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| A picture containing diagram  Description automatically generated | **AMERICAN INTERNATIONAL UNIVERSITY- BANGLADESH (AIUB)**  Faculty of Science and Technology (FST)  Department of Computer Science (CS)  Undergraduate Program |

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| **COURSE PLAN** | **SEMESTER: Spring 2024-2025** |
| 1. **Course Core and Title**   COE 3205 Computer Organization & Architecture   1. **Credit**   3 credit hours (2 hours of theory and 2 hours 20 minutes Lab per week)  **III. Nature**  **Core Course for CSE**  **IV. Prerequisite**  COE 3104 Microprocessor & Embedded Systems | 1. **Vision:**   Our vision is to be the preeminent Department of Computer Science through creating recognized professionals who will provide innovative solutions by leveraging contemporary research methods and development techniques of computing that is in line with the national and global context.   1. **Mission:**   The mission of the Department of Computer Science of AIUB is to educate students in a student-centric dynamic learning environment; to provide advanced facilities for conducting innovative research and development to meet the challenges of the modern era of computing, and to motivate them towards a life-long learning process. |

# **VII - Course Description:**

* Explain the components of a Microcomputer System
* Describe the organization of the Intel 8086 family of Microprocessors.
* Introduce IBM PC Assembly Language
* Learn to use Emulator and to realize their necessity.
* Understand how Flag Registers work.
* Solve complex programming problems using assembly language.

# **VIII – Course outcomes (CO) Matrix:**

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

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| **COs** \* | **Description** | **Domain of Level** \*\*\* | | | **PO**  **Assessed**  \*\*\*\* |
| C | P | A |
| CO1  \*\* | **Understand** the components of a Microcomputer System and the different aspects of internal organization of 8086 architecture. |  |  | 1 | PO-l-1 |
| CO2 | **Calculate**flag register values by using the knowledge of binary number systems. | 3 |  |  | PO-a-2 |
| CO3  \*\* | **Design**and **Develop**engineering problems usingEmulator Software and understandthe essentials of Emulator software. |  | 5 |  | PO-e-3 |
| CO4 | **Develop**assembly language programs using Emulator software to solve engineering problems. |  | 4 |  | PO-e-2 |
| *C: Cognitive; P: Psychomotor; A: Affective Domain*  *\* CO assessment method and rubric of COs assessment is provided in later section*  *\*\* COs will be mapped with the Program Outcomes (POs) for PO attainment*  *\*\*\* The numbers under the ‘Level of Domain’ columns represent the level of Bloom’s Taxonomy each CO corresponds to.*  *\*\*\*\* The numbers under ‘PO Assessed’ column represent the POs each CO corresponds to.* | | | | | |

# **IX – Topics to be covered in the class \***

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| **Time Frame** | **CO**  **Mapped** | **Topics** | **Teaching Activities** | **Assessment Strategy(s)** |
| Week 1 | CO1 | OBE-related discussion, Computer Evolution and the Components of a Microcomputer System | Lecture, Question-  answer, Lab Practice | Quiz, Term Exam,  Lab Exam |
| Week 2 | CO1,  CO2 | Representation of Numbers and Characters in Computer | Lecture, Question- answer, Lab Practice | Quiz, Term Exam, Lab Exam |
| Week 3 | CO1, CO2 | Organization of the IBM Personal Computer | Lecture, Question-  answer, Lab Practice | Quiz, Term Exam, Lab Exam |
| Week 4 | CO3 | Introduction to IBM PC Assembly Language | Lecture, Question-  answer, Lab Practice | Quiz, Term Exam, Lab Exam |
| Week 5 | CO3 | Introduction to IBM PC Assembly Language (Continued) | Lecture, Question- answer, Lab Practice | Quiz, Term Exam, Lab Exam |
| Week 6 | CO2, CO3 | The Processor Status and the FLAGS Register | Lecture, Question-  answer, Lab Practice | Quiz, Term Exam, Lab Exam |
| Midterm (Week 7) | | | | |
| Week 8 | CO2, CO3 | Flow Control Instructions (Part 1) | Lecture, Question- answer, Lab Practice | Quiz, Term Exam, Lab Exam |
| Week 9 | CO2, CO3 | Flow Control Instructions (Part 2) | Lecture, Question- answer, Lab Practice | Quiz, Term Exam, Lab Exam |
| Week 10 | CO2, CO3 | Logic, Shift Instructions | Lecture, Question-  answer, Lab Practice | Quiz, Term Exam, Lab Exam |
| Week 11 | CO2,  CO3 | Rotate Instructions | Lecture, Question- answer, Lab Practice | Quiz, Term Exam, Lab Exam |
| Week 12 | CO2,  CO3 | The Stack and Introduction to Procedures (Part 1) | Lecture, Question- answer, Lab Practice | Quiz, Term Exam, Lab Exam |
| Week 13 | CO2, CO3 CO4 | The Stack and Introduction to Procedures (Part 2) | Lecture, Question-  answer, Lab Practice | Quiz, Term Exam, Lab Exam |
| Week 14 | CO2,  CO3, CO4 | Multiplication and Division Instructions | Lecture, Question- answer, Lab Practice | Quiz, Term Exam, Lab Exam |
| Final Term (Week 15) | | | | |
| Set B Exam (Week 16) | | | | |

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

# **X – Mapping of PO/PLO and K, P, A of this course:**

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| PO Indicator ID | PO Indicators Definition  (As per the requirement of WKs) | Domain | K | P | A |
| PO-l-1 | Investigate and gather information on a given engineering issue | Affective Level 1 (Receiving) |  |  |  |
| PO-a-2 | Apply information and concepts of mathematics with the familiarity of issues. | Cognitive Level 3 (Applying) | K2 |  |  |
| PO-e-3 | Create relevant resources for complex computer science and engineering problems using modern engineering IT tools. | Cognitive Level 5 (Evaluating) |  | P1 P3 P7 |  |
| PO-e-2 | Use tools for prediction and modeling of complex engineering problems considering the practice in engineering discipline. | Psychomotor Level 4 (Articulation) |  | P1 P4 P5 |  |

# **XI – K, P, A Definitions**

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| **Indicator** | **Title** | **Description** |
| **K2** | Conceptual based mathematics | Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline |
| **P1** | Depth of knowledge required | 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 |
| **P3** | Depth of analysis required | Have no obvious solution and required abstract thinking, originality in analysis to formulate suitable models. |
| **P4** | Familiarity of issues | Involve frequently encountered issues. |
| **P7** | Interdependence | Are high level problems including many component parts or sub-problems. |

# **XII – Mapping of CO Assessment Method and Rubric**

The mapping between Course Outcome(s) (COs) and The Selected Assessment method(s) and the mapping between Assessment method(s) and Evaluation Rubric(s) is shown below:

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| **COs** | **Description** | **Mapped**  **POs** | **Assessment Method** | **Assessment Rubric** |
| CO1 | *Understand* the components of a Microcomputer System and the different aspects of internal organization of 8086 architecture. | PO-l-1 | Term Exam | Rubric for Term Exam |
| CO2 | *Calculate* flag register values by using the knowledge of binary number systems. | PO-a-2 | Term Exam | Rubric for Term Exam |
| CO3 | *Design and Develop* engineering problems *Using* Emulator Software and understandingthe essentials of Emulator software. | PO-e-3 | Lab Exam | Rubric for Lab Exam |
| CO4 | *Design* assembly language programs using Emulator software to solve engineering problems. | PO-e-2 | Lab Exam | Rubric for Lab Exam |

# **XIII – Evaluation and Assessment Criteria**

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| **CO1:** *Understand* the components of a Microcomputer System and the different aspects of internal organization of 8086 architecture. | | | | |
| **Assessment** **Attribute/Criteria** | **Missing/ Incorrect (0)** | **Inadequate (1)** | **Satisfactory (2)** | **Excellent (3)** |
| Fundamental concepts and principles | The student has demonstrated no understanding, or she/he has demonstrated an incorrect understanding of the Intel 8086 Microprocessor family. | The student has demonstrated an inadequate understanding of the Intel 8086 Microprocessor family. | The student has demonstrated a satisfactory understanding of the Intel 8086 Microprocessor family. | The student has demonstrated an excellent understanding of the Intel 8086 Microprocessor family. |
| Content knowledge | The student has demonstrated no knowledge, or she/he has demonstrated an incorrect knowledge of the components of a Microcomputer System and the organization of 8086 microprocessor. | The student has demonstrated an inadequate knowledge of the components of a Microcomputer System and the organization of 8086 Microprocessor. | The student has demonstrated a satisfactory knowledge of the components of a Microcomputer System and the organization of 8086 Microprocessor. | The student has demonstrated an excellent knowledge of the components of a Microcomputer System and the organization of 8086 Microprocessor. |

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| **CO2:** *Calculate* flag register values by using the knowledge of binary number systems. | | | | |
| **Assessment** **Attribute/Criteria** | **Missing/ Incorrect (0)** | **Inadequate (1)** | **Satisfactory (2)** | **Excellent (3)** |
| Content knowledge | The student has demonstrated no knowledge, or she/he has demonstrated an incorrect knowledge of the Flag registers for the 8086 Microprocessor. | The student has demonstrated an inadequate knowledge of the Flag registers for the 8086 Microprocessor. | The student has demonstrated a satisfactory knowledge of the Flag registers for the 8086 Microprocessor. | The student has demonstrated an excellent knowledge of the Flag registers for the 8086 Microprocessor. |
| Correctness | The student could not calculate the Register values, or his/her calculation is incorrect. | The student could calculate the Register values, but the calculation contains significant errors. | The student could calculate the Register values, but the calculation contains some minor errors. | The student could calculate the Register values and the calculation does not contain any errors. |
| Argumentation | The student could not present any argument, or she/he has presented an incorrect argument while trying to clarify the concept. | The student presented an inadequate argument while trying to clarify the concept. | The student presented a satisfactory argument while trying to clarify the concept. | The student presented an excellent argument while trying to clarify the concept. |

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| **CO3:** *Design and Develop* engineering problems *Using* Emulator Software and understandthe essentials of Emulator software. | | | | |
| **Assessment** **Attribute/Criteria** | **Missing/ Incorrect (0)** | **Inadequate (1)** | **Satisfactory (2)** | **Excellent (3)** |
| Problem Analysis | The student could not identify and summarize a particular task, or his/her identification and summary is incorrect. | The student could identify and summarize a particular task, but his/her work has significant shortcomings. | The student could identify and summarize a particular task, but his/her work has some shortcomings. | The student could identify and summarize a particular task and his/her work does not have any shortcomings. |
| Tools utilization | The student could not demonstrate the utilization of the features of Emulator Software for 8086 microprocessors, or his/her demonstration is incorrect. | The student could demonstrate the utilization of the features of Emulator Software for 8086 microprocessors, but his/her demonstration has significant shortcomings. | The student could demonstrate the utilization of the features of Emulator Software for 8086 microprocessors, but his/her demonstration has some shortcomings. | The student could demonstrate the utilization of the features of Emulator Software for 8086 microprocessors and his/her demonstration does not have any shortcomings. |
| Correctness | The student could not properly solve and demonstrate a particular task, or his/her solution and demonstration is incorrect. | The student could solve and demonstrate a particular task, but his/her solution and demonstration have significant shortcomings. | The student could solve and demonstrate a particular task, but his/her solution and demonstration have some shortcomings. | The student could solve and demonstrate a particular task and his/her solution and demonstration does not have any shortcomings. |

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| **CO4:** *Design* assembly language programs using Emulator software to solve engineering problems. | | | | |
| **Assessment** **Attribute/Criteria** | **Missing/ Incorrect (0)** | **Inadequate (1)** | **Satisfactory (2)** | **Excellent (3)** |
| Tools utilization | The student could not determine proper tool and utilize its features to complete a particular task, or his determination and utilization of the tool is incorrect. | The student could determine a tool and utilize its features to complete a particular task, but his/her determination and utilization is inadequate. | The student could determine a tool and utilize its features to complete a particular task, but his/her determination and utilization is not entirely appropriate. | The student could determine a tool and utilize its features to complete a particular task and his/her determination and utilization is entirely appropriate. |
| Correctness | The student could not complete the task to meet the problem statement, or his/her work is incorrect. | The student could complete the task to meet the problem statement, but his/her work has significant errors. | The student could complete the task to meet the problem statement, but his/her work has some errors. | The student could complete the task to meet the problem statement, and his/her work does not have any errors. |
| Submission | The solution is not submitted at all, or it does not follow any structure and formatting. | The solution has a significant problem with its structure and formatting. | The solution has some problems with its structure and formatting. | The solution does not have any problem with its structure and formatting. |

# **XIV- Course Requirements**

* Students are expected to attend at least 80% of the class.
* Students are expected to participate actively in the class.
* For both terms, there will be at least 2 quizzes based on the theoretical knowledge and conceptual understanding of the topic covered discussed in the classes.
* Submit report based on the given course related problems.
* Submission of assignments and projects should be in due time.

# **XV – Evaluation & Grading System\***

The following grading system will be strictly followed in this class

**Mid Term Exam:**

Term Exam: 50%

Quizzes: 20%

Lab Exam: 20%

Attendance: 10%

**Final Term Exam:**

Term Exam: 50%

Quizzes: 20%

Lab Exam: 20%

Attendance: 10%

**Semester grade:** 40% midterm + 60% final term

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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 |
| I |  | Incomplete |
| W |  | Withdrawal |
| UW |  | Unofficially Withdrawal |

*\* The evaluation system will be strictly followed as per the AIUB grading policy.*

*\* CO attainment will be achieved with 60% of the evaluation marks.*

# **XVI – Textbook/ References**

* Assembly Language Programming and Organization of the IBM PC, Ytha Yu and Charles Marut, McGraw Hill, 1992. (ISBN: 0-07-072692-2).
* Essentials of Computer Organization and Architecture, (Third Edition), Linda Null and Julia Lobur
* W. Stallings, “Computer Organization and Architecture: Designing for performance”, 10th Edition, Prentice Hall of India, 2003, ISBN 81 – 203 – 2962 – 7
* Computer Organization and Architecture by John P. Haynes.

# **XVII - List of Faculties Teaching the Course**

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| --- | --- |
| **FACULTY NAME** | **SIGNATURE** |
| DR. KAMRUDDIN MD. NUR |  |
| DR. NAZIB ABDUN NASIR |  |
| MD. FARUK ABDULLAH AL SOHAN |  |
| MD. RAIHAN MAHMUD |  |
| NAZIA ALFAZ |  |
| NUSRAT JAHAN ANANNYA |  |
| SAEEDA SHARMEEN RAHMAN |  |
| SAMIHA ISLAM ABRITA |  |
| SUMAIYA MALIK |  |
| SYEDA ASRAFA ISLAM |  |
| SYMA KAMAL CHAITY |  |
| TAMANNA ZAMAN BRISTY |  |
| TASLIMUR RAHMAN |  |
| ZAHIDUDDIN AHMED |  |

# **XVIII – Verification**

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| **Prepared by:**  ---------------------------------  **Zahiduddin Ahmed**  *Course Convener*  Date:......................................... | **Moderated by:**  ---------------------------------  **Dr. M. Mahmudul Hasan**  *Point Of Contact*  *OBE Implementation Committee*  Date:......................................... | **Checked by:**  ---------------------------------  **Dr. Akinul Islam Joney**  *Head (Undergraduate Program) Department of Computer Science*  Date:......................................... |
| **Verified by:**  ....................................................  **Dr. Md. Abdullah-Al-Jubair**  *Director*  *Faculty of Science & Information Technology*  Date:.......................................... | **Certified by:**  .....................................................  **Prof. Dr. Dip Nandi**  *Associate Dean*,  *Faculty of Science & Information Technology*  Date:............................................ | **Approved by:**  .........................................................  **Mr. Mashiour Rahman**  *Dean*,  *Faculty of Science & Information Technology*  Date:............................................... |