**COURSE SYLLABUS**

**2nd Semester, AY 2015-2016**

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| **Course Information** | | | | **Faculty Information** | | | | | | |
| **Course Code:** | | EM 223 | | **Name:** | | | | | Luke Nigel Laylo | |
| **Course Title:** | | Discrete Mathematics | | **Office:** | | | | | Department of Computer Engineering | |
| **Credit Units:** | | 3 | | **Email:** | | | | | lukelaylo@gmail.com | |
| **Pre-requisites:** | | EM 111 | | **Phone:** | | | | | (+6332) 230-0100 ext. 263 | |
| **Schedule:** | | 04:30 PM-06:00 PM MW Rm:  LB265TC  01:30 PM – 3:00 PM Rm:  LB257TC | | **Consultation Time:** | | | | | 10:30 – 1:30 PM MTW. | |
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| **Course Description** | | | | | | | | | | |
| Discrete mathematics is used whenever objects are counted, when relationships between finite (or countable) sets are studied, and when processes involving a finite number of steps are analyze. Through the course students can develop mathematical maturity the ability to understand and create mathematical arguments, solve counting problems and analyze algorithms. This course is a pre requisite to computer programming course (CpE 311N) as well as logic circuits theory (CpE 321N). | | | | | | | | | | |
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| **COURSE OUTCOMES (CO)** | | | | | | | | | | |
| *By the end of the semester, students should be able to:*  **CO1:** synthesize elementary proofs by mathematical induction  **CO2:** Use postulates and theorems in solving Boolean Algebraic expressions. | | | | **Alignment to Program Outcomes** | | | | | | |
| *The learning outcomes in this course are* ***enabling*** *to the achievement of:*  **[PO1**] Ability to apply knowledge of mathematics and sciences to the practice of computer engineering. | | | | | | |
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| **ASSESSMENT OF OUTCOMES** | | | | | | | | | | |
| Six written timed exams (2- Quizzes, 3-Formative Exams, 1-Final Exam) will be given to assess the student’s ability to solve problems in applying proper solutions or methods to certain given. Short quizzes and long exam are thus formative assessment whereas the final exam is summative | | | | | | | | | | |
| **Formative**  For **CO1 &CO2**:  Exercise Sets, Quizzes, 1.5-hour Exam (PME)  Exercise Sets, Quizzes, 1.5-hour Exam (ME)  Exercise Sets, Quizzes, 1.5-hour Exam (PFE) | | | | | | **Summative (Rubric-Based)**  For **CO1 and CO2**: Comprehensive Final Exam | | | | |
| **Assessment Rubrics** (see annexes for the rubric)  Rubric 1. **Assessing and Grading Synthesize Elementary Proofs by Mathematical Induction**  Rubric 2. **Assessing and Grading the Use Postulates and Theorems in Solving Boolean Algebraic Expressions** | | | | | | | | | | |
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| **Grading System**  The student’s grade for the course is computed based on both formative and summative assessment data. The computation is detailed below. | | | | | | | | | | |
| **Grade Component Weight**  *Exercise Set (SW/HW)*  ( 5%)  *Quizzes* (10%)  *Formative Exams (PME)* (20%)  Formative Exams (ME) (20%)  Formative Exams (FE) (20%)  Summative Exam (Final) (25%) | | | | | **Computation**  Exercise Set Grade x 0.05  Quizzes Grade x 0.10  Pre-mid Exam Grade x 0.20  Midterm Exam Grade x 0.20  Pre-Finals Exam Grade x 0.20  Summative Exam Grade x 0.25  Total **Grade 1.0**  **Passing Grade:** **3.0**  **Condition for Passing:** students must ***have a total grade of 3.0 or above rating.*** | | | | | |
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| **LEARNING PLAN** | | | | | | | | | | |
| **Course Outcome** | **Topics** | | | | | | **Week** | **Learning Activities** | | |
| CO1 | 1. **The Foundations: Logic and Proofs**    1. Propositional Logic    2. Applications of Propositional Logic    3. Propositional Equivalences    4. Predicates and Quantifiers    5. Rules of Inference    6. Nested Quantifier    7. Introduction to Proofs    8. Proof Methods and Strategy | | | | | | 1 | * Open Forum * Course overview * Discussing illustrative examples then open forum * In-Class Exercises (logic proofs) | | |
| 2 |
| 3 |
| CO1 | 1. **Basic Structures: Sets, Functions, Sequences, and Sums**    1. Sets    2. Set Operations    3. Functions    4. Sequences and Summation | | | | | | 4 | * Think-Pair Share activity * Practice Exercises | | |
|  | **PRE-MIDTERM EXAM** | | | | | | 5 | **Formative Exam 3 (Pre-midterm Exam)** | | |
| CO1 | 1. **Algorithms**    1. Properties of Algorithms    2. Searching Algorithms    3. Sorting Algorithms    4. Greedy Algorithms    5. Halting Algorithms (optional) | | | | | | 6 | * Reflection Activity Set 1:   *What knowledge and skills did you put to use in doing or solving problems with such method?*   * Oral presentation on sorting and searching algorithm * Practice Exercises | | |
| 7 |
| CO1 | 1. **Number Theory and Cryptography**    1. Divisibility and Modular Arithmetic    2. Integer Representations and Algorithms    3. Primes and Greatest Common Divisors    4. Solving Congruence    5. Cryptography (optional) | | | | | | 8 | * In-class exercises * Think-pair-share activity * Cooperative Learning:   Groups of students are assigned to evaluate the solutions on different applications on definite integral | | |
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|  | **IEC (January 25 – 30, 2015)** | | | | | | 11 |  | | |
|  | **MIDTERM EXAM WEEK (Feb. 1 -6, 2015)** | | | | | | 12 | **Formative Exam 2 (Midterm Exam)** | | |
| **CO1** | 1. **Induction and Recursion**    1. Mathematical Induction    2. Strong Induction and Well-Ordering    3. Recursive Definitions and Structural Induction | | | | | | 13 | * Group Activity on mathematical induction * Cooperative Learning:   Groups of students are assigned to discuss and share in the class the algorithm made   * Reading Assignment about recurrence relations and Inclusion-Exclusion | | |
| 14 |
| CO1 | 1. **Advanced Counting Techniques**    1. Applications of Recurrence Relations    2. Inclusion-Exclusion | | | | | | 15 | * In-class Exercises * **Formative Exam 3 (Pre-final Exam)** | | |
| CO1 | 1. **Relations**    1. Relations and Their Properties    2. Representing Relations    3. Equivalence Relations | | | | | | 16 | * Reflection Set 2: What students have learned in relationships between elements of sets that are represented using the structure | | |
| CO2 | 1. **Boolean Algebra**   10.1 Boolean Functions  10.2 Representing Boolean Functions | | | | | | 17 | * Cooperative Learning:   Groups of students are assigned to discuss and share in the class as to how to evaluate Boolean Expressions and functions | | |
|  | **Final Exams (March 28 – 31, 2015)** | | | | | | 18 | **Summative Exam (Final Exam)** | | |
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| **Learning Resources** | | | | | | | | | | |
| **Textbook**: *Discrete Mathematics and its Application*, 7th ed., Kenneth Rosen  Online References:  [**www.ee.surrey.ac.uk/Projects/Labview/boolalgebra/**](http://www.ee.surrey.ac.uk/Projects/Labview/boolalgebra/) | | | | | | | | | | |
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| **Course Policies** | | | | | | | | | | |
| * **Attendance and Tardiness**   You are expected to attend all classes. The USC Student Manual (2013 Edition) stipulates that “a student who incurs unexcused absences of more than 20% of the prescribed number of class hours or laboratory periods during the term should be given NC or 5.0.” A 3-unit course has 48 class hours and a 1-unit laboratory course has 16 laboratory periods. You do the math.  Tardiness is highly discouraged and habitual tardiness will not be condoned. Appropriate sanctions for tardiness will be given based on agreement reached during a one-on-one conference between you and me. If you come late to class, silently make your way to your seat without disrupting ongoing activity.   * **Classroom Behavior**   In class, students are expected to behave in a manner that would not unnecessarily disrupt classroom activities. The instructor reserves the right to expel misbehaving students from the classroom.   * **Consultation**   My consultation periods are indicated in this syllabus. Should you wish to consult with me on matters pertaining to your achievement of the learning outcomes, you can inform me through the class email or personally. You may do so individually or as a group. | | | | | | | | | | |
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| Prepared By: | | |  | Approved By: | | | | | |  |
|  | | | **Luke Nigel Laylo**  Instructor |  | | | | | | **Antoniette P. Mondigo, MEng.** Department Chair |
| Date Submitted for Approval: | | | **Nov. 21, 2015** | Date Approved: | | | | | |  |

EM 223 Discrete Mathematics

The quality of the outputs and performance in the exams will be rated using rubrics that distinguish four different levels of attainment. The actual rubrics with analytic descriptors are provided as annexes to this syllabus.

**Rubric 1. Assessing and Grading synthesize elementary proofs by mathematical induction (CO1)**

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| --- | --- | --- | --- | --- | --- |
| Level Criteria | Weighted percentage | Outstanding | Competent | Marginal | Not Acceptable |
| 1.0 | 2.0 | 3.0 | 4.0 |
| LOGIC/REASONING | 50% | * Completely Correct * Use symbols correctly * Statements follow logically from one another. * Clearly Indicate the hypothesis and the conclusions of the proof | * Proof has the main flow of correct logic but misses one major element * Element could be incorrect use of symbols or one major logical error * Majority of the argument is correct | * Proof has the correct hypothesis and conclusion * Has serious deficiencies in either in symbolism or in flow of logic | * Empty (Do not Know) * Completely illogical argument and/or invalid logic |
| MATHEMATICAL CONTENT (Demonstrate understanding of mathematical definitions) | 50% | * Applies definition correctly and appropriately * Proves the result according to correct terminology * Implementation of the method is procedurally correct and detailed; * And mathematical operations are logically consistent. | * Applies definition correctly and appropriately * Proves the result according to correct terminology * Implementation of the method is procedurally correct and detailed; * But with minor logical flaws in the mathematical operations leading to minor errors in the solution. | * Applies definition correctly but some are not appropriate * Employ unnecessary content of proof * Implementation of the method is procedurally correct and detailed; * But mathematical operations have major errors leading to a wrong solution | * Implementation of the method is procedurally wrong. |

**Rubric 2. Assessing and Grading the Use Postulates and Theorems in Solving Boolean Algebraic Expressions (CO2)**

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| --- | --- | --- | --- | --- |
| Level Criteria | Outstanding | Competent | Marginal | Not Acceptable |
| 1.0 | 2.0 | 3.0 | 4.0 |
| Method and Solution Obtained | * Chosen method is appropriate; * Implementation of the method is procedurally correct and detailed; * And mathematical operations are logically consistent. * Obtained solution is correct and written in simplified form | * Chosen method is appropriate; * Implementation of the method is procedurally correct and detailed; * But with minor logical flaws in the mathematical operations leading to minor errors in the solution. * Obtained solution can still be further simplified. | * Chosen method is appropriate; * Implementation of the method is procedurally correct and detailed; * But mathematical operations have major errors leading to a wrong solution | * Chosen method may be appropriate; * But implementation of the method is procedurally wrong. |