Mobile Game Programming
ITP 382x (3 Units)

Objective	This course provides students with an in-depth introduction to technologies and techniques used to create successful cross-platform mobile games. At semester's end, students will have: 1. Developed a solid foundation in software engineering for mobile games 2. Gained an understanding of Unity and C# and popular tools & plugins 3. Familiarized themselves with mobile usability and design concerns 4. Implemented several individual game project prototypes 5. Implemented a larger, demo-able game project in a team environment
Concepts	Working with Unity. Intermediate C#. Mobile input. Mobile game design. 2D & 3D. Math & Physics. Animation. Artificial Intelligence. Augmented reality games. UX. Networking. Multi-platform build systems. Optimization.
Prerequisites	CSCI 104 or ITP 365x
Website	All information and files, except grades, will be on Piazza.
Instructor	Mike Sheehan (msheehan@usc.edu only for personal or non-course questions)
Contact	Any questions related to the course and material should be posted on Piazza. Private questions are allowed only for private matters. TAs should also only be contacted through Piazza. Anything posted on Piazza is an official announcement.
Office Hours	Posted on Piazza
Assistants	Adrian Swanberg (swanberg@usc.edu) and Jordan Komoda (jkomoda@usc.edu)
Time/Location	M 6-9PM in OHE 540
Course Structure	For the first several weeks, students will spend the lab time working on small individual assignments for simple game prototypes. The intent is to familiarize students with the initial concepts covered in the first few lectures. These assignments must be completed *individually*. Once the individual assignments are complete, students will break into groups of 2-3 and work on programming a larger game project that they will take from concept/design to running on mobile devices and finishing with playtesting and polishing. More information regarding the team project is on the next page. To engender an enhanced understanding of the mobile game industry, there will be several guest mini-lectures. Students are encouraged to ask questions. There are two exams, which are comprehensive of all topics covered.
Textbooks	**Required:** *Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#*. Jeremy Gibson. ISBN-10: 0321933168. **Recommended**: *Game Programming Algorithms and Techniques.* Sanjay Madhav. ISBN-10: 0321940156.
Grading	The course is graded with the following weights:

Individual Assignments	15%
Team Project	40%
Participation and Professionalism	5%
Midterm Exam	20%
Final Exam	20%
TOTAL POSSIBLE	100%

Grading Scale	Letter grades will be assigned according to the following scale: 93%+ A 90-92% A- 87-89% B+ 83-86% B 80-82% B- 77-79% C+ 73-76% C 70-72% C- 69 D+ 67-68 D 66 D- 65 and below F Half percentage points will be rounded up to the next whole percentage. So for instance, 89.5% is an A-, but 89.4% is a B+. There is no curving. Students will receive the grade they earn. Several opportunities for a small amount of extra credit will be offered starting Week 4.
Team Project	Starting in Week 5, students will break into groups of 2-3 to work on a larger game of their own design. Before commencing work on their project, students must submit a game proposal and have it approved by the instructor. Working on a project that is not approved is not allowed. Students are expected to follow all procedures and instructions. Individual contributions will be evaluated during grading, and there will be a team evaluation process. As this is a fairly lengthy project (~11 weeks in length), staying organized as a team is very important and necessary for the instructor to know who is working on which task. Specifically, we will utilize Agile/Scrum and the online task board Trello. This will give students "real world" game development experience. By the end of the project every team member should be knowledgeable and confident regarding systems used for game creation and implementing gameplay. The project occurs in two phases with a presentation at the end of each phase. Much greater detail on the project, including all of the info here and how it is graded, will be provided in the team project guide available on Piazza. **Phase One** (6 weeks)**:** The first phase is intended to familiarize students with the concepts covered during the first half of the semester while creating a playable prototype. Students are encouraged to be creative with their game design ideas. Students should also follow the mobile design principles that are outlined in class. The proposal is required to outline the game idea, which systems and tasks will be completed for the playable prototype, and which systems and tasks are intended for phase two. **Phase Two** (~5 weeks, until last class)**:** The second phase kicks off with re-evaluating the tasks intended for phase two. Students will make them more granular, having had more experience, and then get approval from the instructor. The game must involve more technically sophisticated programming. Playtesting and iterating based on feedback is a requirement.

Policies	*Make-up policy for exams:* To make up for a missed exam, the student must provide a satisfactory reason (as determined by the instructor) along with proper documentation. Make-ups are only allowed under extraordinary circumstances. *Assignments:* Projects must be committed and in the student's repository by the due date. Late projects will not be accepted without penalty unless the student(s) meet the same criteria for making up exams. Assignments turned in one day late will have 20% of the total points deducted from the graded score. Assignments turned in two days late will have 50% of the total points deducted from the graded score. After two days, submissions will not be accepted thus receiving a 0. The Team Project will not be accepted late. It will be graded based on what's in the repository at the required time of presentation. Before logging off a computer, students must ensure that they saved projects created during the class or lab session. Any work saved to the computer will be erased after restarting the computer. ITP is not responsible for any work lost. Note: Dropbox is a great utility for securely backing up your work and optionally sharing with people (including hosting webpages): https://db.tt/Oq9yXfUO ITP offers Open Lab use for all students enrolled in ITP classes. These open labs are held beginning the second week of classes through the last week of classes. Specific times and days for the current semester are posted at http://itp.usc.edu/labs/ Students are expected to be in class, on time, distraction free, and respectful of whoever is presenting. Outside of class time, students should participate in Piazza. Students may install Unity Free on their own machine from unity3d.com/download. Recommendations are only considered for excellent students, based on final grade.
Hardware	Programming assignments are for mobile devices, specifically iOS and Android. Students are not required to have their own personal devices, as devices will be available during class as well as on a limited checkout basis from the ITP office.
Statement on Academic Conduct and Support Systems	**Academic Conduct** Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Section 11, *Behavior Violating University Standards* https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct/. Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* http://equity.usc.edu/ or to the *Department of Public Safety* http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us. This is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* http://www.usc.edu/student-affairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage sarc.usc.edu describes reporting options and other resources.

	Support Systems A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* http://dornsife.usc.edu/ali, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information http://emergency.usc.edu/* will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.
Students with Disabilities	Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. Website and contact information for DSP: http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html, (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu.
A Further Note on Plagiarism	In this class, all homework submissions will be compared with current, previous, and future students' submissions using MOSS, which is a code plagiarism identification program. If your code significantly matches another student's submission, you will be reported to SJACS with the recommended penalty of an F in the course. It is okay to discuss solutions to specific problems with other students, but it is not okay to look through another student's code. It does not matter if this code is online or from a student you know, it is cheating. Do not share your code with anyone else in this or a future section of the course, as allowing someone else to copy your code carries the same penalty as you copying the code yourself.

Course Outline

Week 1 (1/12) – Course Intro and Unity and C#
- Course Introduction
- Why Mobile?
- Unity and C#: Game Dev Basics, Scenes, Game Objects, Components, etc.

Reading: *Gibson*: Preface, Chapters 15-23

Tasks: Setup Git, Piazza, and Unity; Assignment #1 posted on Piazza

Week 2 (1/19) – **No class 1/19 due to Martin Luther King's Birthday.**

Reading: *Gibson*: Chapters 24-26, Appendix A

Tasks: Assignment #1 DUE Weds 1/21; Assignment #2 posted on Piazza

Week 3 (1/26) – Working with Unity and C#; 2D Graphics
- Unity and C#
- Camera
- Sprites and Texture Atlases
- Animation
- Scrolling

Tasks: Assignment #2 DUE Weds 1/28; Assignment #3 posted on Piazza

Week 4 (2/2) – Math and Physics; 3D Introduction
- Quick overview of vector math
- Physics principles
- 3D math primer
- Basics of the 3D world
- 3D rendering essentials
- Using Unity for 3D development

Reading: *Gibson*: Appendix B ("Math Concepts" and "Interpolation")

Tasks: Assignment #3 DUE Weds 2/4; Assignment #4 posted on Piazza

Week 5 (2/9) – Mobile Game Input; Designing for Mobile
- Basic Touch and Multi-Touch Gestures
- Accelerometer
- Virtual joypads
- Usability and Game case studies
- Designing for the impatient gamer

Reading: *Gibson*: Chapters 1, 2, 7, 8, 27, Appendix C

Tasks: Assignment #4 DUE Weds 2/11; Start Team Project (Phase One)

Week 6 (2/16) – **No class 2/16 due to Presidents' Day.**

Reading: *Gibson*: Appendix B ("User Interface Concepts")

Tasks: Continue work on Team Project (Phase One)

Week 7 (2/23) – Artificial Intelligence; Procedural Generation
- AI behavior
- Pathfinding
- Procedural generation

Reading: *Gibson*: Chapters 11 and 12

Tasks: Continue work on Team Project (Phase One)

Week 8 (3/2) – Tilemaps; Alternate Game Development Solutions
- Basic tilemaps and Isometric tilemaps
- Alternate game development solutions

Tasks: Continue work on Team Project (Phase One)

Week 9 (3/9) – **<u>Midterm Exam during lecture hours on 3/9</u>**

       Tasks: Continue work on Team Project (Phase One)

Spring Recess (3/16)	**Reading**: *Gibson*: Appendix B ("C# and Unity Coding Concepts") ***Tasks***: Continue work on Team Project (Phase One)

Week 10 (3/23) – Particle Effects; Audio
- Particle Effects
- Audio

       Tasks: **Present Team Project (Phase One)**, Start Team Project (Phase Two)

Week 11 (3/30) – Connecting (and selling) to the World; Data
- Networking
- Multiplayer principles
- Game Center and competitors
- "Social" mobile gaming
- Analytics
- Monetization
- Localization
- Remote Data and Data persistence

       Tasks: Continue work on Team Project (Phase Two)

Week 12 (4/6) – Playtesting and Tutorials; Augmented Reality Games
- Playtesting
- Tutorials
- Augmented reality games case studies
- Augmented reality games design principles

       Reading: *Gibson*: Chapters 10 and 13

       Tasks: Continue work on Team Project (Phase Two)

Week 13 (4/13) – Software Engineering for Games
- Game Architecture and Implementation Patterns
- Optimization
- Pipelines and Tools
- Profiling
- Build Systems
- Testing

       Tasks: Continue work on Team Project (Phase Two)

Week 14 (4/20) – Advanced Graphics on Mobile; Native Development
- Shaders on mobile
- Advanced 3D effects
- Plugins

       Tasks: Continue work on Team Project (Phase Two)

Week 15 (4/27) – Publishing and Conclusion
- Deploying on the App Store
- Thin line between success and failure
- Future of mobile games

       Reading: *Gibson*: Chapter 14

       Tasks: **Present Team Project (Phase Two)**

<u>Final Exam 5/11 @ 7PM in OHE 540</u>

This syllabus is subject to change.