |  | **1** | **PS** | **5** |  |  |  |  |  |  |  |  |  | **P.b.2.C4** |
|  |  |  |  |  |  |  | **2** | **PS** | **5** |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  | **3** | **PS** | **5** |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  | **4** | **PS** | **5** |  |  |  |  |  |  |  |  |  |
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| **Total** |  | **5** | **5** |  |  |  |  |  |  |  |  |  | **20** |  |  |  |  |  |  |  |  |  |  |

***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.

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| **Assessment Type** | **Marking system (Midterm)** | |
| Continuous | Attendance | 10% |
| Continuous | Lab Report | 30% |
| Continuous | OEL | 20% |
| Continuous/summative | Performance + viva | 20% |
| Summative | Quiz | 20% |
|  | **Total** | 100% |

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| **Assessment Type** | **Marking system (Finalterm)** | |
| Continuous | Attendance | 10% |
| Continuous | Lab Report | 30% |
| Continuous | OEL | 20% |
| Summative | Project Presentation + viva | 20% |
| Summative | Quiz | 20% |
|  | **Total** | 100% |

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

1. **Grading Policy**

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| **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) |

1. **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.

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| **PART D** |

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| **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.

1. **Recommended Readings (Textbook);**
2. Robert. L. Boylestad & Louis Nashelky, “Electronics Devices and Circuit Theory”, 11th edition, Prentice Hall.
3. **Supplementary Readings (Reference Book);**
4. Muhammad H. Rashid, “Microelectronic Circuits Analysis and Design”, 2nd edition, CL Engineering, 2010
5. Adel S. Sedra & Kenneth C. Smith, “Microelectronic Circuit”, 5th edition, Oxford University press
6. Jimmie J. Cathey, “Schaum's Outline of Electronic Devices and Circuits”, 2nd Edition
7. Richard S. Muller, Theodore I. Kamins & Mansun Chan, “Device Electronics for Integrated Circuits”.
8. John Henderson, “Electronic Devices: Concepts and Applications”.
9. Ali Aminian & Marian Kazimierczuk, “Electronic Devices: A Design Approach”.
10. Ben. G. Streetman & S.K. Banerjee, “Solid State Electronics”, 6th edition, Prentice Hall
11. Jacob Millman & Christos C. Halkias, “Integrated Electronics”, Tata McGrew-Hill edition
12. Paul Horowitz & Winfield Hill, “The Art of Electronics”, 2nd Edition, Cambridge University Press
13. Donald A Neamen, “Semiconductor Physics and Devices”, 3rd Edition, McGraw-Hill Series in Electrical and Computer Engineering.

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| **PART E** |

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| Verification:  **EEE 2104: Electronic Devices Lab** | | |
| Prepared by:  ………………………………...  Dr. Md. Kabiruzzaman  (Course Co-ordinator)  Date: 30/01/2023 | 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: ............................................... |
|  | Moderated by:  …………………….  Date: …………………………. | Moderated by:  ……………………….  Date: …………………………. |