Faculty and Staff

Lecture Instructors:

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Course Description

**IT 415 Information Visualization  Prerequisite: IT 213**

Information visualization is an important area that focuses on the use of visualization techniques to help people understand and analyze abstract data. Through careful analysis of data, creation of visual representations, and implementation with interactive techniques, visualized information increases our ability to gain insight and make decisions for many types of datasets, tasks, and analysis scenarios. This course will provide students the opportunity to learn the principles and applied technologies in information visualization and explore the application of development protocols. Relevant topics will be chosen to enable students to create comprehensible applied visualizations and may include fundamentals of information visualization; system functional requirements development; current important visualization applications: geographic information visualization and scientific visualization; advanced interactive visualization -- virtual reality; future trends in information visualization. Students will get hands on experience with the latest web-based widely-used visualization tools and software to include design and development of a rudimentary
The prerequisite for this course is IT 213 (or an approved equivalent course). A grade of "C" or better must be achieved in the prerequisite course before a student is qualified to take this course. The prerequisite course must be completed prior to, not concurrently with, this course.

This requirement will be strictly enforced. Any student who does not meet the prerequisite requirement will be dropped from the course by the Instructor at the start of the semester and the student will be responsible for any consequences of being dropped.

**Rationale**

The most pressing need now is to be able to present the information in a manner that is usable. This requires that cogent information be provided in context. To the maximum extent possible the information must be displayed in an intuitive manner that supports not only analytical but cognitive processes. (Source: Taylor Connor Associates LLC, all rights reserved)

To support this burgeoning technology requirement designers and developers of information systems need to be current not only with the technology but the unique aspects of information visualization design. This course is intended to develop an awareness of the design issues; an understanding of the underlying technology; introduce students to currently available technology; guide students in design protocols; and examine typical applications of those technologies.

**Course Outcomes**

Students will learn the principles of information visualization system design based on user functional requirements. They will learn about current tools and technologies used in information visualization development as well as current off the shelf information visualization software systems.

On successful completion of this course, students will be able to:

- Learn the principles involved in information visualization
- Learn about the variety of existing techniques and systems in information visualization
- Give examples of current information visualization technology
- Develop a rudimentary information visualization design based on the requirements
- Develop skills in applying different visualization techniques to particular tasks
- Learn how to evaluate visualization systems
- Gain a background that will aid the design of new, innovative visualizations
- Learn how to write scientific/technical documentations
- Learn some project management techniques
Supported Student Outcomes at the Program Level

- Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solution.
- Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program’s discipline.
- Identify and analyze user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing-based systems.

Major Topics

- Researching and finding raw data
- Understanding what information visualization is and what it is not
- Learning to use Google API visualization tools
- Learning to use Google document tools in conjunction with visualization tools
- Learning Tableau Public
- Learning to use Excel as a practical tool for data formatting and visualization
- Learning to setup and use a portable web server to host your visualizations on any computer
- Publishing your visualization on the web
- Learning to create beautiful presentations to go along with visualization
- Learning to use audio/video tools to create video presentations
- Research and learn additional visualization tools

Textbooks

Information Visualization: An Introduction

Third Edition
Robert Spence
2014 Springer

ISBN-10: 3319073400

Grading

Grades will be awarded in accordance with the GMU Grading System for undergraduate students. See http://www.gmu.edu/catalog/apolicies/ under Grading System for more information.
Letter grades will be assigned according to the following scale:

<table>
<thead>
<tr>
<th>Numeric Score</th>
<th>Letter Grade</th>
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<tbody>
<tr>
<td>97 – 100</td>
<td>A+</td>
</tr>
<tr>
<td>93 – 96</td>
<td>A</td>
</tr>
<tr>
<td>90 – 92</td>
<td>A–</td>
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<tr>
<td>87 – 89</td>
<td>B+</td>
</tr>
<tr>
<td>83 – 86</td>
<td>B</td>
</tr>
<tr>
<td>80 – 82</td>
<td>B–</td>
</tr>
<tr>
<td>77 – 79</td>
<td>C+</td>
</tr>
<tr>
<td>73 – 76</td>
<td>C</td>
</tr>
<tr>
<td>70 – 72</td>
<td>C–</td>
</tr>
<tr>
<td>60 – 69</td>
<td>D</td>
</tr>
<tr>
<td>0 – 59</td>
<td>F</td>
</tr>
</tbody>
</table>

* Grades of "C-" and "D" are considered passing grades for undergraduate courses. However, a minimum grade of "C" is required in the BSIT program for any course that is a prerequisite for one or more other courses. This course is a prerequisite for several courses in BSIT Concentrations – see [http://www.gmu.edu/catalog/courses/it.html](http://www.gmu.edu/catalog/courses/it.html) for more information on those courses.

Final grades will be determined based on the following components:

<table>
<thead>
<tr>
<th>Total Points</th>
<th>100%</th>
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<tbody>
<tr>
<td>Individual Project 1</td>
<td>25%</td>
</tr>
<tr>
<td>Individual Project 2</td>
<td>25%</td>
</tr>
<tr>
<td>Lab Assignments</td>
<td>20%</td>
</tr>
<tr>
<td>Final Project</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Final Project includes:**

Each student shall propose to design an information visualization based on one concrete application area (such as GIS, statistics, network, performance, bioinformatics, etc.). Students may use the development program, tool, or language of their choice after instructor’s approval. Once the proposals are approved by instructor, students will build the proposed information visualization.

1. Proposal (submitted in MS Word) (10 points)
   a. Introduction
b. Objectives

c. Description of the proposed system

d. Proposed development platforms

2. Progress Report (submitted in MS Word) (10 points)

3. Final Technical Report (submitted in MS Word) (20 points)
   a. Abstract
   b. Objectives
   c. Functional requirements
   d. System architecture and description
   e. Development platforms
   f. Experimental analysis and conclusions

4. Visualization (submitted in electronic format) (30 points)
   a. The visualization should be demonstrated in the presentation
   b. It should be submitted in one zipped file via Blackboard or all the files on CD if the size is big or loaded to the web with the link submitted

5. Presentation (30 points)
   a. Video presentation (5-minutes)
   b. Final report presentation
   c. Demonstrations of the working visualization

Lab Assignments:
Students are required to complete lab assignments in this course. For lab schedule and due dates, check the Lab section on Blackboard. The lab exercises will help you practice development skills and prepare for the projects. Lab assignments are always due at 11:00PM on the 6th day from the class in which the assignment is given. Late submission will not be accepted.

Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Chapters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Intro to the course</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Introduction to information visualization</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Extra lab</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Issues</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Extra lab</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Representation</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Extra lab</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Presentation</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Extra lab</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Interaction</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>Extra lab</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Design</td>
<td>6</td>
</tr>
</tbody>
</table>
This schedule is subject to revision before and throughout the course. Registered students should see the Blackboard Learning System for the latest class schedule.

Important Dates

See [http://registrar.gmu.edu/calendars](http://registrar.gmu.edu/calendars) for more information.

Religious Holidays

A list of religious holidays is available on the University Life Calendar page. Any student whose religious observance conflicts with a scheduled course activity must contact the Instructor at least 2 weeks in advance of the conflict date in order to make alternative arrangements.

Attendance Policy

Students are expected to attend each class, to complete any required preparatory work and to participate actively in lectures, discussions and exercises. As members of the academic community, all students are expected to contribute regardless of their proficiency with the subject matter.

Students are expected to make prior arrangements with Instructor if they know in advance that they will miss any class and to consult with the Instructor as soon as possible if they miss any class without prior notice. Students who anticipate absences are discouraged from taking the class.

Departmental policy requires students to take exams at the scheduled time and place, unless there are truly compelling circumstances supported by appropriate documentation. Except in such circumstances, failure to attend a scheduled exam will result in a score of zero (0) for that exam, in accordance with Mason policy on final exams. Students should not make travel plans or other discretionary arrangements that conflict with scheduled classes and/or exams. If the University is closed due to weather or other unforeseen conditions, final exams may be rescheduled. Contact the instructor in advance if you have a serious problem that prevents you from meeting course requirements.

Classroom conduct

Students are expected to conduct themselves in a manner that is conducive to learning, as directed by the Instructor. Any student who negatively impacts the opportunity for other students to learn will be warned – if disruptive behavior continues, the student will be asked to leave the classroom.

Communications

Registered students will be given access to a section of the Blackboard Learning System for this course. Blackboard will used as the primary mechanism (outside of lectures) to disseminate course
information, including announcements, lecture slides, homework and other assignments, and scores for homework and exams.

Communication with the Professor on issues relating to the individual student should be conducted using GMU email, via telephone, or in person - **not** in the public forums on Blackboard. Email is the preferred method. Federal privacy law and GMU policy require that any communication with a student related in any way to a student's status be conducted using secure GMU systems – if you use email to communicate with the Instructor you **MUST** send messages from your GMU email account.

All course materials (lecture slides, assignment specifications, etc) are published on Blackboard. This allows users of most computing platforms to view and print these files. Microsoft® Word (or a compatible word processing application) is required for preparing assignments – it is available on computers in the Mason open labs.

**Privacy**

Instructors respect and protect the privacy of information related to individual students.

As described above, issues relating to an individual student will discussed via email, telephone or in person. Instructors will not discuss issues relating to an individual student with other students (or anyone without a need to know) without prior permission of the student.

Assessable work other than final exams will be returned to individual students directly by the Instructor (or by a faculty or staff member or a Teaching Assistant designated by the Instructor, or via another secure method). Under no circumstances will a student's graded work be returned to another student. Faculty and staff will take care to protect the privacy of each student's scores and grades.

**Disability Accommodations**

The Office of Disability Services (ODS) works with disabled students to arrange for appropriate accommodations to ensure equal access to university services. Any student with a disability of any kind is strongly encouraged to register with ODS as soon as possible and take advantage of the services offered.

Accommodations for disabled students **must** be made in advance – ODS cannot assist students retroactively, and at least one week's notice is required for special accommodations related to exams. Any student who needs accommodation should contact the Instructor during the first week of the semester so the sufficient time is allowed to make arrangements.

**Honor Code**

All members of the Mason community are expected to uphold the principles of scholarly ethics. Similarly, graduating students are bound by the ethical requirements of the professional communities they join. The ethics requirements for some of the communities relevant to Applied IT graduates are available via the following links:

- [ACM Code of Ethics and Professional Conduct](#)
- [IEEE Code of Ethics](#)
- [EC-Council Code of Ethics](#)
On admission to Mason, students agree to comply with the requirements of the Honor Code at George Mason University. Student members of the George Mason University community pledge not to cheat, plagiarize, steal, and/or lie in matters related to academic work. The Honor Code will be strictly enforced in this course.

Any use of the words or ideas of another person(s), without explicit attribution that clearly identifies the material used and its source in an appropriate manner, is plagiarism and will not be tolerated. The Instructor reserves the right to use manual and/or automated means (including such services as Turnitin.com) to detect plagiarism in any work submitted by students for this course, and to direct Teaching Assistants and/or other faculty and/or staff members to do likewise in support of this course.

WARNING! This course has a zero tolerance policy for violations of the Honor Code. There are no second chances. Offenses carry the following minimum recommended sanctions:

**Level 1 Offenses, such as cheating on an assignment (working together when not allowed)**
1\(^{st}\) Offense: 0 on the assignment, one letter grade (10%) reduction in the final grade, and the academic integrity seminar
2\(^{nd}\) Offense: F in the course, and one semester academic suspension
3\(^{rd}\) Offense: F in the course and expulsion from the University

**Level 2 Offenses, such as cheating on an exam, posting to a website for a partial or completed solution to an assignment (chegg.com, homeworkmarket.com, rentacoder.com, etc.)**
1\(^{st}\) Offense: F in the course and the academic integrity seminar
2\(^{nd}\) Offense: F in the course, and one year academic suspension
3\(^{rd}\) Offense: F in the course and expulsion from the University

For this course, the following requirements are specified:

- All assessable work is to be prepared by the individual student, unless the Instructor explicitly directs otherwise.
- All work must be newly created by the individual student for this course for this semester. Any usage of work developed for another course, or for this course in a prior semester, is strictly prohibited without prior approval from the instructor.