TO: The Faculty of the College of Engineering

FROM: School of Electrical and Computer Engineering of the College of Engineering

RE: New Graduate Course, ECE 60826 Introduction to Visual Analytics

The faculty of the School of Electrical and Computer Engineering has approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

ECE 60826 Introduction to Visual Analytics
Sem. 1, Lecture 3, Cr. 3.
Prerequisite by Topic: A broad and strong foundation in undergraduate computer engineering courses, and good programming skills. A prior course in operating systems or networking will be useful but not essential.

Description: This course introduces students to visual analytics: the use of interactive visual interfaces to facilitate analytical reasoning. The course contents will include both theoretical foundations of this interdisciplinary science as well as practical applications of integrated visual analysis techniques on real-world problems.

Reason: The development of terascale and petascale computing systems and powerful new scientific instruments has created an unprecedented growth of scientific data. Unfortunately, this sea of data has not had the transformational effect that was expected on science and engineering, but has instead become a bottleneck in itself. Fundamental new techniques are needed to turn this data deluge into the useful, understandable information and knowledge necessary for transformational science and engineering, creating interactive knowledge environments for exploration, design, and discovery.

Michael R. Melloch

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School of Electrical and Computer Engineering

Supporting Document to the Form 40G
for a New Graduate Course

To: Purdue University Graduate Council

From: Faculty Member: David Ebert

Department: Electrical and Computer Engineering

Campus: West Lafayette

Date:

Subject: Proposal for New Graduate Course

Contact for information if questions arise:
Name: Matt Golden
Phone: 494-3374
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Address: EE Building, Room 135

Course Subject Abbreviation and Number: ECE 60826

Course Title: Introduction to Visual Analytics

Course Description:

This course introduces students to visual analytics: the use of interactive visual interfaces to facilitate analytical reasoning. The course contents will include both theoretical foundations of this interdisciplinary science as well as practical applications of integrated visual analysis techniques on real-world problems.

Semesters Offered:

For the benefit of graduate student plan of study development, how frequently will this prototype be offered? Which semesters?
Fall Odd Years

A. Justification for the Course:

The development of terascale and petascale computing systems and powerful new

scientific instruments has created an unprecedented growth of scientific data. Unfortunately, this sea of data has not had the transformational effect that was expected on science and engineering, but has instead become a bottleneck in itself. Fundamental new techniques are needed to turn this data deluge into the useful, understandable information and knowledge necessary for transformational science and engineering, creating interactive knowledge environments for exploration, design, and discovery.

Use the following criteria:
Graduate Council policy requires that courses at the 50000 level in the Purdue system should be taught at the graduate level and meet four criteria: a) the use of primary literature in conjunction with advanced secondary sources (i.e., advanced textbooks); b) assessments that demonstrate synthesis of concepts and ideas by students; c) demonstrations that topics are current, and; d) components that emphasize research approaches/methods or discovery efforts in the course content area (reading the research, critiquing articles, proposing research, performing research). Such courses should be taught so that undergraduate students are expected to rise to the level of graduate work and be assessed in the same manner as the graduate students.

- Anticipated enrollment
  - Undergraduate 0
  - Graduate 10-20

B. Learning Outcomes and Method of Evaluation or Assessment:

ECE Graduate Learning Outcomes:

a. Knowledge and Scholarship (thesis/non-thesis)
b. Communication (thesis/non-thesis)
c. Critical Thinking (thesis/non-thesis)
d. Ethical and Responsible Research (thesis) or Professional and Ethical Responsibility (non-thesis)

- List Learning Objectives for this course and map each Learning Objective to one or more of the ECE Learning Outcomes (a-d, listed above):

- Understanding of the fundamentals of visual analytics and its applications (a)
- Understanding of the analytical reasoning process (a, c)
- Understanding of cognition, perception, and designing for human users (a, c,d)
- Ability to design, build, and evaluate suitable visual representations to a real-world dataset (c, d)
- Ability to apply automatic analysis algorithms (such as statistics, aggregation, or knowledge discovery) to real-world datasets (c, d)

- Methods of Instruction
    - Lecture
- Will/can this course be offered via Distance Learning?
    - The course will not be offered via Distance Learning.
- Grading Criteria

  Grading criteria (select from checklist); include a statement describing the criteria that will be used to assess students and how the final grade will be determined. Add and delete rows as needed.

    - papers and/or projects
    - attendance/participation
    - exam

  Describe the criteria that will be used to assess students and how the final grade will be determined:

  Grades will be assigned on the following grounds:
    - Analytical exercise (10%)
    - In-class presentations (15%)
    - Midterm exam (25%)
    - Class project (50%)

C. Prerequisite(s):

List prerequisites and/or experiences/background required. If no prerequisites are indicated, provide an explanation for their absence. Add bullets as needed.

- Prerequisite by Topic: Introductory knowledge of one of the following areas: data analysis, knowledge management, statistics, computer graphics, visualization

D. Course Instructor(s):

Provide the name, rank, and department/program affiliation of the instructor(s). Is the instructor currently a member of the Graduate Faculty? (If the answer is no, indicate when it is expected that a request will be submitted.) Add rows as needed.

Name	Rank	Dept.	Graduate Faculty or expected date
David Ebert	Professor	ECEN	Yes

E. Course Outline:

Provide an outline of topics to be covered and indicate the relative amount of time or emphasis devoted to each topic. If laboratory of field experiences are used to supplement a lecture course, explain the value of the experience(s) to enhance the quality of the course and student learning. For special topics courses, include a sample outline of a course that would be offered under the proposed course. **(This information must be listed and may be copied from syllabus).**

Week No.	*Principal Topics*
1	Course introduction, overview, and review of visualization and data analysis
2-3	Analytical reasoning and critical thinking
4	Cognition and perception
5-6	Data representations, transformations and statistics for visual reasoning
7-8	Visual representations
9	Interaction and interface design
10	Production, presentation and dissemination
11	Collaborative visual analytics
12	Evaluation
13	New technology for visual analytics
14-15	Advanced topics in visual analytics

F. Reading List (including course text):

A primary reading list or bibliography should be limited to material the students will be required to read in order to successfully complete the course. It should not be a compilation of general reference material.

A secondary reading list or bibliography should include material students may use as background information.

- Primary Reading List

  J. J. Thomas and K. A. Cook, *Illuminating the Path: The Research and Development Agenda for Visual Analytics.* IEEE Computer Society Press, 2005.

- Secondary Reading List

G. Library Resources

Describe any library resources that are currently available or the resources needed to support this proposed course.

H. Course Syllabus

(While not a necessary component of this supporting document, an example of a course syllabus is available, for information, by clicking on the link below, which goes to the *Graduate School's Policies and Procedures Manual for Administering Graduate Student Program.*
See Appendix K.
http://www.purdue.edu/gradschool/faculty/documents/Graduate_School_Policies_and_Procedures_Manual.pdf