**Computer Science Department**

**College of Computer at Al-Lith**

**Course Syllabi**

**5901102-3 - Computer Programming (3 credits)**

**Coordinator: Ali El - Najar**

Catalog Description

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| --- |
| Introduce students to the basics of writing software programs including variables, types, arrays, procedures, control structures, input/output, and general rules for writing good code. |

Prerequisites

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| 4800153-3 – Computer Programming Skills |

Major Topics Covered in the Course (14 week semester)

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| --- | --- |
| **Topic** | **Week** |
| Introduction to basic concepts of writing code, compilation, and execution | 1-2 |
| Using Classes/Objects/Data members as building blocks | 3 |
| Defining methods: parameters, return values | 4 |
| Primitive data types and operations (vvariables, types, assignment, and expressions) | 5-6 |
| Control statements | 7-8 |
| Loops and arrays | 9-11 |
| Vectors | 12-13 |
| Input/output via console | 14 |

Weekly Hours

|  |
| --- |
| 2 x 50 mins lectures, 2 x 50 mins labs |

Textbook/References/References

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| --- |
| * Head First Java, 2nd Edition by Kathy Sierra and Bert Bates, O'Reilly Media, 2005 * Absolute Java, 4th Edition, Walter Savitch, Addison Wesley, 2009 * Java Programming, 7th Edition, Joyce Farrell, 2013, 1285081951 * Java: How to Program, 9e, Dietel and Dietel, Pearson 0273759760 |

Assessment Methods

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| --- |
| * Assignments and quizzes (40%) * Midterms (20%) * Final Exam (40%) |

Course Learning Outcomes (CLOs)

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| 1. Students will be able to solve problems using programming. 2. Students will learn to use professional programming coding style and comments to improve code readability and maintainability. 3. Students will learn to write error-free code using debugging and testing techniques. |

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| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ | ✓ | ✓ |  |  |  |  |  |  |  |  |
| CLO 2 |  |  |  |  | ✓ |  |  |  | ✓ |  |  |
| CLO 3 | ✓ |  |  |  |  |  |  |  | ✓ |  |  |

Relationship between CLOs and Student Outcomes

Relationship of Course to ABET Student Outcomes

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of programming to solve simple programming problems.*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students acquire the ability to study programming problems and write programs that realize the required logic.*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs**

*Students are required to write (implement) their assignment in the form of methods to be called from the main method and test their methods by passing different appropriate values.*

**d. an ability to function effectively on teams to accomplish a common goal**

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**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*Students will understand the importance of code readability and maintainability.*

**f. an ability to communicate effectively**

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**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

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**h. a recognition of the need for, and an ability to engage continuing professional development**

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**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Students use the command line and an IDE for writing, formatting, compiling, running, and debugging code.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

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**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

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Approvals

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| ***Course Coordinator*** | **Ali El-Najar** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901204-3 - Structured Programming (3 credits)**

**Coordinator:**

Catalog Description

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| --- |
| Builds on 5901102-3 introducing object oriented programming concepts such as classes, objects, and methods. Also explores larger design concepts such as encapsulation, inheritance, abstraction and polymorphism. |

Prerequisites

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| 5901102-3 – Computer Programming |

Major Topics Covered in the Course (14 week semester)

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| --- | --- |
| **Topic** | **Week** |
| Review Object Oriented Programming concepts | 1 |
| Objects: Defining, Creating, and Using | 2-5 |
| Inheritance | 6-7 |
| Polymorphism-Part1 | 8-9 |
| Polymorphism-Part2 | 10-11 |
| UML for Object Oriented Programming | 12 |
| Object Oriented Design | 13-14 |

Weekly Hours

|  |
| --- |
| 2 x 50 mins lectures, 2 x 50 mins labs |

Textbook/References

|  |
| --- |
| Java: How to Program, 9e, Dietel and Dietel, Pearson 0273759760  Object-Oriented Analysis and Design: Undergraduate Topics in Computer Science, Sarnath Ramnath and Brahma Dathan, Springer, ISBN 978-1-84996-521-7 |

Assessment Methods

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| --- |
| Assignments and quizzes (60%)  Midterm (20%)  Final exam (20%) |

Course Learning Outcomes (CLOs)

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| --- |
| 1. Students will understand object oriented concepts including – classes, objects, inheritance, data abstraction, encapsulation, and polymorphism 2. Students will learn how to design applications using object oriented design methodology 3. Students will appreciate the benefits of code reuse by learning how to make use of off-the-shelf Java libraries such as the Java String |

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| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ | ✓ | ✓ | ✓ |  |  |  |  | ✓ |  |  |
| CLO 2 | ✓ | ✓ | ✓ | ✓ |  |  |  |  | ✓ | ✓ | ✓ |
| CLO 3 |  | ✓ |  |  |  |  |  |  |  |  | ✓ |

Relationship between CLOs and Student Outcomes

Relationship of Course to ABET Student Outcomes

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students acquire the concepts of Object Oriented Programming and use it to design applications.*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students acquire the ability to decompose problems into components and design and code each component.*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*Students are required design and implement software to meet specifications.*

**d. an ability to function effectively on teams to accomplish a common goal**

*Students are required to communicate with their group members efficiently to accomplish their assignment and to be able to defend it individually.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

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**f. an ability to communicate effectively**

*---*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

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**h. a recognition of the need for, and an ability to engage continuing professional development**

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**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Students acquire the ability to learn advanced IDE features such as UML class diagrams and sequence diagrams.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students acquire the ability to design advanced logical algorithms by decomposing it and writing objects realizing these tasks.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*Students acquire the principles of OOD through the use of UML design principles and tools.*

Approvals

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| ***Course Coordinator*** |  |  |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901105-3 - Advanced Programming (3 credits)**

**Coordinator: Ahmed Rafat Abas**

Catalog Description

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| Extends the programming knowledge introduced in 5901102-3 and 5901204-3. The course will focus more heavily upon application development with an emphasis on more advanced programming concepts. Topics include, but are not limited to, GUI (Swing), Collections, Exception handling, and I/O file management. Students will develop several GUI-based computer programming projects. |

Prerequisites

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| --- |
| 5901204-3 – Structured Programming |

Major Topics Covered in the Course (14 week semester)

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| --- | --- |
| **Topic** | **Week** |
| Review of OOD | 1 |
| Exception handling and input validation | 2-3 |
| File management and object persistence | 4-5 |
| GUI building | 6-8 |
| Collections | 9-10 |
| Other advanced topics (e.g., recursion, generic programming, design patterns, …) | 11-14 |

Weekly Hours

|  |
| --- |
| 2 x 50 mins lectures, 2 x 50 mins labs |

Textbook/References/References

|  |
| --- |
| * Java: How to Program, 9e, Dietel and Dietel, Pearson 0273759760 * Absolute Java, 4th Edition, Walter Savitch, Addison Wesley, 2009 * Java Programming, 7th Edition, Joyce Farrell, 2013, 1285081951 * Head First Java, 2nd Edition by Kathy Sierra and Bert Bates, O'Reilly Media, 2005 |

Assessment Methods

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| --- |
| * The student is expected to complete theoretical homework and programming assignments, pass written examinations, and successfully complete a project |

Course Learning Outcomes (CLOs)

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| --- |
| 1. Students will be familiar with exception handling and input validation. 2. Students will gain knowledge about I/O file management and object persistence 3. Students will be able to develop GUI-based Java applications. 4. Students will learn how to use different types of collections provided in the standard library as well as the fundamental operations of the **Arrays** and **Collections** classes 5. Students will learn about other advanced Java topics. 6. Students will get the experience of working in groups to design and develop complete GUI-based Java application projects. |

Relationship between CLOs and Student Outcomes

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| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  |  |  |  |  |  |  | ✓ |  |  |
| CLO 2 | ✓ |  |  |  |  |  |  |  | ✓ |  |  |
| CLO 3 |  |  |  |  |  |  |  |  | ✓ |  |  |
| CLO 4 | ✓ |  |  |  |  |  |  |  | ✓ |  |  |
| CLO 5 | ✓ |  |  |  |  |  |  | ✓ | ✓ |  |  |
| CLO 6 | ✓ | ✓ | ✓ | ✓ |  | ✓ |  | ✓ | ✓ |  | ✓ |

Relationship of Course to ABET Student Outcomes

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of object-oriented programming to solve programming problems.*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students acquire the problem analysis and solving skills throughout the course projects.*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*Students are required to design and develop programming projects to meet the desired requirements.*

**d. an ability to function effectively on teams to accomplish a common goal**

*Students work on teams to accomplish the building blocks of their projects.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

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**f. an ability to communicate effectively**

*Students improve their communication skills as they discuss and exchange the ideas with each other to build their projects.*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

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**h. a recognition of the need for, and an ability to engage continuing professional development**

*Students are encouraged to conduct self-study on some advanced topics.*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Students will use an IDE to facilitate the development process of the programming projects.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

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**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*The students are required to use standard design and development principles on some significant programming problems.*

Approvals

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| --- | --- | --- |
| ***Course Coordinator*** | **Ahmed Rafat Abas** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901210-3 - Discrete Structures (3 credits)**

**Coordinator: Sherif El-etriby**

Catalog Description

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| This course covers the mathematical foundations of computer science and engineering. It provides an introduction to elementary concepts in mathematics such as definitions, logic, proofs, functions, relations and counting principles. The course also introduces students to elementary discrete structures such as sets, partial orders, graphs and trees. |

Prerequisites

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| 4800141-4 – Introduction to Math(2)  5901102-3- Computer programming |

Major Topics Covered in the Course (14 week semester)

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| --- | --- | --- |
| **Topic** | **Reading** | **Week** |
| Logic, Truth Table, Propositional equivalences | [KR] 1.1, 1.2 | 1,2 |
| Predicates and Quantifiers | [KR] 1.3 | 3 |
| Sets and Functions | [KR] 1.4 – 1.6  [JMJN] 1.2,1.4 | 4 |
| Relations, Equivalences and Partial Orders | [KR] Chapter 6  [JMJN] 1.5, 1.6, 2.1 | 5,6 |
| Proofs: Induction, Contradiction, Contrapositives | [KR] 3.1, 3.2  [JMJN] 1.3 | 7,8,9 |
| Counting Principles: Cardinality, factorials, permutations, Binomial coefficients, Inclusion-Exclusion, Pigeon-Hole Principle, sums and asymptotic | [KR] 4.1 – 4.3, 5.5,5.6  [JMJN] 3.1 – 3.3, 3.7  [KR] 1.7, 1.8 | 10,11,12 |
| Graphs and Trees: Representation, degree sequences and hand shaking lemma, Euler tours, Planar graphs, Euler Formula. Properties of Tree, Spanning Trees | [KR] 7.1 – 7.3, 7.5, 7.6, 8.1, 8.2, 8.5, 8.6  [JMJN] 4.1 – 4.3, 4.4, 5.1, 5.3. 5.4 | 13,14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

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| --- |
| [KR] Discrete Mathematics and Its Applications, 4th Edition, By Kenneth Rosen  [JMJN] Invitation to Discrete Mathematics, 2nd Edition, By Jiri Matousek and Jaroslav Nesetril |

Assessment Methods

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| --- |
| Homework: 20%  Quizzes: 10%  Midterm: 30%  Final: 40% |

Course Learning Outcomes (CLOs)

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| --- |
| 1. Be able to analyze complexity of algorithms 2. Be able to apply number theory to practical problems 3. Be able to synthesize elementary proofs 4. Be able to apply concepts of graph theory and trees to solve real world problems |

Relationship between CLOs and Student Outcomes

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| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  |  |  |  |  |  |  |  | ✓ |  |
| CLO 2 | ✓ |  |  |  |  |  |  |  |  | ✓ |  |
| CLO 3 | ✓ |  |  |  |  |  |  |  |  | ✓ |  |
| CLO 4 | ✓ |  |  |  |  |  |  |  |  | ✓ |  |

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| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students will be able to analyze computational processes*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

**d. an ability to function effectively on teams to accomplish a common goal**

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**e. an understanding of professional, ethical, legal and social issues and responsibilities**

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**f. an ability to communicate effectively**

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**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

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**h. a recognition of the need for, and an ability to engage continuing professional development**

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**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

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**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*This course provides the foundation for algorithms and theory of computing. Hence the students will be able to apply methods learned in this course to analyze and reason mathematically about the tradeoffs involved in design choices. Furthermore this course will enable students to model many systems using discrete structures.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

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Approvals

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| --- | --- | --- |
| ***Course Coordinator*** | ***Sherif El-etriby*** |  |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901211-3 – Programming on the Web (3 credits)**

**Coordinator:**

Catalog Description

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| --- |
| This course provides an introduction to network/Internet programming. It covers the major concepts for programming distributed applications, in particular, asynchronous and synchronous inter-process communication, process synchronization and remote procedure call (RPC). |

Prerequisites

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| --- |
| 5901102-3 – Computer Programming |

Major Topics Covered in the Course (14 week semester)

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| --- | --- |
| **Topic** | **Week** |
| Admin + Introduction | 1 |
| Brief Introduction to Java | 2-6 |
| Threads/Synchronization | 7-8 |
| Basic Network Concepts | 9 |
| Remote Invocation Method (RMI) | 10-11 |
| Socket Programming | 12-14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Primary Book: Java Network Programming, Elliotte Rusty Harold, O'Reilly, 3rd edition, 2005, ISBN: 978-0-596-00721-8  Secondary Book: Jan Graba, An Introduction to Network Programming with Java, 2nd edition, 2007, ISBN-13: 978-1-84628-380-2 |

Assessment Methods

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| --- |
| Bi-weekly assignments to be completed outside class (40%), Midterm (30%), Final Exam (30%) |

Course Learning Outcomes (CLOs)

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| --- |
| 1. The student will have a working knowledge of Internet Programming theory and practice. 2. The student will design and experiment with various Internet Programming concepts and components via projects, to increase overall understanding of modern Internet Programming. 3. The student will be able to write and debug small distributed Java programs. |

Relationship between CLOs and Student Outcomes

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| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  |  |  |  |  |  |  |  | ✓ |  |
| CLO 2 | ✓ |  |  | ✓ |  |  |  |  | ✓ |  |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of computing and design to a project*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

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**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

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**d. an ability to function effectively on teams to accomplish a common goal**

*Projects are implemented in teams.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

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**f. an ability to communicate effectively**

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**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

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**h. a recognition of the need for, and an ability to engage continuing professional development**

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**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Projects use current computing and modeling/design tools.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students are required to apply their knowledge of computing to design a solution to a problem and to document the solution including the tradeoffs involved in their design choices.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

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Approvals

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| ***Course Coordinator*** |  |  |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901213-3 Analysis & Logic Design (3 credits)**

**Coordinator: Mohammad Zafar Zahir**

Catalog Description

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| --- |
| Computer arithmetic (how data is manipulated by a computer), digital logic and how it relates to boolean algebra, designing of combinational and sequential circuits |

Prerequisites

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| --- |
| 4800153-3 –Computer Programming Skills |

Major Topics Covered in the Course (14 week semester)

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| --- | --- |
| **Topic** | **Week** |
| Data representation in computer systems (signed and unsigned arithmetic) | 1 |
| Addition, subtraction, multiplication and division | 2 |
| Floating-point arithmetic | 3 |
| Fundamentals of Boolean algebra and logic gates | 6-10 |
| Basic concepts of combinational circuits (adders, subtractors, multiplexors, decoders, encoders, magnitude comparator) | 11-13 |
| Basic concepts of sequential circuits (flip flops, counters) | 14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Morris Mano, DIGITAL DESIGN, 4th Edition, Prentice Hall, 2007 |

Assessment Methods

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| --- |
| Attendance **10 %**  Written assignments to be completed outside class **10 %**  Midterm **30 %**  Final Exam **50 %** |

Course Learning Outcomes (CLOs)

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| --- |
| 1. Understanding of basic computer arithmetic (how computer manipulates data) 2. Understanding of digital logic at the gate and switch level 3. Understanding of combinational and sequential circuits (designing of simple circuits) |

Relationship between CLOs and Student Outcomes

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| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  |  |  |  | ✓ |  |  |  |  |  |
| CLO 2 | ✓ | ✓ |  |  |  | ✓ |  |  |  | ✓ |  |
| CLO 3 | ✓ |  | ✓ |  |  | ✓ |  |  |  | ✓ |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of digital logic to develop circuits. Students apply knowledge of computing to practical computing problems.*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students analyze the Boolean functions and simplify it.*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs**

*Students are required to design simple digital circuits (combinational as well as sequential)*

**d. an ability to function effectively on teams to accomplish a common goal**

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**e. an understanding of professional, ethical, legal and social issues and responsibilities**

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**f. an ability to communicate effectively**

*The written assignments and class presentation enable students to communicate effectively*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

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**h. a recognition of the need for, and an ability to engage continuing professional development**

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**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

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**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

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Approvals

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| ***Course Coordinator*** | ***Mohammad Zafar Zahir*** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901214-3 - Computer Organization & Assembly (3 credits)**

**Coordinator: Mohammad Zafar Zahir**

Catalog Description

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| --- |
| Instruction set architecture and MIPS assembly language, processor computation (data path and control), processor communication (cache and I/O modules) |

Prerequisites

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| --- |
| 5901213-3 – Analysis & Logic Design |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Introduction to computer organization and CPU time | 1 |
| Instruction set architecture and MIPS assembly language | 2-5 |
| Processor data path and control | 6-8 |
| An overview of I/O modules and devices | 12-13 |
| Course review | 14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Computer Organization & Design: The Hardware/Software Interface, D. Patterson and J. Hennessy (4th edition) |

Assessment Methods

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| --- |
| Quizzes **10%**  Homework **10%**  Midterm **25%**  Attendance **5%**  Final Exam **50%** |

Course Learning Outcomes (CLOs)

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| --- |
| 1. The ability to assess the performance of computers based on CPU time 2. Understanding of instruction set architecture (ISA) and basic Assembly language programming skills (MIPS ISA) 3. Understanding of processor computation by building processor data path and control 4. Understanding of processor communication by I/O modules |

Relationship between CLOs and Student Outcomes

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ | ✓ |  |  |  |  |  |  |  |  |  |
| CLO 2 | ✓ | ✓ | ✓ |  |  |  |  |  |  |  |  |
| CLO 3 | ✓ | ✓ |  |  |  |  |  |  |  |  |  |
| CLO 4 | ✓ | ✓ | ✓ |  |  |  |  |  |  |  |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of computer organization and assembly language to a project*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students are exposed to a variety of problems where they have to identify the computing requirements of solution.*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs**

*Students write assembly code and evaluate computer components for desired performance.*

**d. an ability to function effectively on teams to accomplish a common goal**

*---*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*---*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

---

**h. a recognition of the need for, and an ability to engage continuing professional development**

*---*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*---*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

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**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

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Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** | ***Mohammad Zafar Zahir*** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901215-3 - Computer Architecture (3 credits)**

**Coordinator: Ahmed Rafat Abas**

Catalog Description

|  |
| --- |
| This course extends 1401214-3 (computer organization) by covering advanced processor features that are standard in modern processors, and exploring the design and trade-offs of memory hierarchies, including implications for parallel processor architectures. |

Prerequisites

|  |
| --- |
| 5901214-3 – Computer Organization & Assembly |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Introduction to computer architecture and computer performance | 1-2 |
| Revision of Instruction set architecture (for MIPS) | 3 |
| How instructions are executed (Data path and Control) | 4-6 |
| Pipelining | 7-9 |
| Memory hierarchy | 10-11 |
| Multiprocessor architectures | 12-14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Computer Organization & Design: The Hardware/Software Interface, D. Patterson and J. Hennessy (3rd edition or newer) |

Assessment Methods

|  |
| --- |
| The student is expected to complete theoretical homework and programming assignments, pass written examinations, and successfully complete a project |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. An ability to compare the performances of different computers 2. An ability to understand the implementation of instructions 3. An ability to improve the computer performance by pipelining 4. An ability to improve the computer performance by memory hierarchy 5. An ability to understand the principles of multicore architectures |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ | ✓ |  |  |  |  |  |  |  |  |  |
| CLO 2 | ✓ | ✓ |  |  |  |  |  |  |  |  |  |
| CLO 3 | ✓ | ✓ |  |  |  |  |  |  |  |  |  |
| CLO 4 | ✓ | ✓ |  |  |  |  |  |  |  |  |  |
| CLO 5 | ✓ | ✓ |  |  |  |  |  | ✓ |  |  |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of computing and mathematics to assess and compare different architectures and organization designs*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students learn to identify the computing requirements to solve a problem.*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*---*

**d. an ability to function effectively on teams to accomplish a common goal**

*---*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*---*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*---*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*---*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*---*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*---*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** | **Ahmed Rafat Abas** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901217-3 - Logic Programming (3 credits)**

**Coordinator: Moeiz Miraoui**

Catalog Description

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| --- |
| The aim of this course is to present the key concepts behind logic programming: logic as a declarative (context-free) language, how to write programs with logic, and how to make efficient implementations. In particular, we will cover: recursive structures, syntax and semantics of propositional logic, 1st order and higher-order logics, inferences rules, unification and resolution, SLD-resolution, negation as failure, and implementation issues. |

Prerequisites

|  |
| --- |
| 5901210-3 – Discrete Structures |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Introducing the concepts of Logic, Mathematical Logic, and Logic programming. |  |
| Distinguishing between declarative, object-oriented, and logic programming methodologies. |  |
| Directionless of logic programming. |  |
| Mathematical Logic (First order logic) issues (Rules of mathematical representation, Representing facts and rules) |  |
| Mathematical Logic (First order logic) issues (Deduction, Computation function and predicate, Unification, Resolution, and Clause Form) |  |
| Introduction to Logic Programming and Prolog Syntax. |  |
| Starting Prolog with Prolog terms and Prolog programs. |  |
| Clauses, Predicates, Variables. |  |
| Common Variables and Satisfying and evaluating goals. |  |
| Unification and backtracking. |  |
| Operations and Arithmetic. Input and Output. |  |
| Loops, Preventing Backtracking. |  |
| Lists and String in Prolog. |  |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Programming in Prolog: Using the ISO Standard  Clocksin and Mellish, Springer, 2003, ISBN 3540006788 |

Assessment Methods

|  |
| --- |
| Programming exercises  MidTerm Exam  Project  Final exam |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. Students will appreciate the declarative programming model, and be able to identify when it would be useful in problem solving. |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  |  |  |  |  |  |  | ✓ |  |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students learn to apply declarative programming to solve problems*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*---*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*---*

**d. an ability to function effectively on teams to accomplish a common goal**

*---*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*---*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*---*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Students learn to use Prolog, a popular tool for logic programming*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*---*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*---*

Approvals

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| --- | --- | --- |
| ***Course Coordinator*** | **Moeiz Miraoui** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901218-4 - Data Structures & Algorithms (4 credits)**

**Coordinator:**

Catalog Description

|  |
| --- |
| The objective of this course is to provide the fundamentals of data structures and algorithm design needed in the remainder of the curriculum, introduce algorithm analysis, and develop students’ problem solving and computer programming skills. Emphasis on linked lists, stacks, queues, trees, priority queues, heaps and graphs, and abstract data types. Also includes object oriented concepts. |

Prerequisites

|  |
| --- |
| 5901105-3 - Advanced Programming |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Basics of algorithm analysis | 3-4 |
| Linear Data Structures | 5 |
| Sorting | 6-7 |
| Search Trees | 8-9 |
| Hash Tables | 10-11 |
| Priority Queues | 12 |
| Graphs | 13-15 |

Weekly Hours

|  |
| --- |
| 2 x 50 mins lectures, 2 x 50 mins labs |

Textbook/References

|  |
| --- |
| Data Structures and Algorithms in Java, 4th edition, by M.T. Goodrich and R. Tamassia. John Wiley and Sons, Inc., ISBN: 0-471-73884-0 |

Assessment Methods

|  |
| --- |
| The students are expected to complete programming assignments, and pass written examinations on class material. The mark division is 50% for final exam, 25% for midterm exam, and 25% for practical work and quizzes. |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. The students will be able to describe, construct, and use various implementations for fundamental data abstractions such as lists, stacks, queues, trees, and graphs 2. The students will be able to design and implement efficient algorithms for manipulating data structures 3. The students will be able to compare the efficiency of various data structures and algorithms and to choose the most appropriate ones for a given application |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 |  |  | ✓ |  |  |  |  |  | ✓ |  |  |
| CLO 2 | ✓ | ✓ |  |  |  |  |  |  |  | ✓ |  |
| CLO 3 | ✓ | ✓ | ✓ |  |  |  |  |  |  | ✓ |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students appreciate the use of mathematical proofs to reason about and compare the asymptotic complexity of various algorithms through the use of Big-Oh and other notations. They will also develop an understanding of how to represent different algorithm resource requirements as mathematical functions on the size of the input (logarithmic, linear, etc.)*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students can analyze the time and space requirements of a particular problem by performing asymptotic analysis.*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*Students are asked to modify algorithms to produce different outputs or combine algorithms and data structures to offer new solutions e.g. search trees + in-order traversal for sorting.*

**d. an ability to function effectively on teams to accomplish a common goal**

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**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

---

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

---

**h. a recognition of the need for, and an ability to engage continuing professional development**

---

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*The students learn how to use the most up-to-date libraries in the course-selected programming language to implement different data structures e.g. maps in Java.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students are able to compare various algorithms e.g. which of the sorting algorithms is best for which kind of input, which is best in parallel systems, which is best when memory is limited, which is best when implemented as part of a dependable system, etc.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

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Approvals

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| --- | --- | --- |
| ***Course Coordinator*** |  |  |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901222-3 - System Analysis & Design (3 credits)**

**Coordinator: Khalid Al Saqqa**

Catalog Description

|  |
| --- |
| Introduce students to the relative complexity of information requirements, systems analysis and design within a business, and introduce concepts, formal techniques, tools and methods used in analysis, design and implementation of information systems. The course approaches the development of information systems from a problem-solving perspective. This course builds upon concepts to which the student has been exposed to in previous classes. |

Prerequisites

|  |
| --- |
| 5901101-3 - Introduction to Information Systems |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Introduction and Overview | 1 |
| Systems Analysis and the role of the analyst  Software development process models | 2 |
| The requirements engineering process: Facilitated workshops, Fact-finding interviewing, Other requirements elicitation techniques | 3,4 |
| Documenting requirements, analyzing requirements | 5 |
| Requirements Management, Validating requirements | 6 |
| Feasibility Analysis and System Proposal | 7 |
| Systems Design | 8 |
| Data Flow Diagrams | 9 |
| Process Modeling | 10 |
| Database Design | 11 |
| Output Design And Prototyping | 12 |
| Input Design And Prototyping | 13 |
| System Constructions and Implementation | 14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Systems Analysis and Design Methods, 6th Edition by Jeffery L. Whitten, Lonnie D. Bentley and Kevin C. Dittman, 2004, McGraw-Hill |

Assessment Methods

|  |
| --- |
| Project, Exam 50% |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. Know the system and the phases, activities and deliverables in system analysis 2. Know the basic techniques of systems analysis, design and implementation 3. Understand and synthesize different models used to describe a system, the competencies needed by system analysts to carry out their tasks and responsibilities successfully, and fact finding and analysis techniques used in system analysis 4. Be able to perform system analysis, and work successfully with team members |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  |  |  |  |  |  |  |  |  | ✓ |
| CLO 2 |  | ✓ |  |  |  |  |  |  |  |  | ✓ |
| CLO 3 |  |  |  |  |  |  |  | ✓ |  |  | ✓ |
| CLO 4 |  |  |  | ✓ |  | ✓ |  |  |  |  |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of computing and design to a project*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students apply systems analysis to gather system requirements*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*---*

**d. an ability to function effectively on teams to accomplish a common goal**

*Projects are implemented in teams.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*The projects require communications, specifications, progress reports, and final report.*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

---

**h. a recognition of the need for, and an ability to engage continuing professional development**

*The students often must utilize the internet to learn and apply the new technologies that they have chosen in support of their projects.*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Projects use current computing and modeling/design tools.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students are required to apply their knowledge of computing to design a solution to a problem and to document the solution including the tradeoffs involved in their design choices.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*The students are required to use standard design and development principles on a significant software project*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** | **Khalid Al Saqqa** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901227-3 - File Organization & Processing (3 credits)**

**Coordinator: Ali EL-Najar**

Catalog Description

|  |
| --- |
| Design and analysis of efficient computer algorithms. Algorithm design techniques, including divide-and-conquer, depth-first search, and greedy approaches. Worst-case and average-case analysis. Models of computation. NP-complete problems. |

Prerequisites

|  |
| --- |
| 5901218-4 - Data Structures & Algorithms |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Advanced Search-Tree Structures (Red-Black Trees, B- Trees, Tries, Splay Trees). | 2-4 |
| Advanced Heap Structures (Fibonacci Heaps). | 5-6 |
| Graphs and Graph Algorithms (Graph Representations, Depth-First Search, Breadth-First Search, Minimum Spanning Trees, Shortest Paths, Maximum Flow, Matching). | 7-10 |
| Geometric Algorithms (Intersection of Line Segments, Convex Hull). | 11-12 |
| Advanced Design and Analysis Techniques (Greedy Algorithms, Dynamic Programming) | 13-15 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Introduction to Algorithms by T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, Second Edition, MIT Press, 2001. ISBN 0-262-03293-7 |

Assessment Methods

|  |
| --- |
| The students are expected to complete theoretical assignments, and pass written examinations on class material. The mark division is 50% for final exam, 25% for midterm exam, and 25% for homework and quizzes. |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. The students will be able to describe, construct, and use various implementations for advanced data abstractions such as more specialized search trees and heaps. 2. The students will be able to design and implement advanced algorithms and analyze them. 3. The students will develop an understanding of various algorithm-design paradigms e.g. divide-and-conquer, greedy, etc. |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 |  |  | ✓ |  |  |  |  |  |  |  |  |
| CLO 2 | ✓ | ✓ |  |  |  |  |  |  |  | ✓ |  |
| CLO 3 | ✓ | ✓ | ✓ |  |  |  |  |  |  | ✓ |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students will develop an understanding of how to represent different algorithm resource requirements as mathematical functions on the size of the input (logarithmic, linear, etc.)*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students can analyze the time and space requirements of a particular problem by performing asymptotic analysis.*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired specification**

*Students are asked to modify algorithms to produce different outputs or combine algorithms and data structures to offer new solutions.*

**d. an ability to function effectively on teams to accomplish a common goal**

*---*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*---*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*---*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*---*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students are able to compare various algorithms for specific problems and the optimal choice of data structures.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*---*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** | **Ali EL-Najar** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901231-3 - Programming Languages (3 credits)**

**Coordinator: Ali EL-Najar**

Catalog Description

|  |
| --- |
| An introduction to programming language, specification and analysis. Additional topics include control structures, data types and structures, runtime, environments, binding strategies, compilers, and interpreters. |

Prerequisites

|  |
| --- |
| 5901105-3 - Advanced Programming  5901217-3 - Logic Programming |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Preliminaries | 1-2 |
| Evolution of the Major Programming Languages | 3-4 |
| Describing Syntax and Semantics | 5 |
| Names, Variables, Bindings and Type Checking. | 6-7 |
| Scope and lifetime. | 8 |
| Referencing Environments Named Constants | 9 |
| Primitive Data Types, Character String Types | 10 |
| User-Defined Ordinal Types | 11 |
| Array Types and Associative Arrays | 12 |
| Record Types and Union Types | 13 |
| Pointer and Reference Types | 14 |

Weekly Hours

|  |
| --- |
| 4 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Sebesta R.W., Concepts of Programming Languages, 9th Edition, Addison-Wesley, 2010 |

Assessment Methods

|  |
| --- |
| Home works **5 %**  Quiz **5%**  Midterm **25 %**  Research in Assigned Programming Language **15 %**  Final Exam **50 %** |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. Apply concepts from prerequisite courses, especially formal languages and architecture courses, in the context of evaluating the features of programming languages. 2. Explain and evaluate design and implementation features of programming languages. 3. Apply conceptual knowledge of the syntax of languages, as well as the design of language data structures and control statements, to the efficient implementation of a working language. |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 |  | ✓ |  | ✓ |  | ✓ |  | ✓ | ✓ |  |  |
| CLO 2 |  | ✓ |  | ✓ |  | ✓ |  | ✓ | ✓ |  |  |
| CLO 3 |  | ✓ |  | ✓ |  | ✓ |  | ✓ | ✓ |  |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

---

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students could determine the language that is suitable language for programming each problem.*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs**

---

**d. an ability to function effectively on teams to accomplish a common goal**

*Students works in team to accomplish a research on certain language. .*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*The assigned research on a language and presentation at the end of course enable students to communicate effectively.*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

---

**h. a recognition of the need for, and an ability to engage continuing professional development**

*Students learn how to differentiate between programming languages domains is useful in continuation of professional development.*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Students get knowledge about different language as tools and technologies to be used in developing applications.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

---

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

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Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** | **Ali EL-Najar** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901233-3 – The Development of Internet Application (3 credits)**

**Coordinator:**

Catalog Description

|  |
| --- |
| This is a practical course that will enable students to develop skills in website development and administration, exploring backend/server technologies such as (PHP/ASP and XML, JavaScript, CSS and web framework). The course will focus on building dynamic websites and issues relating to user input validation, authorization, roles management, database connectivity and session and state management |

Prerequisites

|  |
| --- |
| 5901211-3 – Programming on the Web |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Introduction and revision for XHTML forms | 1 |
| Cascading Style Sheets (CSS) and themes | 2 |
| JavaScript and Document Object Model (DOM) | 3,4 |
| Web servers management and Administration | 5 |
| Web Forms and server side scripting | 6 |
| Web Development Frameworks | 7,8 |
| User input Validation | 9 |
| Database Connectivity | 10 |
| XML and AJAX | 11 |
| Session and state management | 12 |
| Authentication and Authorization | 13 |
| Web 2.0 Applications and open source applications | 14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 1 x 50 mins labs |

Textbook/References

|  |
| --- |
| 1. Robert Sebesta, Programming the World Wide Web, 2011, ISBN-10: 0132130815 2. Stepp,Miller,Kirst. Web Programming Step by Step.( 1st Edition, 2009) Companion Website: <http://www.webstepbook.com/> 3. <http://www.w3schools.com/html/default.asp> |

Assessment Methods

|  |
| --- |
| Assignments 30%, project 30%, exam 40% |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. Students will be able to construct websites that receive and perform complex processing of user input on the server side. 2. Students will be appreciate the different methods of storage available for data required and served by web applications. 3. Students will be able to create websites with interactivity without page reloading 4. Students will be able to configure a modern web server for deploying large web sites. |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 |  |  |  | ✓ |  | ✓ |  |  | ✓ |  |  |
| CLO 2 |  |  | ✓ |  |  |  |  |  |  |  |  |
| CLO 3 |  |  |  |  |  |  |  |  | ✓ |  |  |
| CLO 4 |  |  |  |  |  |  |  |  | ✓ |  |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*---*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*---*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*Students are required design and implement a software project to meet a specification.*

**d. an ability to function effectively on teams to accomplish a common goal**

*Projects are implemented in teams.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*The project requires a written final report.*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

---

**h. a recognition of the need for, and an ability to engage continuing professional development**

*---*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Projects use current computing and modeling/design tools.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*---*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*---*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** |  |  |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901310-3 – Compiler Construction (3 credits)**

**Coordinator: Sherif El- Etripy**

Catalog Description

|  |
| --- |
| Compiler construction: lexical analysis, including regular languages and finite-state acceptors; syntactic analysis, including parsing techniques and grammars; code generation and optimization. |

Prerequisites

|  |
| --- |
| 5901231-4 Programming Languages |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Introduction to compilers structure & goals | 1 |
| Arithmetic expression processing using a stack | 2 |
| Simple compiler structure | 3 |
| Grammars, parse trees, and ambiguous grammars | 4 |
| Translation schemes | 5 |
| Context-free grammars & parsing | 6 |
| Introduction to left recursion and right recursion | 7 |
| Lexical analyzer (language, errors, pattern specifications) | 8 |
| Operations on languages and regular expressions | 9 |
| Finite automata | 10-11 |
| Parsers and errors and sentential error | 12 |
| Left recursion and left factoring | 13-14 |
| FIRST, FOLLOW, and transition diagrams | 15 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Compilers: Principles, Techniques, and Tools ,A. V. Aho, R. Sethi, J. D. Ullman; (c) 2010; |

Assessment Methods

|  |
| --- |
| Home works **10 %**  Midterm **20 %**  Project **15 %**  Final Exam **50 %** |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. Understanding of the organization of a compiler 2. Understanding of the concepts of scanning, parsing, and translation 3. Understanding of Compiler writing tools. |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ | ✓ | ✓ | ✓ |  |  |  |  | ✓ |  | ✓ |
| CLO 2 | ✓ | ✓ | ✓ | ✓ |  |  |  | ✓ | ✓ |  | ✓ |
| CLO 3 | ✓ | ✓ | ✓ | ✓ |  | ✓ |  | ✓ | ✓ |  | ✓ |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge computing and science in a practical programming project.*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students analyze the different steps of compilation and apply algorithms for solutions.*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs**

*Students are required to implement a simple compiler to translate infix code representation to postfix representation.*

**d. an ability to function effectively on teams to accomplish a common goal**

*Students works in team to accomplish projects.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*The assigned project and assignments and presentation at the end of course enable students to communicate effectively.*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*Students learns how use existing code to develop tailored system.*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Student*s used the current tools and technologies in developing their projects.

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

---

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*Developing a project of simple compiler require applying design and implementation principles in constructing of software system.*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** | **Sherif El- Etripy** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901311-3 - Operating Systems (3 credits)**

**Coordinator: Sherif El-Etripy**

Catalog Description

|  |
| --- |
| This course provides an introduction to operating system design and implementation. It covers the major components of most operating systems, in particular process management, memory management (segmentation, paging, swapping), file systems, and OS protection and security. |

Prerequisites

|  |
| --- |
| 5901215-3 - Computer Architecture |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Introduction to Operating Systems | 1-2 |
| Process and thread management | 3-8 |
| Memory management | 9-11 |
| File system | 12-13 |
| I/O system | 14 |
| Protection & Security | 15 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Operating Systems Concepts, seventh edition, Silberchatz, Galvin, and Gagne, John Wiley & Sons Inc., ISBN 0-471-69466-5 |

Assessment Methods

|  |
| --- |
| The student is expected to complete theoretical homework and programming assignments, pass written examinations, and successfully complete a project |

Course Learning Outcomes (CLOs)

|  |
| --- |
| * 1. Awareness of basic components of operating system and knowledge of the services provided by it.   2. Appreciate the main principles and techniques used to implement processes and threads, inter-process communication, process synchronization, and algorithms for process scheduling.   3. Appreciate memory management techniques including virtual memory abstractions.   4. Appreciate I/O mechanisms, disk organization and file system structure.   5. Evaluate security risks in operating systems and understand the role operating systems can and should play in establishing security. |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  |  | ✓ |  |  |  |  | ✓ | ✓ |  |
| CLO 2 | ✓ |  |  | ✓ |  |  |  |  | ✓ | ✓ |  |
| CLO 3 | ✓ |  |  | ✓ |  |  |  |  | ✓ | ✓ |  |
| CLO 4 | ✓ |  |  | ✓ |  |  |  |  | ✓ | ✓ |  |
| CLO 5 | ✓ |  |  | ✓ |  |  |  |  | ✓ | ✓ |  |

Relationship of Course to ABET Student Outcomes

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of computing and design to programming assignments*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*---*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*---*

**d. an ability to function effectively on teams to accomplish a common goal**

*Programming assignments are implemented in teams.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*---*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*---*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Students leverage the capabilities of a modern OS to solve real problems.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students are required to apply their knowledge of computing to design a solution to a problem and to document the solution including the tradeoffs involved in their design choices.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*---*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** | **Sherif El-Etripy** | ***1/1/2015*** |
| ***Undergraduate Director*** |  |  |

**5901312-3 – Introduction to Databases (3 credits)**

**Coordinator: Khalid Al Saqqa**

Catalog Description

|  |
| --- |
| Fundamentals of database design and data indexing techniques. Data models. Data base design theory. Query languages, their implementation and optimization. Database transaction processing. |

Prerequisites

|  |
| --- |
| 5901222-3 - Systems Analysis and Design |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Relational algebra: relations, tuples, attributes, schemas, operators and expressions | 1 |
| Functional Dependencies: keys, closures, Armstrong’s axioms, canonical cover. | 2 |
| Normalization: anomalies, lossless decomposition, dependency preservation, BCNF, 3NF. | 3,4,5 |
| SQL queries: types, 3 valued logic, nulls, select, ordering, joins, set operators, aggregate functions, grouping, sub-queries. | 6,7 |
| SQL data manipulation: insertion, deletion, and update. | 8,9 |
| SQL data definition: schema definition, default, primary key, unique, not null, check, assertions, foreign keys, referential integrity, views. | 10 |
| Transactions: failures, atomicity, consistency, isolation, durability. | 11 |
| Entity Relationship Modeling: Entities, relationships, attributes, ER diagrams, relationships, participation, fan and chasm traps, roles, weak entities, mapping to relation schemas, is-a relationships and hierarchies. | 12,13 |
| Database Indexing | 14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Fundamentals of Database Systems, 5th ed., by Elmasri and Navathe, 2007. |

Assessment Methods

|  |
| --- |
| The student is expected to complete theoretical homework and programming assignments, pass written examinations, and successfully complete a project.. |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. The student will understand various different types of data modeling techniques and the supporting theoretical foundation. 2. The student will understand how to use different types of query languages. 3. The student will understand a variety of techniques for designing database schemas, associated index structures, and design and implementation of a database system. 4. The student will understand the notions of concurrency control, recovery, and security. |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  |  |  |  |  |  |  |  |  | ✓ |
| CLO 2 |  |  |  |  |  |  |  |  | ✓ |  |  |
| CLO 3 |  |  | ✓ |  |  |  |  |  |  |  | ✓ |
| CLO 4 | ✓ |  |  | ✓ |  | ✓ |  |  |  |  | ✓ |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of computing and design to a project*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*---*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*Students are required design and implement a software project to meet a specification.*

**d. an ability to function effectively on teams to accomplish a common goal**

*Projects are implemented in teams.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*The projects require communications, specifications, progress reports, and final report.*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*---*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Projects use current computing and modeling/design tools.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*---*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*---*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** | ***Khalid Al Saqqa*** | ***1/1/2015*** |
| ***Undergraduate Director*** |  |  |

**5901313-3 - Software Engineering (3 credits)**

**Coordinator: Moeiz Miraoui**

Catalog Description

|  |
| --- |
| Software engineering concepts including the software life cycle and other software-development process models. Specification techniques, design methodologies, performance analysis, and verification techniques. Team-oriented software design and development, and project management techniques. Introduction to design and debugging tools of a modern programming language. Homework and laboratory projects that emphasize design and the use/features of a modern programming language in software development |

Prerequisites

|  |
| --- |
| 5901222-3 – System Analysis & Design |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Introduction to software engineering and its impact on software development | 1 |
| Critical software engineering principles such as modularity, abstraction, software evolution, etc | 2,3 |
| Software development process models such as waterfall, spiral, etc. and case studies on their usage. Object-oriented development models | 4,5,6 |
| Traditional and object-oriented software design concepts and techniques | 6,7 |
| Software verification via testing, analysis, and debugging | 8,9 |
| Software engineering tools and environments. Practice in using tools for software design, and testing | 10,11,12 |
| Basic management concepts including an introduction to team aspects of solving software design problems | 13,14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Software Engineering – Principle and Practice Hans Van Vliet, 3rd, 2010, 978-0-470-03146 |

Assessment Methods

|  |
| --- |
| The student is expected to complete theoretical homework and programming tasks, to pass written examinations, and to successfully complete a significant project |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. The student will have a working knowledge of established software engineering issues and practice and their relationship to emerging methodologies, paradigms, techniques, tools, and languages. 2. The student will be able to analyze, design and implement a modern application from an architectural perspective, which includes a decomposition into components of software, hardware, and their interdependencies. 3. The student will be able to design and prototype software from written specifications and/or supplied application libraries. |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  |  |  |  |  |  | ✓ |  |  |  |
| CLO 2 |  |  | ✓ | ✓ |  | ✓ |  | ✓ | ✓ | ✓ | ✓ |
| CLO 3 |  |  | ✓ | ✓ |  | ✓ |  | ✓ | ✓ |  | ✓ |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of computing and design to a project*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*---*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*Students are required design and implement a software project to meet a specification.*

**d. an ability to function effectively on teams to accomplish a common goal**

*Projects are implemented in teams.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*The projects require communications, specifications, progress reports, and final report.*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

---

**h. a recognition of the need for, and an ability to engage continuing professional development**

*The students often must utilize the internet to learn and apply the new technologies that they have chosen in support of their projects.*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Projects use current computing and modeling/design tools.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students are required to apply their knowledge of computing to design a solution to a problem and to document the solution including the tradeoffs involved in their design choices.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*The students are required to use standard design and development principles on a significant software project*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** | **Moeiz Miraoui** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901330-3 - Computer Graphics (3 credits)**

**Coordinator: Sherif El-etriby**

Catalog Description

|  |
| --- |
| The course offers an introduction to computer graphics hardware, algorithms, and software. Topics include overview of graphics hardware, 2D and 3D object representation, geometric transformations, 2D viewing, 3D viewing, illumination models, color modes, and color applications. |

Prerequisites

|  |
| --- |
| 5901105-3 – Advanced Programming |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Introduction to computer graphics | 1 |
| Computer graphics hardware | 2 |
| Introduction to OpenGL | 3 |
| Math for Computer Graphics (Trigonometry, Vectors, Projections, Interpolation) | 4 |
| 2D objects drawing (using OpenGL) | 5 |
| Line drawing algorithms | 6 |
| Matrices and 2D Transformations | 7 |
| 3D Transformations | 8-9 |
| 2D & 3D Viewing | 10-11 |
| Color models | 12 |
| Animation & Lighting | 13-14 |

Weekly Hours

|  |
| --- |
| 3 x 50 minutes lectures, 2 x 50 minutes labs |

Textbook/References

|  |
| --- |
| Computer Graphics with OpenGL, Hearn & Baker, Prentice Hall  OpenGL Programming Guide, Shreiner & Khronos OpenGL ARB Working Group, Addison-Wesley |

Assessment Methods

|  |
| --- |
| 1. Assignment (10%) Midterm (20%) Lab (10%) Final exam (50%) 2. Group final project (10%) |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. Understand the foundation of the implementation of computer graphics modeling and rendering systems 2. Understand the mathematical background of computer graphics 3. Understand the handling of colors 4. Implementation of a graphics programming project |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  | ✓ |  |  |  |  |  | ✓ |  |  |
| CLO 2 | ✓ |  |  |  |  |  |  |  |  | ✓ |  |
| CLO 3 | ✓ |  | ✓ |  |  |  |  |  | ✓ |  |  |
| CLO 4 | ✓ |  | ✓ | ✓ |  |  |  |  | ✓ | ✓ |  |

Relationship of Course to ABET Student Outcomes

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of computer graphics (modeling and rendering) to complete assessments*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students apply principles of computer graphics to analyze the simple real world modeling problem, identify computing requirements e.g., memory, speed, etc for an appropriate solution.*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*Students design and write simple programs in labs. Students design and implement a software project to meet a specification.*

**d. an ability to function effectively on teams to accomplish a common goal**

*Students work in teams in the project.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*Students are informed about policies related to ethics* (*plagiarism*, *submission of assignment on time, attendance, etc*).

**f. an ability to communicate effectively**

*Course project require effective communication.*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*The students utilize the internet to learn and apply the new methods that they have chosen in support of their assignments and project.*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Students use current computing and modeling/design tools such as OpenGL, Blender, etc.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students use mathematical knowledge (vectors, transformations, modeling, etc) to design a solution to a problem and to document the solution including the tradeoffs involved in their design choices.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*The students are required to use standard design and development principles on a significant computer graphics project*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** | **Sherif El-etriby** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901332-3 - Artificial Intelligence (3 credits)**

**Coordinator:**

Catalog Description

|  |
| --- |
| This course introduces basics of Artificial Intelligence, concept of Intelligent agents and various types of agents. It includes various search techniques, Propositional logic and First order logic. It further introduces the concept of knowledge engineering and inference systems. |

Prerequisites

|  |
| --- |
| 5901310-3 – Compiler Construction |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Introduction to AI  History of AI  AI Domains  AI Applications  Intelligent Agents and Environment  Structure of Different type of Agents  Problem Solving through search   1. Un-informed search (BFS, DFS, Depth First, Depth limited and iterative deepening search) 2. Informed Search (Greedy best first search, A\* search, Heuristics) 3. Local Search Algorithms (Hill Climbing, Simulated Annealing)   Adversarial Search (Minimax Algorithm, Alpha Beta Pruning, Chance Minimax)  Logical Agents (knowledge based agents, propositional logic, First Order Logic, Knowledge  Engineering in FOL  Inference in FOL |  |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Artificial Intelligence: A Modern Approach 3rd Edition, Russell & Norvig, 2009, Prentice Hall, ISBN 0136042597 |

Assessment Methods

|  |
| --- |
| Assignments, Quizzes, Discussion Group, Project, Midterm, Final Exam |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. Students will learn basics of AI, Intelligent Agents and their different types and applications. 2. They will learn in detail different search techniques including uninformed search, heuristic search, adversarial search that can be used in Game playing and other AI applications. 3. Students will learn logical agents, first order logic and first order inference system. |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 |  |  | ✓ |  |  |  |  |  |  | ✓ |  |
| CLO 2 |  |  | ✓ |  |  |  |  |  |  | ✓ |  |
| CLO 3 |  |  | ✓ |  |  |  |  |  |  | ✓ |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*---*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*---*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*Students are required design and implement a software project to meet a specification.*

**d. an ability to function effectively on teams to accomplish a common goal**

*---*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*---*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*---*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*---*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students are required to apply their knowledge of computing to design a solution to a problem and to document the solution including the tradeoffs involved in their design choices.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*---*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** |  |  |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901333-3 - Human Computer Interaction (3 credits)**

**Coordinator:**

Catalog Description

|  |
| --- |
| Students will gain an understanding of user interface design, and alternatives to traditional "keyboard and mouse" computing, including virtual reality, and ubiquitous computing. Students will become familiar with sensory and cognitive systems and be able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks and recognize the limits of human performance as they apply to computer operation. Students will appreciate the importance of a design and evaluation methodology that begins with and maintains a focus on the user, the social implications of technology and ethical responsibilities in the design of technological systems. |

Prerequisites

|  |
| --- |
| 5901330-3 – Computer Graphics |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Background--the development, context, and scope of HCI | 1 |
| Design and Usability Principles | 2 |
| Human Capabilities and Universal Design | 3 |
| Conceptual Models | 4 |
| Cognitive Models and Theories: Norman’s theory, Fitts' Law, Human Action Cycle | 5 |
| User Centred Design and Low-Fidelity Prototyping | 6,7 |
|  | 8 |
| Students’ Projects Presentations | 9,10 |
| *Evaluation Methods and Techniques* Evaluation Paradigms, Frameworks Evaluation, Heuristic Evaluation and Usability Testing | 11 |
| Interface and Interactions | 12 |
| Affective Aspects | 13 |
| Advanced Topics: Virtual Reality and Virtual Agents | 14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Designing the User Interface: Strategies for Effective Human-Computer Interaction,5/E, Shneiderman et al., [ISBN: 0321537351, Pearson](http://www.pearsonhighered.com/educator/product/Designing-the-User-Interface-Strategies-for-Effective-HumanComputer-Interaction/0321537351.page), 2009 |

Assessment Methods

|  |
| --- |
| Homework, project, and exams. |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. Students will know key concepts in designing usable products 2. Students will be able to employ paper-based and electronic design techniques 3. Students will be able to evaluate the usability of a given computer-based solution |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 |  |  | ✓ |  |  |  |  |  |  |  |  |
| CLO 2 |  |  | ✓ |  |  |  |  |  | ✓ |  |  |
| CLO 3 |  |  |  |  |  |  |  |  | ✓ |  | ✓ |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*---*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*---*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*Students are required design and implement a software project to meet a specification.*

**d. an ability to function effectively on teams to accomplish a common goal**

*---*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*---*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*---*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Projects use current computing and modeling/design tools.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*---*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*Students will learn to apply design theories to develop user centered interfaces*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** |  |  |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901334-3 - Parallel & Distributed Computing Systems (3 credits)**

**Coordinator:**

Catalog Description

|  |
| --- |
| Introduction to parallel computing using shared memory and distributed memory multi-core computers, including hands-on practice with such systems during programming homework assignments, and a team project. |

Prerequisites

|  |
| --- |
| 5901214-3 – Computer Organization & Assembly  5901311-3 – Operating Systems |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Multi-core and its implications on software engineers | 1 |
| Parallel architectures | 2-3 |
| Source of loss in parallel performance | 4-6 |
| Accessing shared data safely | 7-9 |
| General parallel algorithmic models | 10 |
| Pthreads, OpenMP, and MPI | 11-14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Introduction to Parallel Programming, Peter Pacheco, 2011 |

Assessment Methods

|  |
| --- |
| A number of homework programming exercises (20%)  Two written exams (20% + 40%)  A team design and implementation project (20%) |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. Awareness of basic multiprocessor hardware taxonomy 2. A strong grasp of the basic software and hardware strategies for managing access to shared data (from locks, and barriers, to cache coherency) 3. An in-depth understanding of the major sources of performance loss in parallel programs, and some general solutions to reducing performance loss 4. Ability to use standard parallel programming APIs such as Pthreads, OpenMP, and MPI through practice on shared memory and distributed memory computers |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ | ✓ |  |  |  |  |  |  |  |  |  |
| CLO 2 | ✓ |  | ✓ |  |  |  |  |  |  | ✓ | ✓ |
| CLO 3 | ✓ |  | ✓ |  |  |  |  |  |  | ✓ | ✓ |
| CLO 4 | ✓ |  |  | ✓ |  |  |  |  | ✓ |  |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students are required to have a good understanding and knowledge of principles of developing parallel programs to complete assessments*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students will learn about the trade-offs in different parallel architectures, and their implication on execution performance of software with different execution characteristics*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*Students are required design and implement a software project to meet a specification.*

**d. an ability to function effectively on teams to accomplish a common goal**

*Projects are implemented in teams.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*---*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*---*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Students will use current parallel programming tools and APIs in homework assignments and their project.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students are required to apply their knowledge of computing to design a solution to a problem and to document the solution including the tradeoffs involved in their design choices.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*The students are required to use standard design and development principles on a parallel programming project*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** |  |  |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901335-3 - Advanced Databases (3 credits)**

**Coordinator:**

Catalog Description

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| --- |
| The enhanced entity-relationship (EER) model. Relational database design by ER- and EER-to-relational mapping. Concepts for object databases. Object database standards, languages, and design. Object-relational databases. XML databases. Database transaction and query processing. Distributed databases. Database security. Database tuning and recovery. |

Prerequisites

|  |
| --- |
| 5901312-3 – Introduction to databases |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Advanced relational algebra and SQL: Set vs. bag semantics, NULL values, Distinct operator, Semi join, left join, right join, SQL constraints and triggers, Data mining and OLAP operators: Group By, Roll Up, Cube, Pivot | 1 |
| The Enhanced Entity-Relationship (EER) model and EER to relational mapping | 2 |
| Object and Object-Relational Databases: Concepts, Models, Languages, Standards | 3 |
| XML for semi-structured data: XML language and its tree representation, XML schema language, XPath/XQuery languages, Translation of an XML schema into a relational schema | 4 |
| Database File Indexing Techniques, B-Trees, and B+-Trees | 5 |
| Query Processing and Query Optimization Techniques | 6,7 |
| Database Tuning and Physical Design Issues | 8,9 |
| Advanced Database Transaction Processing | 10 |
| Database Recovery Protocols | 11 |
| Distributed Databases (DDB): Horizontal/vertical fragmentation, Basic distributed query processing, Semi-join query processing | 12,13 |
| Database Security | 14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Database Systems: Models, Languages, Design And Application Programming, 6th Edition,2011. |

Assessment Methods

|  |
| --- |
| The student is expected to complete theoretical homework, pass written examinations, and successfully complete a project. |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. The students will understand different terms of advanced data modeling e.g. object, object-relational, and XML and the supporting theoretical foundation. 2. The students will learn techniques of advanced schema mapping i.e. from enhanced entity relation to relational, object to relational, object-relational to relational, and xml to relational. 3. The students will understand advanced database topics such as indexing, query processing, local and distributed transaction processing, and security. |

Relationship between CLOs and Student Outcomes

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  |  |  |  |  |  |  |  | ✓ | ✓ |
| CLO 2 |  |  |  |  |  |  |  |  | ✓ |  |  |
| CLO 3 |  |  | ✓ | ✓ |  |  |  | ✓ |  |  | ✓ |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of computing and design to a project*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*---*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*Students are required to apply indexing and tuning to a database project.*

**d. an ability to function effectively on teams to accomplish a common goal**

*Some course work will be done as team projects.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*---*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

---

**h. a recognition of the need for, and an ability to engage continuing professional development**

*The students often must utilize database vendors blogs and open source sites to learn and apply the new technologies that they have chosen in support of their projects.*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Projects use current computing and modeling/design tools.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students are required to apply their knowledge of computing to design a solution to a problem and to document the solution including the tradeoffs involved in their design choices.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*The students are required to use standard design and development principles on a significant database project*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** |  |  |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901417-3 - Computer Network Systems (3 credits)**

**Coordinator: Moeiz Miraoui**

Catalog Description

|  |
| --- |
| The course covers principles of computer networking with the focus on the Internet. The structure, practices, protocols and components of computer networks involved in supporting the Internet, are studied in detail. Important concepts discussed in the course are related to packet switching, layered architecture, TCP/IP protocol suite, window flow control and local area networks. Simulations are used for visualization of network related concepts. |

Prerequisites

|  |
| --- |
| 5901311-3 – Operating Systems |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Introduction to Computer Networks, Internet Architecture, Circuit and Packet Switching, Access Systems | 1 - 2 |
| Application Layer Principles, HTTP, DNS, Peer to Peer Networks | 3 - 5 |
| Transport Layer Services, UDP, Reliable data delivery, TCP, Congestion Control | 6 - 8 |
| Network Layer Services, IP, Addressing, Routing Protocols | 9 - 11 |
| Link Layer Services, Link layer addressing, Ethernet, Switches | 12,13 |
| Introduction to Wireless and Mobile Networks, Wireless characteristics, CDMA, Cellular Networks, Mobility | 14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Textbook: "Computer Networking: A Top-Down Approach", James Kurose and Keith Ross , 5th edition ISBN: 0136079679, Publisher: Addison-Wesley, 2009.  References: “Computer Networks”, Andrew S. Tanenbaum, 5th Edition, Prentice Hall, 2011  “Data and Computer Communications”, W. Stalling , 9th Edition, Prentice Hall, 2007 |

Assessment Methods

|  |
| --- |
| Final Exam 50%, Mid-Term Exam 25%, Quizzes 10%, Lab Work 15% |

Course Learning Outcomes (CLOs)

|  |
| --- |
| Students successfully completing this course will:   1. Appreciate the significance of layered network architectures 2. Understand key Internet applications and their protocols. 3. Be able to design, implement and evaluate transport layer, network layer and routing protocols. 4. Be able to use modern network analysis and simulation tools. |

Relationship between CLOs and Student Outcomes

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  |  |  |  |  |  |  |  |  |  |
| CLO 2 | ✓ |  | ✓ |  |  |  |  |  |  |  |  |
| CLO 3 | ✓ |  | ✓ |  |  |  |  |  |  |  |  |
| CLO 4 | ✓ |  | ✓ |  |  |  |  |  | ✓ |  |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students are required to have a good understanding and knowledge of principles of networking to successfully pass all the evaluation components*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*---*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*Students are required to design, implement, evaluate and analyze different protocols and network related aspects using simulations.*

**d. an ability to function effectively in teams to accomplish a common goal**

*---*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*---*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*---*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Students are required to use sophisticated network analyzer in labs to visualize working of different protocols on different network layers. Network Simulator is used to visualize network related tasks.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*---*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*--*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** | **Moeiz Miraoui** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901419-4 – Research Project (4 credits)**

**Coordinator:**

Catalog Description

|  |
| --- |
| This course is the first semester of the required major design experience. In a two semester-long project, student teams will propose, design, produce and evaluate a software and/or hardware system. The project will culminate in the delivery of a working system, a formal public presentation, and written documentation. Oral and written progress reports are required. |

Prerequisites

|  |
| --- |
| 5901312-3 – Introduction to databases  5901313-3 – Software Engineering |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| N/A | N/A |

Weekly Hours

|  |
| --- |
| 4 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| UQU Undergraduate Final Year Project Handbook. |

Assessment Methods

|  |
| --- |
| Weekly meetings, written report, and oral/poster presentation |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. Ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline. 2. Ability to analyse a problem, and identify and define the computing requirements appropriate to its solution. 3. Ability to function effectively on teams to accomplish a common goal. 4. Ability to communicate effectively. 5. Recognition of the need for, and an ability to engage continuing professional development. 6. Ability to use the current techniques, skills, and tools necessary for computing practice. 7. Apply mathematical foundations, algorithmic principles, and computer science theory in the modelling and design of computer based systems in a way that demonstrates comprehension of the trade-offs involved in design choices 8. Ability to apply design and development principles in the construction of software systems of varying complexity |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of computing and design to a project*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students will develop project requirement specification*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

**---**

**d. an ability to function effectively on teams to accomplish a common goal**

*Projects are implemented in teams.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*The projects require communications, specifications, progress reports, and final report.*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*The students often must utilize the internet to learn and apply the new technologies that they have chosen in support of their projects.*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Projects use current computing and modeling/design tools.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students are required to apply their knowledge of computing to design a solution to a problem and to document the solution including the tradeoffs involved in their design choices.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*The students are required to use standard design and development principles on a significant software project*

Approvals

|  |  |  |
| --- | --- | --- |
| ***Course Coordinator*** |  |  |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901431-3 - Computers & Society (3 credits)**

**Coordinator: Saed Nazhawy**

Catalog Description

|  |
| --- |
| This course explores basic cultural, social, legal, and ethical issues inherent in the  discipline of computing. Students will investigate important non-technical aspects of their role as a computing expert such as personal responsibility in ensuring faulty products are not released to market. Finally, students will see the importance of remaining up to date in their specialties and in computing as a whole, not just for personal benefit, but for society, too. |

Prerequisites

|  |
| --- |
|  |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Social (cultural, international, govt) implications of computing, and internet |  |
| Identifying and evaluating ethical choices in software design |  |
| Professionalism (care, attention, responsibility). Importance of keeping up to date. |  |
| Codes of ethics, maintaining awareness of ethical consequences, ethical dissent |  |
| Historical examples of software risks (such as the Therac-25 case) |  |
| Computing in the workplace issues |  |
| Implications of software complexity |  |
| Risk assessment and risk management; risk removal, risk reduction and risk control |  |
| Foundations of intellectual property (copyrights, patents) |  |
| Software piracy |  |
| Ethical and legal basis for privacy protection |  |
| Privacy implications of database systems (e.g. data gathering, storage, and sharing) |  |
| Technological strategies for privacy protection |  |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| A Gift of Fire: Social, Legal, and Ethical Issues for Computers and the Internet (3rd Edition) by Sara Baase |

Assessment Methods

|  |
| --- |
| Essay assignments, presentation, project, midterm, final exam |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. Students will be aware of, and be able to identify, the social, ethical, legal, professional, and privacy issues related to computing 2. Students will be able to articulate varying perspectives regarding ethical, social, and professional issues in computer science and engineering 3. Students will gain an appreciation for remaining up to date in their specialties |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 |  |  |  |  | ✓ | ✓ |  |  |  |  |  |
| CLO 2 |  |  |  |  |  | ✓ | ✓ |  |  |  |  |
| CLO 3 |  |  |  |  |  |  |  | ✓ |  |  |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*---*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*---*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*---*

**d. an ability to function effectively on teams to accomplish a common goal**

*---*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*A significant portion of course will be spent on educating students about professional, ethical, legal and social issues and responsibilities of a computing professional*

**f. an ability to communicate effectively**

*The students will be required to write long reports and make presentations as part of the course.*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*Students will work in teams and analyze the impact of a chosen computing technology on individuals, organizations, and society, including ethical, legal, security, and global policy issues.*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*The students will utilize the internet to search for examples of ethical, legal, and social impact of computing, and build an awareness for the need to stay aware of such issues in the future.*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*---*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*---*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

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Approvals

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| --- | --- | --- |
| ***Course Coordinator*** | **Saed Nazhawy** | ***1/1/2015*** |
| ***Undergraduate Director*** | ***ABET Committee*** |  |

**5901432-3 - Computer Security Systems (3 credits)**

**Coordinator: Moeiz Miraoui**

Catalog Description

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| --- |
| This course is the first level of computer and network security. The course will cover various topics related to computer security, data privacy, network protection against various attacks. The course gives students enough knowledge and a reasonable background to understand network security, active and passive attacks, Internet privacy, secure communications. Students are expected to practice biweekly homeworks, develop critical thinking about computer and network security, and apply learned materials in different contexts of various attacks, wireless and Internet security. |

Prerequisites

|  |
| --- |
| 5901311-3 – Operating Systems |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| Overview of computer security services | 1 |
| Passive and active attacks | 2 |
| Cryptographic public and symmetric keys: DES | 3-4 |
| Advanced Encryption Standard AES | 5 |
| Public key cryptography, and RSA algorithm | 6-7 |
| El-Gamal cryptosystem | 8 |
| Digital signatures and message authentication protocols | 9-10 |
| Transport layer security, SSL protocol, MAC scheme | 11-12 |
| Wireless security protocols, WPA, WEP | 13 |
| Viruses, and Internet attacks | 14 |

Weekly Hours

|  |
| --- |
| 3 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| Network Security Essentials, Fourth Edition, William Stallings, 2011 Additional materials will be distributed during the course. |

Assessment Methods

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| --- |
| Home works **10 %,** Quiz **10%,** Midterm **30 %,** Final Exam **50 %** |

Course Learning Outcomes (CLOs)

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| --- |
| 1. Appreciate the need for computer security and computer protection, including the tradeoffs between different security and protection methods 2. Able to apply concepts of public keys, private keys, cryptosystem, authentication, digital signatures to secure simple systems. 3. Implement some network security protocols such as SSL, MAC, and wireless security, WEP, WAP, and computer viruses, and Internet attacks, and utilize them in real applications to secure Internet traffic. |

Relationship between CLOs and Student Outcomes

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Outcomes – Mapped to CLOs | | | | | | | | | | | |
| CLOs | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (i) | (j) | (k) |
| CLO 1 | ✓ |  |  |  | ✓ |  | ✓ |  | ✓ |  |  |
| CLO 2 | ✓ |  |  |  |  |  |  |  |  |  |  |
| CLO 3 | ✓ |  |  |  |  |  | ✓ |  | ✓ |  |  |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of computer security, design to a project, and use this topic for other subjects. Students will realize the importance of security and protection for data and information.*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*---*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired**

*---*

**d. an ability to function effectively on teams to accomplish a common goal**

*---*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*Students will appreciate the implications of leaving systems insecure*

**f. an ability to communicate effectively**

*---*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*Students will be able to analyze the impact of security on organizations and individuals*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*---*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Reports and projects use current computing and modeling/design tools.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

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**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*---*

Approvals

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| --- | --- | --- |
| ***Course Coordinator*** | **Moeiz Miraoui** | ***1/1/2015*** |
| ***Undergraduate Director*** |  |  |

**5901439-4 - Graduation Project (4 credits)**

**Coordinator:**

Catalog Description

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| This course is the second semester of the required major design experience. In a two semester-long project, student teams will propose, design, produce and evaluate a software and/or hardware system. The project will culminate in the delivery of a working system, a formal public presentation, and written documentation. Oral and written progress reports are required. |

Prerequisites

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| --- |
| 5901419-4 – Research Project |

Major Topics Covered in the Course (14 week semester)

|  |  |
| --- | --- |
| **Topic** | **Week** |
| N/A | N/A |

Weekly Hours

|  |
| --- |
| 4 x 50 mins lectures, 0 lab hours |

Textbook/References

|  |
| --- |
| UQU Undergraduate Final Year Project Handbook. |

Assessment Methods

|  |
| --- |
| Weekly meetings, written report, and oral/poster presentation |

Course Learning Outcomes (CLOs)

|  |
| --- |
| 1. Ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline. 2. Ability to analyse a problem, and identify and define the computing requirements appropriate to its solution. 3. Ability to design, implement and evaluate a computer-based system, process, component or program to meet desired goal. 4. Ability to function effectively on teams to accomplish a common goal. 5. Ability to communicate effectively. 6. Recognition of the need for, and an ability to engage continuing professional development. 7. Ability to use the current techniques, skills, and tools necessary for computing practice. 8. Apply mathematical foundations, algorithmic principles, and computer science theory in the modelling and design of computer based systems in a way that demonstrates comprehension of the trade-offs involved in design choices 9. Ability to apply design and development principles in the construction of software systems of varying complexity |

|  |
| --- |
| Relationship of Course to ABET Student Outcomes |

**a. an ability to apply knowledge of mathematics, computing, science, and engineering appropriate to the discipline**

*Students apply knowledge of computing and design to a project*

**b. an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution**

*Students will develop project requirement specification*

**c. an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired goal**

*Students are required to design and implement a software project to meet a specification.*

**d. an ability to function effectively on teams to accomplish a common goal**

*Projects are implemented in teams.*

**e. an understanding of professional, ethical, legal and social issues and responsibilities**

*---*

**f. an ability to communicate effectively**

*The projects require communications, specifications, progress reports, and final report.*

**g. an ability to analyze the local and global impact of computing on individuals, organizations and society, including ethical, legal, security and global policy issues**

*---*

**h. a recognition of the need for, and an ability to engage continuing professional development**

*The students often must utilize the internet to learn and apply the new technologies that they have chosen in support of their projects.*

**i. an ability to use the current techniques, skills, and tools necessary for computing practice.**

*Projects use current computing and modeling/design tools.*

**j. an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.**

*Students are required to apply their knowledge of computing to design a solution to a problem and to document the solution including the tradeoffs involved in their design choices.*

**k. an ability to apply design and development principles in the construction of software systems of varying complexity**

*The students are required to use standard design and development principles on a significant software project*

Approvals

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| --- | --- | --- |
| ***Course Coordinator*** |  |  |
| ***Undergraduate Director*** |  |  |