Curricular Action
Signature Page
(use for forms 1, 2, 3, 4A, 4R, 6, and 8)

Received
MAR 2 6 2014
Dst's Office

Description of Action: New Course

Subject Area & Course # (if applicable) MATH 450

Program or Course Title: Graph Theory

Proposal Sponsor Angela Harlan — Submission Date 2/20/14
Signature Angela K Harlan

Chair of Sponsoring Department Fe Evangelista — Approval Date 2/24/14
Signature FEvangelista

Chair, College Curriculum Committee E. Hadden — Approval Date 3/20/14
Signature Elizabeth Hadden

Dean of College D. Travis — Approval Date 3/26/14
Signature

For Undergraduate Actions:
If a course is to be considered as a Diversity option:
☐ Recommended ☐ Not Recommended

Chair, Diversity Committee _____ Date _____

If a course is to be considered as a General Education option:
☐ Recommended ☐ Not recommended

Chair, General Education Committee _____ Date _____

If a course is to be considered as ☐ an Honors course or ☐ Honors option
☐ Recommended ☐ Not recommended

Honors Council _____ Date _____

Action taken by UCC:
☐ Received & Recorded ☐ Approved ☐ Not approved

Chair, University Curriculum Committee _____ Date _____

Action taken by Faculty Senate:
☐ Received & Recorded ☐ Approved ☐ Not approved

Chair, Faculty Senate _____ Date _____

Action taken by Graduate Council:
☐ Received & Recorded ☐ Approved ☐ Not approved

Graduate Council _____ Date _____

Received:
Provost and Vice Chancellor _____ Approval Date _____

☐ Consultation page is attached (if applicable)

University of Wisconsin-Whitewater
Curriculum Proposal Form #3

New Course

Effective Term: 2151 (Spring 2015)

Subject Area - Course Number: **MATH 450/650** **Cross-listing:**
(See Note #1 below)

Received
MAR
Provost's Office

Course Title: (Limited to 65 characters) Graph Theory

25-Character Abbreviation: Graph Theory

Sponsor(s): Angela Harlan

Department(s): Mathematical and Computer Sciences

College(s): Letters and Sciences

Consultation took place: ☒ NA ☐ Yes (list departments and attach consultation sheet)
Departments:

Programs Affected: **Mathematics, Computer Science**

Is paperwork complete for those programs? (Use "Form 2" for Catalog & Academic Report updates)

☐ NA ☒ Yes ☐ will be at future meeting

Prerequisites: MATH 280 OR COMPSCI 215 AND (MATH 253 with a C or better OR MATH 250 with a B or better)

Grade Basis: ☒ Conventional Letter ☐ S/NC or Pass/Fail

Course will be offered: ☒ Part of Load ☐ Above Load
☒ On Campus ☐ Off Campus - Location

College: Letters and Sciences **Dept/Area(s):** MATH

Instructor: Angela Harlan
Note: If the course is dual-listed, instructor must be a member of Grad Faculty.

Check if the Course is to Meet Any of the Following:

☐ Technological Literacy Requirement ☐ Writing Requirement
☐ Diversity ☐ General Education Option: Select one:

Note: For the Gen Ed option, the proposal should address how this course relates to specific core courses, meets the goals of General Education in providing breadth, and incorporates scholarship in the appropriate field relating to women and gender.

Credit/Contact Hours: (per semester)

Total lab hours:	0	Total lecture hours:	48
Number of credits:	3	Total contact hours:	48

Can course be taken more than once for credit? (Repeatability)

☒ No ☐ Yes If "Yes", answer the following questions:

No of times in major: No of credits in major:

No of times in degree:

No of credits in degree:

Proposal Information: (*Procedures for form #3*)

Course justification:
With the rapid growth of the Computer Science major, we are looking to the future of the program. Graph theory is a topic that is utilized in many computer science fields. We would like to include a course on this topic as an elective for the current major, as well as a requirement for the comprehensive major that is under development. In addition, there is a plan to develop a master's program in computer science, for which a course in graph theory would be utilized.

Relationship to program assessment objectives:
This course will help students obtain the following mathematics SLO's:

- Demonstrate mathematical thinking skills, progressing from a procedural and computational understanding of mathematics to logical reasoning, pattern recognition, generalization, and abstraction, and to a formal proof.
- Communicate mathematical ideas orally and in writing, with precision, clarity and organization, using proper terminology and notation.
- Use knowledge of content and mathematical procedures to solve problems and make connections between the different areas of mathematics.

This course will help students obtain the following computer science SLO:

- Each graduated student should have an understanding of the fundamental areas of Computer Science discipline includes fundamentals of computing, programming languages, basic foundation of mathematics, algorithms, computer architecture, design and implementation of programs.

Budgetary impact:
In the beginning it is expected that the course will be taught once every two years. With the hiring of a new faculty member specializing in mathematics education anticipated in Fall 2014, the two graph theory experts in the math department will be able to cover the course as part of load.

Course description: (50 word limit)
This course will examine basic concepts and applications of graph theory. Topics covered will be selected from trees, connectivity, paths and cycles, coloring, matching and covering problems, digraphs, and network flows.

If dual listed, list graduate level requirements for the following:

1. **Content** (e.g., What are additional presentation/project requirements?)
Graduate students will be assigned additional readings and exercises, particularly more theoretically based material. That is, there will be more proof writing from the graduate students.

2. **Intensity** (e.g., How are the processes and standards of evaluation different for graduates and undergraduates?)
Graduate students will be held to a higher standard of mathematical communication. Their writing will be expected to meet professional standards.

3. **Self-Directed** (e.g., How are research expectations differ for graduates and undergraduates?)
The additional material assigned to graduate students will be self-directed. Undergraduates will not be expected to learn the material in a self-directed manner.

Course objectives and tentative course syllabus:
The course objectives are contained in the tentative course syllabus on the pages that follow.

Bibliography: (Key or essential references only. Normally the bibliography should be no more than one or two pages in length.)

Buckley, F., Lewinter, M., *A Friendly Introduction to Graph Theory*. Upper Saddle River: Prentice Hall, 2003. Print.

Chartrand, G. and Lesniak, L., *Graphs and Digraphs*. Boca Raton: CRC Press, 2005. Print.

Chartrand, G., and Zhang, P., *A First Course in Graph Theory*. Boston: Dover, 2012. Print.

Gould, R., *Graph Theory*. New York: Dover, 2012. Print.

Gross, J., Yellen, J., *Graph Theory and its Applications, Second Edition*. Boca Raton: CRC Press, 2006. Print.

West, D., *Introduction to Graph Theory, Second Edition*. Upper Saddle River: Prentice Hall, 2001. Print.

The University of Wisconsin-Whitewater is dedicated to a safe, supportive and non-discriminatory learning environment. It is the responsibility of all undergraduate and graduate students to familiarize themselves with University policies regarding Special Accommodations, Academic Misconduct, Religious Beliefs Accommodation, Discrimination and Absence for University Sponsored Events (for details please refer to the Schedule of Classes; the "Rights and Responsibilities" section of the Undergraduate Catalog; the Academic Requirements and Policies and the Facilities and Services sections of the Graduate Catalog; and the "Student Academic Disciplinary Procedures (UWS Chapter 14); and the "Student Nonacademic Disciplinary Procedures" (UWS Chapter 17).

Course Objectives and tentative course syllabus with mandatory information (paste syllabus below):

Math – 450/650 Graph Theory

Spring 2015 – 01	MWF 9:55 – 10:45 in Hyer 216
Instructor:	Angela Harlan
Office:	2212 Laurentide Hall
Office Phone:	472-5181
E-mail Address:	harrisak@uww.edu
Office Hours:	W 1:30 – 3:30, TR 12:30 – 2:00 and by appointment

Prerequisites: Successful completion of Math 280, or successful completion of CS 215 and (MATH 253 with a C or better, or MATH 250 with a B or better).

Textbooks: ***A First Course in Graph Theory*** by Gary Chartrand and Ping Zhang, Dover Publications, Inc., 2012.
Graph Theory by Ronald Gould, Dover Publications, Inc., 2012.

Course Description: This course will examine basic concepts and applications of graph theory. Topics covered will be selected from trees, connectivity, paths and cycles, coloring, matching and covering problems, digraphs, and network flows.

Course Objectives: Upon successful completion of this course the student will be able to

- model mathematical problems using graph theory
- solve problems using various algorithms
- solve problems using graph-theoretical techniques
- write formal proofs using various techniques

As a student you are expected to:

- **Attend** all class sessions. If an extended absence is necessary, please inform the instructor.
- **Work.** It is expected that you will spend at least 6 – 9 hours per week on study outside of class, which is the norm for any upper-level, three-credit class. As you tackle individual problems, keep in mind the answer is just part of your work in this course. It is the process you must understand and be able to explain. After all, that is what will be expected of you in the future. Thus, discussions in class will focus on conceptual understanding, and your work outside of class should do the same.
  - **Expectations for submitted work:**
    - Any submission that is more than one sheet of paper **must** be stapled.
    - All problems must be in sequential order. You must use correct mathematical "grammar."
- **Succeed.** If you are having problems understanding a topic, there is help available. Come see me during my office hours or make an appointment with me for a mutually agreeable time. It is best if you have tried the problems and come with specific questions.
- **Be Aware of you Rights and Responsibilities as a Student** (see the Student Handbook). The University of Wisconsin-Whitewater is dedicated to a safe, supportive and non-discriminatory learning environment. It is the responsibility of all undergraduate and graduate students to familiarize themselves with University policies regarding Special Accommodations, Academic Misconduct, Religious Beliefs Accommodation, Discrimination and Absence for University Sponsored Events (for details please refer to the Schedule of Classes: the "Rights and Responsibilities" section of the Undergraduate Catalog; the Academic Requirements and Policies and the Facilities and Services sections of the Graduate Catalog; and the "Student Academic Disciplinary Procedures (UWS Chapter 14); and the "Student Nonacademic Disciplinary Procedures" (UWS Chapter 17)).

Important Dates:

- **February 2:**
  - Last day to change a grading basis
  - Last day to drop with no "W" assigned
  - Last day to drop for 100% refund
- **February 27:** Last day to drop a course
- **February 27:** No student shall be required to take more than two **comprehensive** final examinations on the same day. Any student with more than two **comprehensive** final examinations scheduled on the same day who wants to reschedule the excessive examination(s) must make arrangements with the instructors involved. If the student and instructors are unable to reach mutual agreement about alternate arrangements, the student must notify the Registrar by Friday, February 27. The Registrar shall arrange times as necessary with instructors involved and shall notify the student of the arrangements by Monday, April 13.

Class conduct:

- The use of cell phones is prohibited in the classroom at all times.

- The use of laptops and tablets is prohibited in the classroom except for those days on which I request you bring your laptop or tablet for classroom use.

Course work: In this course, you will have assignments, two in-class exams, and a final exam. Each of these serves a purpose in your learning experience.

Assignments: There will be assignments each week, with the exception of exam weeks. Problems will come from those found in the textbook, as well as from any supplemental material I provide in class, and will be a combination of computations and proofs. I have high expectations for your work, particularly when writing proofs. We will discuss these expectations in class before the first assignment is due. Assignments constitute 40% of your course grade. The purpose of these assignments is for you to learn to use the various techniques taught in the course to solve problems. ☺

Exams: There will two in-class exams during the semester, which constitute 40% of your course grade (20% each). The purpose of the exams is to assess your knowledge of the course content.

Final Exam: The final exam is comprehensive/cumulative and constitutes 20% of your course grade.

Make-up/Late Policy: I will allow make-up exams for an absence that I deem to be excused. If you must miss an exam, you should contact me **before** the exam whenever possible.

I do not accept late assignments. I will drop the lowest assignment grade.

Grades: Your final grade is composed of Activities (5%), Assignments (30%), two in-class Exams (20% each), and a comprehensive Final Exam (25%).
The grading scale that follows will be used, where x represents your grade. Note that 92.9 < 93 and is therefore an A- and **not** an A.

A:	$\geq 93\%$
A-:	$90\% \leq x < 93\%$
B+:	$87\% \leq x < 90\%$
B	$83\% \leq x < 87\%$
B-:	$80\% \leq x < 83\%$
C+:	$77\% \leq x < 80\%$
C:	$73\% \leq x < 77\%$
C-:	$70\% \leq x < 73\%$
D+:	$67\% \leq x < 70\%$
D:	$63\% \leq x < 67\%$
D-:	$60\% \leq x < 63\%$
F:	$< 60\%$

Tentative Course Schedule*:

Week	Topics Covered
1	Graphs and Models

2	Connected Graphs Common Classes of Graphs
3	Digraphs
4	Degree
5	Trees
6	Connectivity
7	Connectivity
8	Networks
9	Networks
10	Cycles and Circuits
11	Planarity
12	Matchings
13	Independence
14	Colorings
15	Ramsey Numbers

*Note: Instructors may choose to cover fewer topics in more detail, opting for depth of knowledge rather than breadth of knowledge.