Course title: Advances in GIS and Current Trends			
Course code: NRG 179	**No. of credits:** 4	**L-T-P:** 22-10-48	**Learning hours:** 56
Pre-requisite course code and title (if any):			
Department: Department of Natural Resources			
Course coordinator: Dr.Anu Rani Sharma	**Course instructor**: Mr Piyush Dubey		
Contact details:			
Course type: Core	**Course offered in:** Semester 3		

Course Description

This course is designed to introduce Web GIS, programming concepts for constructing high quality web mapping applications, participatory GIS, mobile GIS and fundamental concepts behind Internet of Things. The course will be delivered using both COTS and FOSS platform and related programming tools to customize web-mapping applications and to develop distributed GIS based web services.

Course objectives

1. Introduces new ways of data collections, dissemination and applications of GIS technology
2. Provide state-of-art technical skills to build Web GIS applications and the knowledge needed to choose from various Web GIS development options
3. Introduces fundamental concepts of Internet of Things and its applications in GIS

Course content

Module	Topic	L	T	P
1.	Introduction to Web mapping, Web publishing technology: CSS and HTML	2		
2.	WebGIS: Concept of WebGIS, Server Architecture, Web server, Application server, Database server, GIS server	2	2	
3.	Web server: IIS server, apache tomcat / GIS server: ArcGIS server, Geoserver / Database server: Oracle, postgreSQL	2		
4.	Database Management in Oracle and PostgreSQL, sde architecture in Oracle and PostgreSQL	2		
5.	Introduction to GIS web services: WMS, WFS, WMTS, Mapservices, Feature Services. Publishing Spatial data as one of the above specified web services	2	2	
6.	Web Mapping: Introduction, Geospatial web services, Geospatial mashups	2		
7.	Participatory GIS and Mobile GIS	2	2	
8.	Distributed GIS System	2		
9.	Internet GIS : Web mapping application using open source api to consume GIS web services in web application.	4	2	
10.	Internet of Things: Introduction, Designing principles for connected devices, Internet Principles, Embedded devices and codes (sensors, actuators, platform: Arduino, Raspberri Pi), Applications in GIS	2	2	
	LAB			
1.	Creating a webmap using Google map and ArcGIS online			4
2.	Write a page using HTML and CSS			4

3.	Creating web application using spatial data			4
4.	Writing query in PostgreSQL and creating a customized map			8
5.	Creating a geodatabase using ArcSDE			4
6.	Creating web maps using different web services: leaflet, geoserver			8
7.	Development of distributed GI services application			4
8.	Development of mobile app			6
9.	Creating a web based map using open source API			6
	Total	**22**	**10**	**48**

Evaluation criteria

- Test 1: 15% [Modules 1, 2 and 3] (Learning outcome1)
- Test 2: 15% [Module 4,5 and 6] (Learning outcome 1,2 and 3)
- Assignment/tutorial: 20% [every week] (All the learning outcomes over semester)
- Lab Exam: 20% [from all modules at the end of semester] (All the learning outcomes)
- Test 3: 30% [All the modules] (All the learning outcomes)

Learning outcomes

After completion of this course students should be able to

1. Assess benefits and challenges of development of web based application in GIS
2. Differentiate between webGIS, mashup, mobile GIS
3. Critically examine the internal workings of "communities" and "mapping."
4. Able to develop web based application in GIS

Pedagogical approach

The course will be delivered through class lectures, lab exercise and tutorials

Course Reading Materials

1. Peng, Z. R., & Tsou, M. H. (2003). *Internet GIS: distributed geographic information services for the internet and wireless networks*. John Wiley & Sons.(Module 1-6)
2. Sheehan, M. (2015). *Developing Mobile Web ArcGIS Applications*. Packt Publishing Ltd. (Module 7)
3. Weiner, D., & Harris, T. M. (2008). Participatory geographic information systems. *The handbook of geographic information science*, 466-480. (module 7)
4. McEwen, A., & Cassimally, H. (2013). *Designing the internet of things*. John Wiley & Sons (Module 10)

Advanced Reading Material

1. McCord, P., Tonini, F., & Liu, J. (2018). The Telecoupling GeoApp: A Web-GIS application to systematically analyze telecouplings and sustainable development. *Applied Geography*, 96, 16-28.
2. Al–Sahly, A., Hassan, M. M., Al–Rubaian, M., & Al–Qurishi, M. (2018, April). Using GIS for Measuring Mobile Tower Radiation on Human. In 2018 *1st International Conference on Computer Applications & Information Security (ICCAIS)* (pp. 1-6). IEEE.
3. Radil, S. M., & Anderson, M. B. (2018). Rethinking PGIS: Participatory or (post) political

GIS?. *Progress in Human Geography*, 0309132517750774.

4. Cao, H., & Wachowicz, M. (2019). The design of an IoT-GIS platform for performing automated analytical tasks. *Computers, Environment and Urban Systems*, 74, 23-40.

Recommended journals for reference

5. Journal of Digital Earth,
6. Computers, Environment and Urban System
7. Computer and Geosciences

Additional information (if any)

Student responsibilities

The students are expected to submit assignments in time and come prepared with readings when provided.

Course reviewers: s

1. Prof. C. Jeganathan, BIT Mesra, Ranchi.
2. Mr. Greg Fiske, Senior Geospatial Analyst, WHRC, USA