



Man-made Hazards and Disaster risk management

Course description sheet

Basic information

Field of study Geodesy, Surveying and Cartography		Didactic cycle 2024/2025	
Major Surveying and Geohazards		Course code DGIKGGS.IIi4.00894.24	
Organisational unit Faculty of Geo-Data Science, Geodesy, and Environmental Engineering		Lecture languages English	
Study level Second-cycle (engineer) programme		Mandatoriness Elective	
Form of study Full-time studies		Block Major Modules	
Profile General academic		Course related to scientific research Yes	
Course coordinator	Agnieszka Malinowska		
Lecturer	Agnieszka Malinowska		
Period Semester 3	Method of verification of the learning outcomes Completing the classes	Number of ECTS credits 3	
	Activities and hours Project classes: 30		

Course's learning outcomes

Code	Outcomes in terms of	Learning outcomes prescribed to a field of study	Methods of verification
Knowledge - Student knows and understands:			

Code	Outcomes in terms of	Learning outcomes prescribed to a field of study	Methods of verification
W1	rules of engineering structure vulnerability assessment. Student has knowledge about the most reliable methods for surface deformation prognosis. Student has knowledge about engineering structure hazards assessments.	GIK2A_W01, GIK2A_W03, GIK2A_W06, GIK2A_W07	Activity during classes, Participation in a discussion, Execution of exercises, Case study, Involvement in teamwork, Essays written during classes
W2	methods and rules for hazards reduction in different circumstances.	GIK2A_W03, GIK2A_W07	Participation in a discussion, Execution of a project, Case study, Involvement in teamwork, Essays written during classes
Skills - Student can:			
U1	Student is able to work in a team and appreciate the value of teamwork Student is open to new ways of solving problems and is able to discuss and critique methods applied for resolving problems. Student can express their ideas and solutions implemented through public speaking Student can establish weaknesses in the methods applied and can defend thesis. Student understands and appreciates intellectual property.	GIK2A_U04, GIK2A_U06, GIK2A_U07, GIK2A_U08, GIK2A_U09, GIK2A_U10, GIK2A_U11, GIK2A_U12	Activity during classes, Participation in a discussion, Execution of a project, Project, Case study, Involvement in teamwork, Essays written during classes, Presentation, Oral answer
Social competences - Student is ready to:			
K1	work in a team and appreciate the value of teamwork. Student is open to new ways of solving problems. Student is able to discuss and critique methods applied for resolving problems. Student can express their ideas and solutions implemented through public speaking. Student can establish weaknesses in the methods applied. Student can defend thesis. Student understands and appreciates intellectual property.	GIK2A_K01, GIK2A_K02	Activity during classes, Participation in a discussion, Execution of laboratory classes, Case study, Involvement in teamwork, Essays written during classes, Oral answer

Program content ensuring the achievement of the learning outcomes prescribed to the module

Upon successful completion of this course, students should be able to: understand basic man-made hazards and implement the methods for assessments.

Student workload

Activity form	Average amount of hours* needed to complete each activity form
Project classes	30
Preparation for classes	35
Contact hours	5
Preparation of project, presentation, essay, report	20

Student workload	Hours 90
Workload involving teacher	Hours 30

* hour means 45 minutes

Program content

No.	Program content	Course's learning outcomes	Activities
1.	Course Concerns: Surface continuous and discontinuous deformation cause financial losses. Properly designed monitoring of the hazards and reliable hazard prognosis may lead to reduction of those losses. The problem of properly established hazard management is also a very significant social issue.	W1, W2, U1, K1	Project classes
2.	<p>Course Objectives: Upon successful completion of this course, students should be able to:</p> <ul style="list-style-type: none"> • understand basic man- made hazards (e.g., continuous surface deformation, discontinuous surface deformation and their monitoring) • understand the basic rules of assessment of structure vulnerability (railway tracks, pipelines etc) • implement the methods for assessments (Polish, worlds experiences) • know the methods and rules for hazards reduction in different circumstances • analyze the underlying probability distributions of various hazards, including magnitude and frequency distributions for different hazards • use GIS for spatial analysis, mapping, risk assessment and real-time management of disasters and their effects • reduce hazards in different circumstances • showcase professional research, analysis, writing, and presentation skills <p>The course will deal with the following topics (among others):</p> <ul style="list-style-type: none"> • principles of GIS techniques • spatial modeling of hazards • mapping of elements at risk • vulnerability assessment • risk assessment and risk reduction planning <p>research skills and methodology; thesis research</p>	W1, W2, U1, K1	Project classes

No.	Program content	Course's learning outcomes	Activities
3.	<p>Tentative List of Topics: Week 1-2: Monitoring surface deformation Integration of the results of the surface monitoring in GIS database. Estimation of the surface deformation factors and their reliability analysis. Evaluation of the areas being under influence of dynamic and vanishing surface deformations.</p> <p>Week 3-6: Risk Assessment of engineering structures affected by continuous deformation Integration spatial data concerning engineering structures and continuous surface deformation predicted in GIS. Estimation of the engineering structures vulnerability. Hazard assessment of the engineering structures which will be affected by surface deformation. Analysis of the reliability of the assessments done. Proposition of the risks reduction.</p> <p>Week 7-12 Risk assessment terrain surfaces affected by discontinuous deformation Integration spatial data concerning risk factors causing discontinuous surface deformation in GIS. Estimation of the areas hazarded by discontinuous deformation. Comparison of the results achieved with a use of different methods. Analysis of the reliability of the assessments done.</p> <p>Week 13-14 Risk assessment of terrain surfaces affected by continuous deformations caused by liquid reservoirs exploitation Integration spatial data concerning risk factors causing continuous surface deformation in GIS. Estimation of the areas hazarded by continuous deformation. Analysis of the reliability of the assessments done.</p>	W1, W2, U1, K1	Project classes

Extended information/Additional elements

Teaching methods and techniques :

Project Based Learning, Group work, Case study

Activities	Methods of verification	Credit conditions
Project classes	Activity during classes, Participation in a discussion, Execution of exercises, Execution of a project, Execution of laboratory classes, Project, Case study, Involvement in teamwork, Essays written during classes, Presentation, Oral answer	

Method of determining the final grade

Grading is based on series of : • tests -individual work, • written state of the art- team work, • discussion, quizzes -team work, • collaborative research project. Student has to pass 7 tests concerning vocabulary and knowledge elicited form 7 hazard issues. This tests will be worth 20% of final grade. Students working in groups have to write short critical assignments about state of the art in 7 hazard issues. Team work assume that every student will write critical reviews based on at least one research journals (in 7 hazards issues). This assignments will be worth an additional 25% of the final grade. Every group will have an opportunity to present their point of view in the front of other students. That will give an additional 25 % of the final grade. The collaborative project will entail small student groups (4-5 people) collecting information about state of the art in 7 hazards issues. Critical review of most current research solution will allow students to elect best method

for resolve given problems. Based on students experiences and ability to GIS application in resolving spatial problem, they will chose the way of solving hazard problem. Every group need to prepare assignment which will summaries presented solution with the state of the art (30%). The allocation of grade points is as follows: 20 points = short tests (7x) 25 points = critical review essay (7x) 25 points = discussion 30 points = collaborative report and presentation (7x)

Prerequisites and additional requirements

Academic level and background

Applicants for the Master of Science (MSc) degree programme should have a Bachelor degree or equivalent from a recognised university in a discipline related to the course, preferably combined with working experience in a relevant field.

English language

As all courses are given in English, proficiency in the English language is a prerequisite. Please note: the requirements when applying for fellowships may vary according to the regulations of the fellowship provider. English language tests: minimum requirements B2 level.

Computer skills

Applicants for the course should have at least 2 semesters experiences in GIS application in resolving environmental problems.

Rules of participation in given classes, indicating whether student presence at the lecture is obligatory

Auditorium classes: Studenci przystępując do ćwiczeń są zobowiązani do przygotowania się w zakresie wskazanym każdorazowo przez prowadzącego (np. w formie zestawów zadań). Ocena pracy studenta może bazować na wypowiedziach ustnych lub pisemnych w formie kolokwium, co zgodnie z regulaminem studiów AGH przekłada się na ocenę końcową z tej formy zajęć.

Literature

Obligatory

1. Required Textbooks:
2. There is no required textbook. Required readings will be posted, including a mix of web sites and refereed journal articles from our Library's online collection.
3. Recommended Texts:
4. While not required, you may want to add one or more of the following to your personal library:
5. • Chilingarian G. V., Donaldson E. C. and Yen T. F.: Subsidence due to fluid withdrawal. Amsterdam : Elsevier Science, 1995.
6. • Kratzsch H. : Mining subsidence engineering. Berlin, Springer-Verlag, 1983.
7. • Rougier J., Sparks S., Hill L. J.: Assessment of risk and uncertainty is crucial for natural hazard risk management. University of Bristol.
8. • Tiberius, C. C. J. M.: Recursive data processing for kinematic GPS surveying . Delft : NCG, 1998.
9. • Whittaker B. N. and Reddish D. J.: Subsidence : occurrence, prediction and control / and David J. Reddish. Elsevier, 1989.
10. • Waltham T.: Sinkholes and subsidence : karst and cavernous rocks in engineering and construction / Tony Waltham, Fred Bell, Martin Culshaw. Berlin : Springer, 2005.

Scientific research and publications

Publications

1. 1. 3D survey of terrain surface deformation in the area of underground copper mining / R. HEJMANOWSKI, A. MALINOWSKA, T. STOCH, G. Patykowski, W. Skobliński // W: Proceedings of the XIV international congress of the International Society for Mine Surveying [Dokument elektroniczny] : 20-24 September 2010, Sun City, South Africa. — Wersja do Windows. — Dane tekstowe. — S.l. : Beta Products cc, [2010]. — Dysk Flash. — e-ISBN: 978-0-620-48540-1. — S. [1-6]. — Wymagania systemowe: Adobe Acrobat Reader. — Bibliogr. s. [6], Abstr.
2. 2. Accuracy estimation of the approximated methods used for assessing risk of buildings damage under the influence of underground exploitation in the light of world's and Polish experience, Pt. 2 — Analiza dokładności przybliżonych

- metod oceny zagrożenia budynków wpływami podziemnej eksploatacji stosowanych w świecie i polskiej metody punktowej, Cz. 2 / Agnieszka MALINOWSKA // Archives of Mining Sciences = Archiwum Górnictwa ; ISSN 0860-7001. — 2013 vol. 58 no. 3, s. 855-865. — Bibliogr. s. 865
3. 3. Analysis of methods used for assessing damage risk of buildings under the influence of underground exploitation in the light of world's experience, Pt. 1 — Analiza metod oceny zagrożenia obiektów budowlanych eksploatacją podziemną w świetle doświadczeń światowych, Cz. 1 / Agnieszka MALINOWSKA // Archives of Mining Sciences = Archiwum Górnictwa ; ISSN 0860-7001. — 2013 vol. 58 no. 3, s. 843-853. — Bibliogr. s. 853
 4. 4. A fuzzy based-approach to building damage risk assessment / Agnieszka MALINOWSKA // W: Land subsidence, associated hazards and the role of natural resources development [Dokument elektroniczny] : proceedings of EISOLS Eight International Symposium on Land Subsidence : Queretaro, Mexico 2010 / eds. Dora Carreón-Freyre, Mariano Cerca, Devin I. Galloway. — Wersja do Windows. — Dane tekstowe. — [Mexico : IAHS], [2010]. — Tryb dostępu: [url\{http://iahs.info/redbooks/339.htm\}](http://iahs.info/redbooks/339.htm) [2010-12-20]. — (IHAS Publication ; 339). — e-ISBN: 978-1-907161-12-4. — S. 443-448. — Wymagania systemowe: Adobe Acrobat Reader
 5. 5. Influence of mining tremors on deformation of terrain surface / Ryszard HEJMANOWSKI, Mieczysław JÓŹWIK, Agnieszka MALINOWSKA, Paweł ĆWIAKAŁA, Anton Sroka, Grzegorz Patykowski // W: 13. Geokinematischer Tag des Institutes für Markscheidewesen und Geodäsie : 10. und 11. Mai 2012, Freiberg / Hrsg. A. Sroka ; TU Bergakademie Freiberg. — Essen : VGE Verlag GmbH, cop. 2012. — (Schriftenreihe des Institutes für Markscheidewesen und Geodäsie an der Technischen Universität Bergakademie Freiberg ; H. 2012-1). — Opis części. wg okł.. — ISBN: 978-3-86797-137-9. — S. 220-225. — Bibliogr. s. 225, Zsfassung., Abstr.
 6. 6. Modelling of cave-in occurrence using AHP and GIS / A.A. MALINOWSKA, K. Dziarek // Natural Hazards and Earth System Sciences ; ISSN 1561-8633. — 2014 vol. 14 no. 8, s. 1945-1951. — Bibliogr. s. 1950-1951, Abstr.. — tekst: <http://www.nat-hazards-earth-syst-sci.net/14/1945/2014/nhess-14-1945-2014.pdf>
 7. 7. Spatial-temporal distribution of surface deformation in the light of observed damage in pipelines / Agnieszka MALINOWSKA, Ryszard HEJMANOWSKI, Michał Szadziul // W: XV international ISM congress 2013 (International Society for Mine Surveying) ; Energie und Rohstoffe 2013 ifm & DMV [Dokumenty elektroniczne] : Eurogress Aachen in conjunction with the German Mine Surveyor Association (Deutscher Markscheder - Verein e.V. - DMV : September 16-20, Aachen : proceedings volumes, 1 and 2. — Wersja do Windows. — Dane tekstowe. — [Germany : s.n.], [2013]. — Dysk Flash. — e-ISBN: 978-3-86948-294-1. — S. 824-841. — Wymagania systemowe: Adobe Reader. — Bibliogr. s. 840-841, Abstr.. — Toż w wersji drukowanej w vol. 2

Learning outcomes prescribed to a field of study

Code	Content
GIK2A_K01	działania w sposób kreatywny i przedsiębiorczy z uwzględnieniem krytycznej oceny posiadanej wiedzy i potrzeby konsultacji eksperckich
GIK2A_K02	wypełniania zobowiązań społecznych, przekazywania społeczeństwu osiągnięć nauki i techniki w sposób zrozumiały i uwzględniający różne aspekty działalności inżynierskiej, a także działania na potrzeby interesu społecznego
GIK2A_U04	planować i przeprowadzać eksperymenty z wykorzystaniem zaawansowanych metod analitycznych i symulacyjnych oraz formułować, projektować i rozwiązywać skomplikowane zadania inżynierskie, prawidłowo szacując nakład pracy i koszty realizacji, a także rozumiejąc ich znaczenie
GIK2A_U06	posługiwać się technikami informacyjno-komunikacyjnymi właściwymi do realizacji zadań typowych dla działalności inżynierskiej,
GIK2A_U07	formułować i testować hipotezy statystyczne związane z problemami inżynierskimi i badawczymi
GIK2A_U08	ocenić przydatność i możliwości wykorzystania nowych technik i technologii pozyskiwania danych przestrzennych oraz zaawansowanych narzędzi informatycznych służących do przetwarzania i analizy wyników obserwacji, dokonać krytycznej analizy ich funkcjonowania i zaproponować usprawnienia istniejących rozwiązań
GIK2A_U09	rozwiązywać złożone zadania inżynierskie z zakresu wybranej specjalności na kierunku Geodezja i Kartografia, stosując nowoczesne metody i uwzględniając komponent badawczy, w tym dokonać identyfikacji i sformułować specjalistyczną specyfikację zadania oraz opracować procedurę realizacji uwzględniając aspekty pozatechniczne
GIK2A_U10	zaprojektować i wykonać badania relacji przestrzennych w środowisku oraz zinterpretować ich wyniki, dokonując krytycznej analizy stosowanych metod, z uwzględnieniem komponentu badawczego i aspektów pozatechnicznych
GIK2A_U11	zapisywać obiekty świata rzeczywistego w systemie informacji przestrzennej oraz tworzyć i realizować procedury postępowania w języku formalnym za pomocą złożonych narzędzi programowych, dokonując krytycznej analizy stosowanych metod, uwzględniając komponent badawczy i aspekty pozatechniczne
GIK2A_U12	przygotować kompletny raport z wykonanych obserwacji i analiz, ze świadomością potrzeby jego sformułowania w sposób zrozumiały dla odbiorców, w tym odbiorców z innych dziedzin, oraz przygotować dokumentację geodezyjną dla celów projektowych, przemysłowych, wykonawczych i inwentaryzacyjnych, zgodnie z wymaganiami formalnymi
GIK2A_W01	zaawansowane zagadnienia z matematyki przydatne do formułowania i rozwiązywania szczegółowych problemów z geodezji i kartografii oraz dziedzin pokrewnych
GIK2A_W03	specjalistyczne zagadnienia z zakresu geodezji i kartografii oraz uwarunkowania prawne, ekonomiczne i etyczne normujące działalność w dziedzinie geodezji i kartografii i w innych dziedzinach z nią związanych, w tym podstawowe zasady tworzenia i rozwoju różnych form indywidualnej przedsiębiorczości oraz ochrony własności przemysłowej i prawa autorskiego,
GIK2A_W06	specjalistyczne metody pozyskiwania, analizowania, modelowania i wizualizowania danych przestrzennych i zmian tych danych spowodowanych procesami naturalnymi i technologicznymi
GIK2A_W07	zasady planowania eksperymentów i symulacji komputerowych oraz zasady interpretowania uzyskanych wyników