Disiplinlerarası Mühendislik Tasarım Projesi Dersi Bilgi Formu

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Grup Özelinde Doldurulacaktır

Dersi Veren Öğretim Üyeleri: Doç. Dr. Gökçen BOMBAR – Dr. Öğr. Üyesi Müge AĞCA
Dersin Yardımcıları: -

Çalışma Konusu: **Taşkın Risk Haritalama ve Analizi**

Ortak çalışma amacı:

Taşkın risk modellemesinde kullanılan simülasyon yazılımlarının öğrencilere tanıtılması,
İnşaat mühendisliği bölümü tarafından öğrencilere hidroloji ve hidrolik hakkında genel bilgilerin verilmesi
Harita mühendisliği bölümü tarafından simülasyon programlarındaki en önemli girdi parametresi olan topografik verilerin hassas ve yüksek doğrulukta ileri teknoloji kullanarak elde edilmesinin öğrencilere aktarılması.

Her bölüme açılan öğrenci kontenjanı: **CE: 10 --- GE: 15**

Değerlendirme araçları ve oranları:

Proje	**% 40**	
	Ödevler	**20 %**
	Poster sunumu	**20 %**
Final	**% 60**	
	Proje raporu	**40 %**
	Final sınavı	**20 %**

Dersin İçeriği:

1. Temel Hidrolik Bilgileri
2. Temel Hidrolik Bilgileri
3. Temel Hidrolik Bilgileri
4. Temel Hidroloji Bilgileri
5. Uzaktan algılama, fotogrametri ve coğrafi bilgi sistemlerinin tanıtımı
6. Uzaktan algılama, fotogrametri ve coğrafi bilgi sistemlerinin tanıtımı
7. Ara sınav
8. Farklı veri türleri (raster, vektör), Veri elde etme yöntemleri, Veri kaynakları
9. Hassas ve yüksek doğruluğa sahip topografik verilerin kullanımının önemi. Temel terminolojiler (SYM, SAM, Hillshade, slope, aspect, counters, simülations, 3B modelleme)
10. Topografik verilerin elde edilmesi ve 3B modelleme (teori ve uygulama)
11. Topografik verilerin elde edilmesi ve 3B modelleme (teori ve uygulama)
12. Risk analizi, risk yönetimi, risk değerlendirmesi
13. HEC-RAS
14. HEC-RAS
15. Final

Interdisciplinary Engineering Design Project - Course Information Form
To be filled based on the specific group

Course Instructors: Doç. Dr. Gökçen BOMBAR – Dr. Öğr. Üyesi Müge AĞCA

Instructor's Assistants: -

Subject of the Study: **Flood Risk Mapping and Analysis**
Taşkın Risk Haritalama ve Analizi

Aim of the Study:

Introducing the software used in flood risk modeling to students,
Presenting general information about hydrology and hydraulics to the students by the Civil Engineering Department
Presenting the ways to obtain the topographic data using advanced technology with precision and high accuracy, which is the most important input parameter in simulation programs by the Geomatics Engineering Department.

Student Quota for Each Department: **CE: 10 --- GE: 25**

Course Evaluation:

Project	**% 40**	
	Homeworks	**20 %**
	Poster presentation	**20 %**
Final (proje)	**% 60**	
	Project report	**40 %**
	Final exam	**20 %**

Textbook / Course Material / Recommended Literature:

References for Hydrology:

Nurünnisa Usul, Engineering Hydrology, ODTÜ
Ercan Kahya, Lecture Notes
Mehmetçik Bayazıt, Hidroloji
Kasım Yenigün & Veysel Gümüş, Hidroloji Ders Notları, Harran Üniversitesi

References for Hydraulics:

M. Şükrü Güney, Laboratuar Uygulamalı Hidrolik. DEÜ Mühendislik Fakültesi.
Terry W. Sturm, Open Channel Hydraulics, 3rd Edition, ISBN: 9781260469707, 2021 McGraw Hill
Ranald V. Giles, Jack B. Evett, Cheng Liu, Schaum's Outline of Fluid Mechanics and Hydraulics, ISBN: 9780071831451, 2014 McGraw-Hill Education

References for HEC-RAS:

Download HEC-RAS: https://www.hec.usace.army.mil/software/hec-ras/download.aspx
HEC-RAS Hydraulic Reference Manual
https://www.hec.usace.army.mil/confluence/rasdocs/ras1dtechref/latest
HEC-RAS User's Manual https://www.hec.usace.army.mil/confluence/rasdocs/rasum/latest
HEC-RAS 2D User's Manual https://www.hec.usace.army.mil/confluence/rasdocs/r2dum/latest
HEC-RAS Mapper User's Manual https://www.hec.usace.army.mil/confluence/rasdocs/rmum/latest
Mehmet Ardıçlıoğlu, "Açık Kanal Akımları ve HEC-RAS Uygulamaları", 2017.
https://www.mehmetardiclioglu.com/_files/ugd/4045bc_995e8148557e4f28908419ed407629b3.pdf
Mehmet Ardıçlıoğlu, Open Channel Flows and HEC-RAS Applications, LAP LAMBERT Academic Publishing, ISBN: 978-62-0-21608-3, 2019.
Mehmet Ardıçlıoğlu, "HEC-RAS Mapper ile Akarsuların 1D/2D Modellenmesi ve Uygulamalar", 2020.
https://www.mehmetardiclioglu.com/_files/ugd/4045bc_cd8ad0e7513345a6b7fd02ef003500ab.pdf

Additional HEC-RAS YouTube videos:

Soner Tuglu, HEC RAS ÖĞRENİYORUM
https://www.youtube.com/watch?v=WTtiKWkqeRo&list=PLRnE1vfGs4GAg4m38QPxqa7GJQ6hzNrCk

References for Remote Sensing and Photogrammetry:

Vosselmann, G., Maas, H.G., Airborne And Terrestrial Laser Scanning, ISBN-10: 1439827982, 2010.

Kraus, K., Photogrammetry: Geometry from images and laser scans, ISBN-10: 3110190079, 2007.

Shan, J., Toth, C.K., Topographic Laser Ranging and Scanning: Principles and Processing, ISBN-10: 1420051423, 2008.

Reshetyuk, Y., Terrestrial laser scanning: Error sources, self-calibration and direct georeferencing,2009.

Kraus, K., Photogrametry Volume 1, Fundamentals and Standard Processes, 389 P., Germany, 1993.

Mikhail, E., M., Bethel, S., J., McGlone, J., C., 2001, Modern Photogrammetry, John Wiley-Sons, USA, 473 P, 1997.

Course Content:

Week	Chapter	Examples and Homeworks
1	**Fundamentals of Hydrology** Precipitation Definition of precipitation Methods to obtain and measure precipitation Analysis of precipitation records hyetograph, filling the missing observations, areal average precipitation, double mass curve method, probable maximum precipitation Streamflow Definition of streamflow Velocity, discharge, stage measurements Stage discharge curve, flow mass curve, Evaporation Definition of evaporation, transpiration and evapotranspiration Factors affecting evaporation Methods to obtain and measure evaporation Infiltration Definition of infiltration Methods to obtain and measure infiltration Infiltration index	
2	**Fundamentals of Hydraulics** Laminar and turbulent flow Reynolds number Velocity profile and shear stress distribution Major and minor head losses Classification of open channel flows Artificial channels – natural channels Loose boundary channels – fixed bed channels 1D, 2D and 3D flow Uniform flow – non-uniform flow Gradually varied flow and rapidly varied flow Steady flow – unsteady flow Definition of hydraulic radius, top width, Froude number and Reynolds number in open channels Definition of normal depth, critical flow depth	**Ex:** Reynolds number uniform flow depth critical flow depth
3	**Fundamentals of Hydraulics** Governing Equations Continuity equation Energy equation Momentum equation Concept of specific energy Rapidly varying flows Hydraulic jump, Bump, hole, contraction, expansion, Control structures (gates, sharp and broad crested weirs) Gradually varied flows M, S, C, H and A profiles Direct step method and standard step method Example numerical solution by DSM&SSM	**Ex:** Specific energy – depths Gradually varied flow DSM&SSM **HW 1 (4%):** Gradually varied flow, M and S profiles with DSM&SSM (Rectangular channel but B, n, Q, S_o, $h_{boundary}$ are different for each student)
4	**Application of HEC-RAS for a simple open channel** Downloading and basic information on HEC-RAS Hydraulic concepts in HEC-RAS Entering the geometry data for the example solved Entering river, reach & station names, coordinates Inter/extrapolation and modification of x-sections Entering the roughness data Entering the discharge data	**HW 2 (4%):** Gradually varied flow, M and S profiles with HEC-RAS (Rectangular channel but B, n, Q, S_o, $h_{boundary}$ are different for each student)

	Entering the boundary conditions Running the HEC-RAS program for steady uniform flow conditions Comparison of SSM and HEC-RAS solutions	
5	**Remote Sensing, photogrammetry and geographic information systems** Definition of systems and technologies Introduction to the fundamentals of remote sensing, photogrammetry, and GIS technologies Operation principles of systems (passive and active systems)	
6	**Remote Sensing, photogrammetry and geographic information systems** Operation principles of systems (passive and active systems) Systems components Comparisons of systems and data Data integration	
7	**Midterm** (no class)	
8	**Different data types (raster, vector), Methods of data collection, Data sources** Data collection platforms Data processing using software Data Integration Evaluation of the data structure	
9	**The importance of using sensitive and highly accurate topographical data. Basic terminologies (DEM, DTM, Hillshade, slope, aspect, counters, simulations, 3D modeling)**	
10	**Obtaining topographic data and 3D modelling (theory and application)** Processing of topographic data Creation of 3D models	
11	**Obtaining topographic data and 3D modelling (theory and application)** Processing of topographic data Creation of 3D models	
12	**Risk analysis, risk management, risk assessment**	
13	**Application of HEC-RAS for a real-life situation** Entering the geometry data (river, reach & station names, coordinates) Inter/extrapolation and modification of x-sections Entering the roughness data Entering the discharge data Entering the boundary conditions Entering the	Part of the report & poster
14	**Application of HEC-RAS for a real-life situation** Entering the geometry data	Part of the report & poster
15	**Final**	**Exam (20 %)** **Poster presentation (20%)** **Project report (40 %)**