

University of Maryland at College Park
Department of Geographical Sciences
GEOG 477/ GEOG777: Mobile GIS Development

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Office hours: Mon 1:00pm – 2:00pm

Schedule of Classes

Lecture: MW 11:00am - 11:50am LEF 1201
Lab: W 12:00pm - 2:00pm LEF 1138

General information about the course

Do you carry maps to the field? Do you use maps and mobile devices to engage with your community? Do you leverage maps and apps on mobile devices when in the office and on the go? Advances in mobile computing and Cloud GIS have introduced new ways that GIS technology can be leveraged on mobile devices and extended the capabilities of traditional GIS with a higher level of portability and flexibility. This course is designed as an introduction to mobile GIS, to the programming concepts underlying mobile GIS development, and more importantly, to the design and implement of a mobile GIS application. The rapid progress of smartphones and tablets also introduced the variety of platforms (Android, iOS, Windows Phone, etc.), among which applications written in native languages are generally not compatible.

The development of mobile apps is generally classified into web app development and native app development. This course covers how to develop, test, and publish mobile GIS native apps working across two mobile platforms: Android and iOS. This course will also try to leverage the capabilities of JavaScript, Swift, Google maps, ArcGIS Server and runtime SDK to developing and publishing mobile GIS web apps.

The prerequisites for this course include Math 140/220, GEOG 306, 373, 376 or another advanced course (GEOG 473, 475, or 476) for Geographic Information Systems (GIS). Students taking the course must be familiar with geographic data structures, basic GIS concepts, and demonstrate basic understanding of object-oriented programming under GIS environment.

For graduated registered under **GEOG777**, there is a personal final project instead of a team project for undergraduate students, and the scope of knowledge covered in personal final projects is expected to be more advanced.

Learning outcomes for the course

Upon a successful completion of the course the students will be able to:

- Evaluate the pros, cons, and major challenges of developing and working with mobile GIS applications.
- Understand the key differences and similarities between various mobile GIS devices.
- Understand mobile application development and deployment process.
- Build mobile native apps using Google Maps API.
- Understand ArcGIS Server and mapping services for mobile apps.

- Build mobile native apps using ArcGIS Runtime SDKs.

Course materials

There is no required textbook for this class since we will be using the most recent online resources, and **tablets that run android and iOS will be loaned to registered students at no cost.**

Android emulator and iOS simulator can be used to develop and test mobile apps in a lot of cases, however, some map APIs won't work on emulators. When you deploy native apps to App Store and Android Apps Market after completing native app development you need to use a smartphone or a tablet (iPad or android tab).

In this class you must be comfortable with searching for resources to understand the concepts and terms that are new to you. Web searches and discussion boards are usually good places to find the up-to-date information pertaining to mobile devices and GIS applications on various platforms. These technologies are all constantly updated so we will all be learning together throughout the semester.

Optional textbooks:

Eric Pimpler, Mark Lewin (2017) Building Web and Mobile ArcGIS Server Applications with JavaScript - Second Edition. ISBN: 9781787280526

Harvey M. Deitel, Paul Deitel (2016) Android: How to Program, Third Edition. ISBN: 978-0134444307.

Additional web-based sources:

Official website to download and learn about android SDK
<http://developer.android.com/index.html>

Google Maps API for iOS, Android, and web
<https://developers.google.com/maps/>

ArcGIS APIs and runtime SDKs
<https://developers.arcgis.com/en/>

Other Useful References

- W3Schools online web tutorial, <http://www.w3schools.com/>
- W3Schools HTML5 tutorial, <http://www.w3schools.com/html5/default.asp>
- W3Schools JavaScript tutorial, <http://www.w3schools.com/js/default.asp>
- W3Schools CSS3 tutorial, <http://www.w3schools.com/css3/default.asp>
- W3Schools SVG (Scalable Vector Graphics) tutorial, <http://www.w3schools.com/svg/default.asp>
- YouTube Data API, <https://developers.google.com/youtube/v3/>
- Flickr APIs, <http://www.flickr.com/services/api/>
- PhoneGap, <http://phonegap.com/>
- iOS Dev Center, <https://developer.apple.com/devcenter/ios/index.action>

Course communication

The main course communication will be carried out through the **Canvas** within the University of Maryland Enterprise Learning Management System (ELMS; <https://elms.umd.edu>). All students enrolled in the course have access to the system. In

addition to communications, **Canvas** will be used by the instructor to post assignments and grades and by the students to submit their assignments.

Class structure

The class structure includes two 1-hour lecture (including lab) , and one 2-hour lab period per week. Lab sections will meet in LEF 1138.

Lecture component

Attendance for lectures in mandatory and will be recorded during the lecture.

Lab component

The course includes a lab component, which will be right after the lecturing component on Wednesdays. During the lab exercises the students will work individually to practice skills developed in the class. All deliverables as described in each lab assignment should be submitted to the **Canvas** by the posted deadlines. Late submissions are subject to 5% penalty per day. Labs will contribute 60% to the total grade for the course. There will be a total of 6 lab exercises. Each lab is worth 10% of the total grade.

Provisional outline of topics covered in the course and exams

Please note that modifications may be introduced to the schedule as the semester progresses. Updated schedules will be made available to all students via **Canvas** as soon as possible.

Week	Lecture		Topic
1	24, 29-Jan	31-Jan	Overview of Mobile App Development
2	5-Feb	7-Feb	Java Programming Overview and Android Overview
3	12-Feb	14-Feb	Android Application Components
4	19-Feb	21-Feb	Interface Design
5	26-Feb	28-Feb	Persistent Data & Location Based Services
6	5-Mar	7-Mar	Google Maps API
7	12-Mar	14-Mar	ArcGIS Server and Service Publishing
8	19-Mar	21-Mar	Reading Week
9	26-Mar	28-Mar	ArcGIS Runtime SDK for Android
10	2-Apr	4-Apr	ArcGIS Runtime SDK for Android II
11	9-Apr	11-Apr	IOS Development
12	16-Apr	18-Apr	Interface Design
13	23-Apr	25-Apr	Mobile GIS in IOS Development
14	30-Apr	2-May	Monetizing Apps and Publishing Apps
15	7-May	9-May	Course review, summary, Project presentation

Final Project

Final Project will present a combination of in-class and out-of-class work and assessment. Various components of the final project will be graded independently and will produce a single cumulative grade for the final project (100 points – worth 35% of the total grade for the course).

In the Final Projects you will:

1. Design a mobile GIS application (either android or iOS) for a specific purpose and audience of your choice.
2. Select and implement your chosen mobile GIS application in your production environment.
3. Implement capabilities for the user based on your application's purpose and goals.
4. Produce a final product that demonstrates the results of your final project work.

The Final Project will have 2 components for marking (Proposal – 25 points, presentation 75 points):

1. Proposal – one-page description of the proposed project.
2. Presentation–oral presentation: the plan and purpose of the project; the mobile GIS app; a description of the development and implementation of the application; issues encountered while completing the project; a demo of the mobile GIS application and its capabilities.

Grade determination

The total grade in the course will be comprised of the grades for the 6 labs (60%), the course project (40%). The general guidelines for letter grades will be as follows: $97 \leq \text{"A+"} \leq 100$, $93 \leq \text{"A"} < 97$, $90 \leq \text{"A-"} < 93$, $87 \leq \text{"B+"} < 90$, $83 \leq \text{"B"} < 87$, $80 \leq \text{"B-"} < 83$, $77 \leq \text{"C+"} < 80$, $73 \leq \text{"C"} < 77$, $70 \leq \text{"C-"} < 73$, $67 \leq \text{"D+"} < 70$, $63 \leq \text{"D"} < 67$, $60 \leq \text{"D-"} < 63$, $60 < \text{"F"}$. Minor adjustments may be introduced to the general scheme to allow for students grade distribution.

Expectations of students in the class

Class attendance is required. Students should be aware that most of the material covered in the class is not available in the optional textbook and will be presented in lectures only. Students are strongly encouraged to take careful notes during the lectures.

Students are expected to treat each other with respect. Disruptive behavior of any kind will not be tolerated. Students who are unable to demonstrate civility with one another, the teaching assistants, or the instructor will be subject to referral to the Office of Student Conduct or to the University Campus Police. You are expected to adhere to the Code of Student Conduct.

In this class, students will be allowed and encouraged to use their personal computers or other means of technology to take class notes and complete practice exercises.

Campus Policies

It is our shared responsibility to know and abide by the University of Maryland's policies that relate to all courses, which include topics like:

- Academic integrity
- Student and instructor conduct
- Accessibility and accommodations

- Attendance and excused absences
- Grades and appeals
- Copyright and intellectual property

Please visit www.ugst.umd.edu/courserelatedpolicies.html for the Office of Undergraduate Studies' full list of campus-wide policies and follow up with me if you have questions.

Get Some Help!

You are expected to take personal responsibility for your own learning. This includes acknowledging when your performance does not match your goals and doing something about it. Everyone can benefit from some expert guidance on time management, note taking, and exam preparation, so I encourage you to consider visiting <http://ter.ps/learn> and schedule an appointment with an academic coach. Sharpen your communication skills (and improve your grade) by visiting <http://ter.ps/writing> and schedule an appointment with the campus Writing Center. Finally, if you just need someone to talk to, visit <http://www.counseling.umd.edu>.

Everything is free because you have already paid for it, and everyone needs help... all you have to do is ask for it.