VOLGENAU SCHOOL OF ENGINEERING

GEORGE MASON UNIVERSITY

Information Sciences and Technology Department

AIT 580:
Analytics: Big Data to Information

Course Syllabus

Summer 2022
Section B01

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Detailed information on AIT 580 offered in this semester including the day, time, location, instructor(s)' name(s) and their contact information is available through the Schedule of Classes posted on PatriotWeb.

For each section, a customized syllabus with information specific to that section will be made available to registered students via the **Blackboard Learning System**.

Course Description

AIT 580 Applied Information Technology
Analytics: Big Data to Information

Prerequisites:
Graduate standing
Knowledge of basic programming and statistics is recommended but not required.

Catalog Description:
This course provides an overview of Big Data Analytics concepts, tools, and methods, and their use in commercial, scientific, governmental, social, and other application areas. Topics include technical and non-technical disciplines required to collect, process and use enormous amounts of data available from numerous public sources. Course content includes discussions of, and hands-on practice with, technologies involved in collecting, managing, mining, analyzing, visualizing data, interpreting the results, and data science project management. Additional topics covered include system infrastructure and acquisition, law and policy, and ethical issues related to data collection.

This course is currently one of the core requirements for the IT Management concentration for the MS in Applied Information Technology; it can also be taken as an elective for the MS/AIT concentrations.

Special Topics Description:
The course includes but is not limited to the following topics and emphasizes the technical aspects of Data Analytics projects:
• Characteristics and Representations of Data
• Architecture of Data Analytics Systems
• Tools for conducting data analytics research
• Role of the Data Scientist and the Data Analytics Project Manager
• Big Data Use Cases in Social Media, Government, and Industry
• Principles of Statistical Analysis
• Querying Data using SQL
• NoSQL Data Analytics, MongoDB, Hadoop, Map & Reduce, Spark
• Data Preprocessing and Cleansing
• Data Visualization Concepts and Methods
• Machine Learning and Predictive Analytics
• Text Mining, Natural Language Processing (NLP)
• Basic Use of SQL, R, Python, Scikit learn, NLTK, TextBlob, MapReduce, and Other Tools
• Data Governance, Security, Curation, Privacy, and Legal Issues
• Data Science Project Management

Required Course Materials

Required Textbook (New):
• **Introduction to Data Mining and Analytics with Machine Learning in R and Python**. **2021** Edition by Dr. Kris Jamsa, ISBN-13: 978-1284180909
https://www.jblearning.com/catalog/productdetails/9781284180909
(More sources for rent or purchase e-textbook at Amazon, Vitalsource or other online bookstores)

Recommended Readings:
• Creating Good Data: A Guide to Dataset Structure and Data Representation. Harry J. Foxwell. 2020. Apress. (Amazon)
• Big Data Science & Analytics: A Hands-On Approach (BDSA), A. Bahga & V. Madisetti, 2016 VPT. http://www.hands-on-books-series.com/bigdata.html
• The Book of R, T. Davies, 2016, No Starch Press. https://www.nostarch.com/bookofr
• An Introduction to Statistical Learning with Applications in R, G.James, et al., 2016 Springer. http://www-bcf.usc.edu/~gareth/ISL/index.html

Tutorials:
• A variety of tutorials (SQL, R, Statistics, Python, etc.) are available at http://lynda.gmu.edu/
• Seeing Theory: http://students.brown.edu/seeing-theory/
• The Statistics Tutor's Quick Guide to Commonly Used Statistical Tests: www.statstutor.ac.uk/resources/uploaded/tutorsquickguidetostatistics.pdf

There will be **required** Web-based readings and tutorials, along with **recommended** resources. These will be listed on the course Blackboard Course Resources link and within individual assignment links.

Course Duration (Online)

Dates: GMU Academic Calendar: https://registrar.gmu.edu/calendars/
Total Duration: **8 weeks**

Faculty

AIT 580, Instructor: Lindi Liao, Ph.D.

AIT 580, Course Coordinator: Harry J. Foxwell, Ph.D.

AIT 580, GTA: **TBD**

Grading Policy

Student grades will be determined based on the following components[1]:

Grade Component	Weight
Online Activities *(Self-intro, peer grading, team evaluations, etc.)*	**5%**
[2]General Assignments, Labs, and Mini Projects	**50%**
[2]Data Analytics Project	**45%**

Extra Credit (12%)	
1. On-time submission credit (A2 & A5-A8, *1 point each*)	Up to 5%
2. [3]A4 - MongoDB (3 points) & A9 – NLP (4 points)	Up to 7%

[1]*Subject to revision before and throughout the course*

[2]*Teamwork (2-**3** team members)*

[3] *Individual work*

Class Participation

This course is designed for "**asynchronous**" delivery (https://masononline.gmu.edu/course-delivery-methods):

- Students can study at their own pace, accessing instructional materials online in Blackboard any time, though a set schedule with due dates is still there.

In addition, in order to help students, master important spots, improve problem-solving skills for assignments, and *successfully* complete final projects, the instructor will also offer a few *optional* class meetings as scheduled on Blackboard. However, optional meetings are not required, there will be no penalty for non-participation.

All assignments, assessments, online class activities, class announcements, schedules, files and presentations will use Blackboard.

Please go to Blackboard for more details.

Schedule

A detailed schedule will be published on Blackboard. As many factors may affect the development and progress of a class, the instructor reserves the right to alter the schedule as may be required to assure attainment of course objectives. The schedule is subject to revision before and throughout the course.

Registered students should see the Blackboard Learning System ***for the latest class schedule.***

Grading

Grading Guidelines:

Some grade components are evaluated *subjectively*

- **A**: consistently above and beyond the course/assignment requirements
- **B**: meets and occasionally exceeds the course/assignment requirements
- **C**: minimally meets the course/assignment requirements
- **F**: fails to meet the course/assignment requirements

Grades will be awarded in accordance with the Mason Grading System for graduate students. See the university catalog for policies: http://catalog.gmu.edu for more information.

Grading Scale:

The grading scale for this course is:

97 – above	A+	Passing
93 – 96%	A	Passing
90 – 92%	A-	Passing
87 – 89%	B+	Passing
83 – 86%	B	Passing
77 – 82%	B-	Passing
70 – 76%	C	Passing
0 – 69%	F	**Failing**

Raw scores may be adjusted by the instructor to calculate final grades.

Students are responsible for checking the currency of their grade books. Grade discrepancies must be brought to instructor's attention within one week of assignment submission and 48 hours of exam submission.

No make-up for any activity, unless arranged in advance. Only in special cases, such as medical problems and family emergency, make-ups and late assignments may be allowed with verifiable proof.

Final grades will be posted to PatriotWeb, which is the only vehicle for students to obtain those grades. A student with a "hold" on his/her PatriotWeb account will be unable to access final grades until the hold has been removed by the Registrar.

Communications

Registered students will be given access to a section of the Blackboard Learning System for this course. Blackboard will be 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 Instructor on issues relating to the individual student should be conducted using Mason email, via telephone, or in person - **not** in the public forums on Blackboard. Mason Mail is the preferred method – for urgent messages, you should also attempt to contact the Instructor via telephone. Federal privacy law and Mason policy require that any communication with a student related in any way to a student's status be conducted using secure Mason systems – if you use email to communicate with the Instructor you **MUST** send messages from your Mason email account.

When sending an e-mail to the instructor, please include the following:

- **Course number**
- **Section number**
- **Your full name**

Other Expectations

- Programming concepts
  - using R, Python, Tableau, other data analytics tools
- Basic statistics
- Self-study, tutorials, online lectures, etc.

Other Notes

- Wikipedia is not a primary reference. Use it for initial discovery, but use and cite primary references (which Wikipedia itself might use).
- If you need assistance with writing an assignment, you can get assistance here: http://writingcenter.gmu.edu
- The first item instructor looks at in assignments is the **References** section!
- Any programming/coding assignments must adhere to the **Honor Code**.
- There will be reading assignments *along with the assumption that you have actually read them.*
- Lecture slides from instructor's material will be posted on Blackboard.
- Some material you may already know (good! that's review!). Some material you may have learned earlier and have forgotten (good! you'll be reminded). Some material you may know more than the instructor (good! share it!).
- Email the instructor if you anticipate being unable to meet any course requirements in a timely manner.

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 IST 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 George Mason University, students agree to comply with the requirements of the Mason Honor System and Code. The Honor Code will be strictly enforced in this course. Honor Code cases are heard by a panel consisting of students – students who meet the requirements are encouraged to nominate themselves to serve on the Honor Committee.

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 SafeAssign.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.

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.

Students may seek assistance with assigned work (and are encouraged to do so if they feel the need), **provided**:

- The directions for the assigned work do not prohibit such assistance.
- Such assistance is acknowledged in the submitted work, clearly identifying the person(s) giving assistance and the nature of the assistance given.
- Any work to be submitted is prepared entirely an exclusively by the student submitting it. Students are expressly prohibited from sharing any assessable work for this course in any manner with other students (except students assigned as Teaching Assistants to this course and the student's section), unless all students involved have had their work graded and returned by the Instructor, or the Instructor has explicitly approved such sharing.

Important Dates

Dates for dropping, adding the course etc. are available via
http://registrar.gmu.edu/calendars/

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 in in-class sections 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. Any student who expects to miss more than one class session is strongly advised to drop the course and take it in a later semester when he/she can attend every 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 – students are strongly advised not to make plans that would prevent them from attending exams that may be rescheduled during the entire exam period.
NET Version attendance: During each week the students must perform all the requirements published for that week. A detailed week-by-week schedule of classes will be published on the net version of the course.

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.

Electronic devices are potential distractions in the classroom environment. Cell phones, pagers and other handheld devices must be turned off or set to "silent" mode and not used while class is in session. Laptop computers and similar devices may be used only if such use is directly related to the classroom activity in progress – for some activities the Instructor may require that such devices not be used in order to maximize student engagement.

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.

Safety and Security

Personal Safety and Security: The Mason Alert system provides emergency information of various sorts. Students can sign up for it by visiting the website https://alert.gmu.edu. Students are also reminded that an emergency poster exists in each classroom explaining what to do in the event of crises and that further information about emergency procedures exists on https://ready.gmu.edu/be-prepared/.

Computer and IT Security: Visit GMU's IT http://itsecurity.gmu.edu/ web site regularly. Norton AntiVirus Software is free to download for all GMU students/faculty/staff.

NET Sections only

For the net section you will need to have the following additional resources:

- Computer with fast internet connection
- Microphone and web camera (optional)

