## ASM 540: Geographic Information **System** Applications

Fall 2018; 3 credits

Class: Monday-Wednesday 9:30-10:20 A.M., Lilly 2102

Lab: Thursday 9:30 to 11:20 A.M, Stanley Coulter Hall G046

Course webpage: engineering.purdue.edu/~asm540

## Instructors

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|    | **Office** | **Tel.** | **Office Hours** |
| Dr. Dharmendra Saraswatsaraswat@purdue.edu | Lilly 3-L32 | 45013 | By appointment. |
| Mr. Ben Hancockhancocb@purdue.edu | Lilly3-108 |  | Thursday in the lab or by appointment |

## Course Description

This course introduces fundamentals of geographic information systems (GIS) in a problem-solving mode. You will learn key concepts of GIS, including spatial data models and databases, data sources, georeferencing, spatial analysis of vector and raster data, data editing, cartographic design principles, online publishing of data and maps, along with conceptualization and implementation framework for solving spatial problems. GIS is a powerful tool and most students find it to be interesting and enjoyable, although it takes time and effort. The laboratory assignments used in the course are compatible with ESRI’s ArcGIS Pro ver. 2.1 software. At the end of the course, we expect you to be an informed GIS user, as well as being reasonably competent using ArcGIS Pro. If you put in the time (which is considerable) you will have success in this course and in using GIS in the future.

## Prerequisites

There are no specific prerequisites, but this course will be difficult ***without basic computer skills***. You are expected to have skills related to (1) use of Microsoft Office products namely word, power point, and excel, (2) developing and maintaining a folder structure that allows you to access file content, (2) regular backing up of important files, (3) manipulating files and programs from the Web, and (4) creating presentations using Power Point, and (5) write/execute code (more relevant for those opting for Python track).

## Learning Outcomes

The course is structured so that after successful completion you will:

1. Learn the fundamentals of geographic information systems and spatial analysis,
2. Organize spatial-data in ArcGIS Pro to automate and streamline GIS workflow processes
3. Apply spatial analysis to solve real-world problems
4. Plan, design, and implement a GIS project to demonstrate problem-solving and communication skills related to suitability of spatial data and analyses for a particular application,
5. Relate GIS concepts to independently learn about other GIS software.

## Required Textbook

You will need the **Fourth Edition (Latest)** of the book titled ***Understanding GIS: An ArcGIS Pro Project Workbook***. It is available from various sources including- eBay (https://tinyurl.com/ych5vvlm), Target (<https://tinyurl.com/ybkyn3e3> ), Barnes and Nobles (<https://tinyurl.com/y7tvf5kx>) etc. Chapter 1 is available online at <https://tinyurl.com/y7gqwzrd>. You should obtain your own copy of the book on or before August 30.

## Reference Textbook/ Additional Sources

## 1) GIS Cartography: A Guide to Effective Map Design by Gretchen N. Peterson (available online through Purdue Libraries

## (<https://www-taylorfrancis-com.ezproxy.lib.purdue.edu/books/9781420082142> )

## 2) Lining Up Data in ArcGIS: A Guide to Map Projections by Margaret M. Maher (available online through Purdue Libraries - <https://ebookcentral.proquest.com/lib/purdue/detail.action?docID=3238272> )

## 3) GIS Basics by Shahab Fazal (available online through Purdue Libraries –

## <https://ebookcentral.proquest.com/lib/purdue/reader.action?docID=418807&ppg=236> )

## 4) The GIS Primer- An Introduction to Geographic Information Systems (http://www.innovativegis.com/basis/primer/The\_GIS\_Primer\_Buckley.pdf)

## 5) GIS Commons (<http://giscommons.org/> )

## 6) Spatial data analysis: An introduction for GIS users by Christopher D. Lloyd (available through Purdue Libraries –

<https://tinyurl.com/yavrbdpm> )

## 6) What is GIS (by ESRI)

## (<https://www.esri.com/en-us/what-is-gis/overview?originref&originref>=)

## 7) What is GIS (by GIS Lounge)

## (<https://www.gislounge.com/what-is-gis/> )

## 8) Key Concepts and Techniques in GIS by Jochen Albrecht (available online through Purdue Libraries –

## <https://search-credoreference-com.ezproxy.lib.purdue.edu/content/title/sageukgis?tab=contents> )

## 9) GIS Research Methods: Incorporating Spatial Perspectives by Sheila Laxmi Steinberg and Steven J. Steinberg, Chapter 12 (available online through Purdue Libraries –

## <https://ebookcentral.proquest.com/lib/purdue/reader.action?docID=3238285&ppg=332> )

## 10) Online exercises through ESRI- as suggested by the instructor during the semester

## 11) Any additional sources as suggested during weekly lectures-

## A ) <http://www.esri.com/esri-news/arcuser/winter-2013/understanding-statistical-data-for-mapping-purposes>

## Instructional activities

Learning to use GIS competently involves both fundamental understanding and familiarity with the specific GIS, in this case ArcGIS Pro. We expect **you** to take responsibility for learning ArcGIS Pro, primarily through the textbook and possibly online courses, although we will be there to support and add to your learning. Class lectures and discussions will focus more on providing theoretical foundations of GIS for solving problems, rather than specifics of the software (i.e., what button to push).

* **Class** will focus on GIS concepts, methods, data, and analysis. A majority of it will be in lecture style and some interactive discussions, in which you are expected to participate. Course participation is one component of the course grade, and attendance is expected throughout the semester. **Short quizzes will be given each Monday**.
* **Lab** is scheduled on Thursday morning 9:30 to 11:20 am in Stanley Coulter Hall G046. Your attendance is strongly encouraged throughout the lab session as it is the best opportunity for you to get help on ArcGIS Pro related questions.The **assignments** covered during the lab sessionwill enable learning about GIS applications in hands-on manner. The lab assignments are expected to build on the theoretical foundations and designed to encourage self-discovery about GIS tools and methods. The assignments will mostly be due every week. Submit the assignments as a Word document in Blackboard. Each assignment should be typed and include assignment number and your name. **Ensure that all maps, including text on the maps, must be readable and map elements** included when the document is displayed at 100%.
* **Individual learning:**  Learning the ArcGIS Pro software will primarily be through the book ***Understanding GIS: An ArcGIS Pro Project Workbook***. This learning needs to take place outside of the classroom and during scheduled lab periods by working in the lab or on your own computer.
* One of the following options will be provided to demonstrate your GIS competencies:
* A **final project** to provide an opportunity to explore in-depth spatial questions using GIS on a topic of interest to you. To pursue this option, you must have a project defined and all data in your possession by the date specified. The final project will include an oral presentation, short written report, and the electronic data and analysis.
* OR a series of **modules and assignments** to learn how to use Python to automate ArcGIS Pro, and additional skills and competencies in using GIS.

## Policies

**General course policies.**

## Course email list

We will use a course email list to notify you of any announcements or changes to the schedule. Students registered for the course will be subscribed to the email list.

## Course Web sites

The class public web site is <http://engineering.purdue.edu/~asm540>.

***Blackboard (***<http://mycourses.purdue.edu>) for the following purposes:

* Introductions so we can get to know each other. **All students are encouraged to post an introductory message by the end of day on August 21.** Include information about your department, your reasons for taking the course, any background you might have in GIS, and any other information that helps us get to know you better.
* It is recommended that you ask questions and get answers about lecture or the assignments, through the Discussion Forum. You are also encouraged to respond to the questions of others, and certainly to check postings on the Discussion Forum before asking a question.
* Posting grades. You can check your grades approximately a week after assignments are submitted.

***Final exam grades***

Please inform the instructor **on the day of the final exam** of your interest to review the final exam grades and set up a time for the meeting.

## Getting help with ArcGIS Pro

It is almost inevitable that you will run into problems with ArcGIS that seem difficult to solve. Finding ways to solve them yourself is an important part of becoming competent in GIS. Therefore, we recommend the following steps when you need help:

1. First, try the ESRI online help, by clicking the question mark icon, or at <http://pro.arcgis.com/en/pro-app/help/main/welcome-to-the-arcgis-pro-app-help.htm>
2. Post your question to the ASM 540 Blackboard Discussion Forum. One of your fellow students may have a suggestion and if not, Ben Hancock (hancocb@purdue.edu) will probably answer.
3. Ask in the lab on Thursdays.
4. Email Ben Hancock at hancocb@purdue.edu. This is especially appropriate if your question is about the assignment or specific problems with the ArcGIS Pro setup in our lab. He may post the answer in the Forum in Blackboard or email the class.

If you have questions about **grades, schedule, policies, or other course-related issues**, email Dr. Saraswat at saraswat@purdue.edu.

The scheduled lab periods are the main times you should expect to get help from Ben Hancock. Because he works on many research projects with tight deadlines, he is not available to answer questions as they arise, but he will always be available to answer questions in Lab.

**Arriving on Time**: We will start and end on time, so please plan to be ready to learn at 9:30 each class. See Dr. Saraswat if you have a commitment that prevents you being on time.

**Course attendance**. You should attend all classes. We understand that on *rare* occasions you may have legitimate business that conflicts with class. If you need to miss class, you must inform *Professor Saraswat* in **advance**so you can arrange to submit your work early. Students who are absent are still responsible for knowing course material and getting assignments and announcements regardless of attendance. You are expected to be punctual and to stay for the entire class period.

**Short exercises**: Short exercises will also be provided in the class from time to time without prior notification. Performance on these exercises could be used towards participation grades.

**Quizzes**: A total of **10** **quizzes** will be administered. If you have a valid reason to be missing any quizzes, please contact Dr. Saraswat either after the class or by email, in a timely fashion, to make up for the missed quizzes.

**Late work**: Each assignment has a due date and time, noted at the top of each assignment. Many assignments will take longer than you think, and we strongly encourage you to start early, and plan to work on the most difficult parts during lab times when Ben Hancock is available for answering any relevant questions. Late assignments that are turned in after the due date and time will be penalized @**5%/day.** If any assignment is turned in more than one week late, without a reasonable cause (example- bereavement, military service, research conference etc.), be prepared to lose up to **50%** of your score for the late submission. Insure that the instructor is informed in a timely fashion about the reasonable cause.

**Working alone**: You are welcome to discuss assignments and help each other figure things out. However, all students are expected to complete and write up their own assignments.

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| Grading (400 points total) | **Points**  |
| Assignments (12) (every assignment is worth 15 points) | 180 |
| Quizzes (10 quizzes, 5 points each) | 50 |
| Participation (in class, lab, and Blackboard) | 20 |
| Midterm exam | 40 |
| Final project and final report/ OR Python scripting assignments  | 50 |
| Final exam (comprehensive) | 60 |
| Total | 400 |

Grades will be assigned as follows:

98-100 A+

93-98% A

90-93% A-

87-90% B+

83-87% B

80-83% B-

77-80% C+

73-77% C

70-73% C-

67-70% D+

63-67% D

60-63% D

<60% F

The participation points will be assessed in various ways. We may have in-class group discussions, and it is everyone’s responsibility to make sure your group comes up with answers. Responding to questions in the Discussion Forum is encouraged. Occasionally we will ask a short question at the end of class which will be turned in.

Mid-term or Final exam scores could be rounded off to the points scheme shown under grading section above.

**Accessibility and Accommodations**

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let Dr. Saraswat know within a couple of weeks of the start of the semester so that various options are discussed. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247.

**Purdue Honors Pledge**

Please click the following link to become aware of student-initiated Purdue Honors pledge:

## <https://www.purdue.edu/provost/teachinglearning/honor-pledge.html>

## Academic dishonesty

## Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, [Student Regulations](http://www.purdue.edu/univregs/)] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972].

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern. For further details, please refer to <https://www.purdue.edu/odos/osrr/academic-integrity/index.html> .

## Use of copyrighted work

*Students are expected, within the context of the Regulations Governing Student Conduct and other applicable University policies, to act responsibly and ethically by applying the appropriate exception under the Copyright Act to the use of copyrighted works in their activities and studies. The University does not assume legal responsibility for violations of copyright law by students who are not employees of the University.*

## A Copyrightable Work created by any person subject to this policy primarily to express and preserve scholarship as evidence of academic advancement or academic accomplishment. Such works may include, but are not limited to, scholarly publications, journal articles, research bulletins, monographs, books, plays, poems, musical compositions and other works of artistic imagination, and works of students created in the course of their education, such as exams, projects, theses or dissertations, papers and articles.

### Violent Behavior Policy

*Purdue University is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent Behavior impedes such goals. Therefore, Violent Behavior is prohibited in or on any University Facility or while participating in any university activity.*

### Emergencies

*In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor’s control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting Dr. Saraswat (saraswat@purdue.edu) via email or phone. You are expected to read your @purdue.edu email on a frequent basis.*

**EMERGENCY PREPAREDNESS**

**EMERGENCY NOTIFICATION PROCEDURES are based on a simple concept – if you hear a fire alarm inside, proceed outside. If you hear a siren outside, proceed inside.**

• **Indoor Fire Alarms** mean to stop class or research and immediately **evacuate** the building.

o Proceed to your Emergency Assembly Area away from building doors. **Remain outside** until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.

• **All Hazards Outdoor Emergency Warning Sirens** mean to immediately seek shelter (**Shelter in Place**) in a safe location within the closest building.

o “Shelter in place” means seeking immediate shelter inside a building or University residence. This course of action may need to be taken during a tornado, a civil disturbance including a shooting or release of hazardous materials in the outside air. Once safely inside, find out more details about the emergency\*. **Remain in place** until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.

*\*In both cases, you should seek additional clarifying information by all means possible…Purdue Home page, email alert, TV, radio, etc…review the Purdue Emergency Warning Notification System multi-communication layers at* [*http://www.purdue.edu/ehps/emergency\_preparedness/warning-system.html*](http://www.purdue.edu/ehps/emergency_preparedness/warning-system.html)

**EMERGENCY RESPONSE PROCEDURES:**

• Review the **Emergency Procedures Guidelines** <https://www.purdue.edu/emergency_preparedness/flipchart/index.html>

• Review the **Building Emergency Plan** (available from the building deputy) for:

o evacuation routes, exit points, and emergency assembly area

o when and how to evacuate the building.

o shelter in place procedures and locations

o additional building specific procedures and requirements.

**EMERGENCY PREPAREDNESS AWARENESS VIDEOS**

• "Shots Fired on Campus: When Lightning Strikes," is a 20-minute active shooter awareness video that illustrates what to look for and how to prepare and react to this type of incident. See: <http://www.purdue.edu/securePurdue/news/2010/emergency-preparedness-shots-fired-on-campus-video.cfm> (Link is also located on the EP website)

**MORE INFORMATION**

Reference the Emergency Preparedness web site for additional information:

<http://www.purdue.edu/emergency_preparedness>

### Nondiscrimination

*Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life.*

*Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics.*

*Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, genetic information, marital status, parental status, sexual orientation, gender identity and expression, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in Purdue’s Equal Opportunity, Equal Access and Affirmative Action policy which provides specific contractual rights and remedies. Additionally, the University promotes the full realization of equal employment opportunity for women, minorities, persons with disabilities and veterans through its affirmative action program.*

*Any question of interpretation regarding this Nondiscrimination Policy Statement shall be referred to the*[***Vice President for Ethics and Compliance***](http://www.purdue.edu/ethics/)*for final determination.*