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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 | BAE 2101 |
| 1. Course Title | Computer Aided Design and Drafting |
| 1. Course Type | Core Course |
| 1. Year/Level/Semester/Term | Second year (4th Semester) |
| 1. Academic Session | Fall 2022-23 |
| 1. Course Teachers/Instructors | Dr. Md. Ehasanul Haque; Dr. Md. Mahadi Hasan; Mr. Nafish Sarwar Islam; Mr. Mahamudul Hassan; Mr. Abul Hasnat |
| 1. Pre-requisite (If any) | EEE 1201: Electrical Circuits 1 (DC) |
| 1. Credit Value | 1 credit hour |
| 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 course provides practical understanding of the fundamentals of CAD software, command for draw, erase, move, rotate, mirror, hatch, trim, planes, parallelism and perpendicularity, surfaces, inter-sections and development, basic operations such as drawing of lines, circles, rectangles, arc, blocks etc. |
| 1. Course Objectives | The course is designed to provide students with:   * Introduction to Computer Aided Design & Drafting and its prospects and applications in engineering drawing using different application packages. * Familiarization with isometric and orthographic projection in engineering drawing. * Familiarization with AutoCAD software and its different features, tools and commands. * Draw isometric and orthographic projection using AutoCAD software. * Draw electrical circuits using AutoCAD software. * Understanding and drawing Civil Plan using AutoCAD software. * Understanding and drawing the proper electric fittings and fixture distribution based on Civil planning. * Familiarization with electric conduit layout diagram. * Application of BNBC-1993 |

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| **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** | **Details** | **K** | **P** | **A** | **Assessed Program Outcome Indicator** | **BNQF Indicator** | **Assessment Techniques** |
| 1 | **Identify** thedifferent views based on projection criteria in engineering drawing using Auto CAD tools. | 3 | 1  2  6 |  | P.a.3.C3 | FS.1 | Mid-term exam |
| 2 | **Design and develop** the drawing of different electrical circuitsusing Auto CAD tools**.** | 6 | 1  4  5 |  | P.e.1.C6 | FS.6 | Lab Task Performance,  Mid Assignment |
| 3 | **Design and draw** a civil plan and electrical fittings layout by using AUTOCAD software and appropriate BNBC. | 6 | 1  4  5 |  | P.e.1.C6 | FS.6 | **OEL Report** |
| 4 | **Solution** of electrical conduit layout on civil plan with proper electric fittings using AUTOCAD and calculate the electrical loads applying BNBC. | 6 | 1  4  5 |  | P.e.1.C6 | FS.6 | Final Exam |

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

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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** | **Evidence** |
| **Week 1** | Mission & Vision of AIUB, Dept. of EEE; OBE Assessment, Objective of Computer Aided Design & Drafting.  Introduction to Engineering Drawing and Computer Aided Design & Drafting and Familiarization with AutoCAD software and its different features. | Lecture Tutorial | **Class Performance** | 1 | **Lab Task** |
| **Week 2** | Familiarization with different toolbars and command of AutoCAD software. | Lecture Tutorial | 1 | **Lab Task** |
| **Week 3** | Basic operations such as drawing of lines, circles, rectangles, arc etc. | Lecture Tutorial | 1 | **Lab Task** |
| **Week 4** | Familiarization with different orthographic projections and drawing using AutoCAD software. | Lecture Tutorial | 1 |
| **Week 5** | Introducing with Electrical Symbols used for Electrical Circuit Design and drawing some Electrical Circuits using AutoCAD. | Lecture Tutorial | 2 | **Lab Task** |
| **Week 6** | **MIDTERM EXAM** | | | | |
| **Week 7** | **MID-TERM EXAM WEEK** | | | | |
| **Week 8** | Understanding and drawing a Civil Plan using AutoCAD software. | Lecture Tutorial | **Class Performance** | 3 | **Lab Task** |
| **Week 9** | Drawing the proper electric Fittings and Fixture Layout based on a Civil plan using AutoCAD software and understanding BNBC | Lecture Tutorial | 3 |
| **Week 10** | Understanding and drawing the proper Electric Conduit Layout based on Civil planning using AutoCAD software. | Lecture Tutorial | 4 | **Lab Task** |
| **Week 11** | Understanding and drawing the connection diagram of Switchboard (SB), Sub Distribution Board (SDB) and Main Distribution Board (MDB) based on Civil planning using AutoCAD software. | Lecture Tutorial | 4 |
| **Week 12** | Design a civil plan with electrical fitting according to BNBC using AutoCAD |  | **OEL** | 3,4 | **Related docs** |
| **Week 13** | **FINAL EXAM** | | | | |
| **Week 14** | **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 Task (Mid)** |  | **40** |  |  |  |
| **Assignment (Mid)** |  | **30** |  |  |  |
| **Exam (Mid)** | **20** |  |  |  |  |
|  |  |  |  |  |  |
| **Lab Task (Final)** |  | **40** |  |  |  |
| **Assignment (Final)** |  |  | **30** |  |  |
| **Exam (Final)** |  |  |  | **20** |  |
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1. **Table of Specification (TOS)**

**Mid-Term Exam**

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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** |
| **Introduction to engineering drawing** | **CO1** | **1** | **1** |  |  |  |  |  |  |  | **1** | **SQ** | **20** |  |  |  |  |  |  |  |  |  | **P.a.3.C3** |
| **Orthographic & Isometric views** | **CO1** | **3** | **2** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **P.a.3.C3** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Circuits drawing** | **CO2** | **1** | **1** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **P.a.3.C3** |
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| **Total** |  | **12** | **4** |  |  |  |  |  |  |  |  |  | **20** |  |  |  |  |  |  |  |  |  |  |

**Final Exam**

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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** |
| **Civil Plan** | **CO3** | **4** | **1** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **P.e.1.C6** |
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| **Electrical Fitting** | **CO3** | **4** | **1** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **P.e.1.C6** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Electrical Conduit Layout** | **CO4** | **4** | **1** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **1** | **PS** | **10** | **P.e.1.C6** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **2** | **PS** | **10** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Total** |  | **12** | **2** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **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;* ***PF:*** *Performance;* ***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 For Theory Classes (Midterm and Final term)** | |
| Continuous | Attendance | 10% |
| Continuous | Performance | 40% |
| Continuous | Assignment/OEL | 30% |
| Summative | Midterm/Final Exam | 20% |
|  | **Total** | 100% |
|  | **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. For the make up of Summative assessments students need to apply for SET – B exam according to the AIUB policy.

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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 Lab manuals. White board will be used for most of the time to give brief description about the drawings.

Multimedia projector will be used to show the software work, for the convenience of the students.

Students must study up to the last experiments before coming to the class and it is suggested that they should go through the relevant notes 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);**
2. “AutoCAD 2004, 2D Training Manual” by Kristen S. Kurland
3. **Supplementary Readings (Reference Book);**
4. “Beginning AutoCAD 2004” by Bob McFarlane
5. “AutoCAD 2007 For Dummies” by David Byrnes and Mark Middlebrook.

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| **PART E** |

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| Verification: **BAE 2101:**  **Computer Aided Design and Drafting** | | |
| Prepared by:  ………………………………...  Nafish Sarwar Islam  (Course Co-ordinator)  Date: …………………………. | 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: …………………………. |

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| **Appendix A** |

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

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| 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)

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| **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)

|  |  |
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| **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)**

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| **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.

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| **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).

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| **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).

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| **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 factors. | Cognitive Level 6 (Create) | 0.4 | EEE4000: Capstone Project | EEE2102: Electrical Circuits 2 (AC) Lab | K5 | P1, P3, P7 |  | Report |
| **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.

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| **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).

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| **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 problems using modern engineering tools. | Psychomotor Level 5  (Naturalization) | 0.3 | EEE3101: Digital Signal Processing | EEE4217: VLSI Circuit Design Lab |  | P1, P3, P7 |  | OEL/project |

## **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)

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| **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)

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| **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)

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| **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 | K7 |  |  | Presentation/Report |
| **P.h.2.A4** | 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.

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| **Indicators ID** | **BNQF Indicator** | **Indicators Definition** | **Domain** | **W** | **Course 1** | **Course 2** | **K** | **P** | **A** | **Assessment 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.

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| **Indicators ID** | **BNQF Indicator** | **Indicators Definition** | **Domain** | **W** | **Course 1** | **Course 2** | **K** | **P** | **A** | **Assessment Technique(s)** |
| **P.j.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.j.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.j.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.j.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.

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| **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.

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| **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** |