The University of Georgia
Department of Computer Science

Course Information Sheet
CSCI 4690
Graph Theory

Brief Course Description (50-words or less)	Elementary theory of graphs and digraphs. Topics include connectivity, reconstruction, trees, Euler's problem, hamiltonicity, network flows, planarity, node and edge colorings, tournaments, matchings, and extremal graphs. A number of algorithms and applications are included.
Extended Course Description / Comments	This course is cross-listed as MATH 4690. This is a 3 credit hour course.
Pre-Requisites and/or Co-Requisites	MATH 3000 or MATH 3500 or MATH 3500H CSCI 2610 or MATH 3200
Approved Textbooks (if more than one listed, the textbook used is up to the instructor's discretion)	Author(s): *Geir* Agnarsson and Raymond Greenlaw Title: *Graph Theory*: Modeling, Applications, and Algorithms Edition: any ISBN-13: 9780131423848

Specific Learning Outcomes (Performance Indicators)

This course is an introduction to graph theory . At the end of the semester, all students will be able to do the following:

1. Tell if two given graphs of small size are isomorphic.
2. Prove the equivalence of several definitions of tree.
3. Convert a Prufer sequence to a labeled tree.
4. State an algorithm for testing connectivity of a given graph
5. Determine the number of labeling of a given unlabeled graph.
6. Use the matrix tree theorem to determine the number of spanning trees in a given graph.
7. Decide if a given graph can be properly 3-colored, or 4-colored.
8. Give the adjacency information for the line graph of a given graph.
9. Determine the 2-connected components of a given connected graph
10. Use either Prim's or Kruskal's algorithm for determining the minimum cost spanning tree of a given edge-weighted graph
11. State three real-world processes model by a graph

Relationship Between Student Outcomes and Learning Outcomes

Learning Outcomes	a	b	c	d	e	f	g	h	i	j	k
1	•		•							•	
2	•									•	
3	•		•							•	
4	•		•							•	
5	•									•	
6	•	•								•	
7	•	•								•	
8	•	•								•	
9	•	•	•							•	
10	•	•								•	
11	•	•							•	•	

Student Outcomes

a. An ability to apply knowledge of computing and mathematics 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 needs.
d. An ability to function effectively on teams to accomplish a common goal.
e. An understanding of professional, ethical, legal, security and social issues and responsibilities.
f. An ability to communicate effectively with a range of audiences.
g. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
h. Recognition of the need for and an ability to engage in continuing professional development.
i. An ability to use 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.

Major Topics Covered (Approximate Course Hours) 3 credit hours = 37.5 contact hours 4 credit hours = 50 contact hours Note: Exams count as a major topic covered	Propositional logic (3.5-hours) Predicate logic (3.5-hours) Proofs: types of proofs (4-hours) Sets, set logic and set operations (2-hours) Functions (2-hours) Sequences and summations (2-hours) Integer algorithms (3-hours) Modular arithmetic (.5-hours) Mathematical induction (3.5-hours) Counting (2.5-hours) The pigeonhole principle (.5-hours) Permutations and combinations (2.5-hours) Finite probabilities (4-hours) Relations (2.5-hours) Using graphs to represent relations (1.5-hours)
Assessment Plan for this Course	Each time this course is offered, the class is initially informed of the Course Outcomes listed in this document, and they are included in the syllabus. At the end of the semester, an anonymous survey is administered to the class where each student is asked to rate how well the outcome was achieved. The choices provided use a 5-point Likert scale containing the following options: Strongly agree, Agree, Neither agree or disagree, disagree, and strongly disagree. The results of the anonymous survey are tabulated and results returned to the instructor of the course. The course instructor takes the results of the survey, combined with sample student responses to homework and final exam questions corresponding to course outcomes, and reports these results to the ABET committee. If necessary, the instructor also writes a recommendation to the ABET committee for better achieving the course outcomes the next time the course is offered.
How Data is Used to Assess Program Outcomes	Each course Learning Outcome, listed above, directly supports one or more of the Student Outcomes, as is listed in "Relationships between Learning Outcomes and Student Outcomes". For CSCI 4690, Student Outcomes (a) and (i) are supported.
Course Master	Dr. E. Rodney Canfield
Course History	05/2008 Course Approved in CAPA 02/2012 Course Information Sheet Created