Doktorandkurser inom Forskningsplattformen

2019-03-13

Kursprogrammet 2019-2020

Stadsmodell

Kurs 1: **Geodetisk datainsamling för stadsmodeller (4hp)**

Ansvarigt universitet: Kungliga tekniska högskolan (KTH)

Kursen ges: *April till Juni 2019*

Kontakt: Kent.eriksson@abe.kth.se

Kurs 2: **Stadsmodeller/BIM samt spatial analys baserat på stadsmodeller (4 hp)**

Ansvarigt universitet: Lunds Universitet (LU)

Kursen ges: *Mars till Juni 2019*

Kontakt: lars.harrie@nateko.lu.se

Riskhantering

Kurs 3: **Risker, osäkerheter och beslutsfattande i den moderna byggprocessen (5 hp)**

Ansvarigt universitet: Lunds tekniska högskola (LTH)

Kursen ges: *Januari till mars 2020*

Kontakt: oskar.larsson_ivanov@kstr.lth.se eller ivar.bjornsson@kstr.lth.se

Automation inom industriellt byggande

Kurs 4: **BIM för koppling mellan projektering och produktionsstyrning (4hp)**

Ansvarigt universitet: Luleå tekniska universitet (LTU)

Kursen ges: *April till Juni 2020*

Kontakt: gustav.jansson@ltu.se

Kurs 5: **Integrering av byggvärdekedjan genom digitalisering (2hp)**

Ansvarigt universitet: Luleå tekniska universitet (LTU)

Kursen ges: *Juni till September 2019*

Kontakt: gustav.jansson@ltu.se

Generellt om kurserna

Kurserna beskrivs längre ner i detta dokument.

Kurserna läggs primärt upp som doktorandkurser men kursplanen kommer att möjliggöra att både yrkesverksamma och doktorander kan följa hela eller delar av kursen.

Apr-Jun 2019	Jun-Sept 2019	Jan-Mar 2020	Apr-Jun 2020
Stadsmodell Kurs 1 och Kurs 2	**Automation** Kurs 5	**Riskhantering** Kurs 3	**Automation** Kurs 4

Beskrivning av kursinnehåll

2018 09 11

COURSE SYLLABUS – THIRD-CYCLE EDUCATION

Course 1: Geodetisk datainsamling för stadsmodeller (4 ECTS credits)

Examiner	Kent Eriksson. Professor
Contact	Kent.eriksson@abe.kth.se
Study period	April to June 2019
Target group	PhD students, Professionals
Prerequisites	None
Aim	Understand how Geodesic data is used in city development and urban planning
Learning outcomes	Ability to apply geodesic data for city development
Examination	Short written text on how geodesic data that student uses in her/his research can be applied in city models/development.
Course literature	A selection of articles, including: (Niu et al., 2015, Khan et al., 2014, Kántor and Unger, 2010, Golubev et al., 2016, Andrenacci et al., 2017)

Contents and scheduled sessions	Concentrated on 2 2-day sessions. First session is on the literature, April 17-18, 2019. Second session is presentation of own work, June 4-5, 2019

ANDRENACCI, N., GENOVESE, A. & RAGONA, R. 2017. Determination of the level of service and customer crowding for electric charging stations through fuzzy models and simulation techniques. *Applied Energy,* 208**,** 97-107.

GOLUBEV, A., CHECHETKIN, I., PARYGIN, D., SOKOLOV, A. & SHCHERBAKOV, M. 2016. Geospatial Data Generation and Preprocessing Tools for Urban Computing System Development1. *Procedia Computer Science,* 101**,** 217-226.

KÁNTOR, N. & UNGER, J. 2010. Benefits and opportunities of adopting GIS in thermal comfort studies in resting places: An urban park as an example. *Landscape and Urban Planning,* 98**,** 36-46.

KHAN, Z., KIANI, S. L. & SOOMRO, K. 2014. A framework for cloud-based context-aware information services for citizens in smart cities. *Journal of Cloud Computing,* 3**,** 14.

NIU, J., LIU, J., LEE, T.-C., LIN, Z., MAK, C., TSE, K.-T., TANG, B.-S. & KWOK, K. C. S. 2015. A new method to assess spatial variations of outdoor thermal comfort: Onsite monitoring results and implications for precinct planning. *Building and Environment,* 91**,** 263-270.

COURSE SYLLABUS – THIRD-CYCLE EDUCATION

Course 2: Stadsmodeller/BIM samt spatial analys baserat på stadsmodeller (4 ECTS credits)

Examiner	Lars Harrie; Lund University
Contact	Lars Harrie; Lund University lars.harrie@nateko.lu.se
Teachers	Fredrik Lindberg, GU Perola Olsson, LU Martin Hooper, Sweco, Malmö Lars Harrie, LU
Study period	Mars to June 2019
Target group	PhD students, Professionals
Prerequisites	Knowledge in GIS or in BIM
Aim	The general aim of this module is to understand the role of city models in the built up environment process and environmental analysis as well as its linkage to BIM.
Learning outcomes	Learn about international and Swedish standards about city models, mainly CityGML and raster-based high resolution digital surface models (DSM). Obtain basic understanding and practical experience of analyses based on city models as well as

environmental modelling exploiting urban GIS-based raster models. Understand the relationship between city models and BIM-data. Understand the role of city models (and partly BIM-data) in the built environment process.

Examination

Practical exercises and a larger individual project work.

Contents and scheduled sessions

The first session will be given in Lund 25-28 March. This session includes introduction, lectures and practical exercises as well as a time for defining a project work. The second session will be in May/June (exact date to be decided) consisting of a one day seminar in Lund; during this seminar each participant will present their individual work. It will be possible to participate on web for the seminar (but not for the first session).

Course literature

Articles and reports. Preliminary:

Andrée M., Larsson K., Nordqvist Darell F., Malm L., Tullberg O., Wallberg A., Norrsell J., Paasch J., Seipel S. and Paulsson J., 2017. BIM som informationsstöd för 3D fastighetsbildning. *Project report in Smart Built Environment project "Smart Planering för Byggande"*.

Arroyo Ohori K., Biljecki F., Diakité A., Krijnen T.F., Ledoux H., and Stoter, J., 2017. Towards an integration of GIS and BIM data: What are the geometric and topological issues? *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, Vol. IV-4W5, pp. 1-8

Biljecki F., Stoter J., Ledoux H., Zlatanova S., Çöltekin, 2015. A. Applications of 3D City Models: State of the Art Review. *ISPRS International Journal of Geo-Information*. 4(4):2842-2889.

Biljecki F., Heuvelink G. B.M., Ledoux H. and Stoter J., 2018. The effect of acquisition error and level of detail on the accuracy of spatial analyses, Cartography and Geographic Information Science, 45:2, 156-176.

Donkers S., Ledoux H., Zhao J. and Stoter J., 2016. Automatic conversion of IFC datasets to geometrically and semanticaly correct CityGML LOD3 buildings. *Transactions in GIS*, 2016, 20(4): 547–569.

El-Mekawy M., Östman, A., and Hijazi I., 2012. I. A Unified Building Model for 3D Urban GIS. *ISPRS Int. J. Geo-Inf.*, 1:120–145.

Ellul C., J. Stoter, L. Harrie, M. Shariat, A. Behan, M. Pla, 2018. Investigating the state of play of GeoBIM across Europe. *Proceedings of 3D GeoInfo*, Delft 1-2 October.

Eriksson, H., L. Harrie and J. M. Paasch, 2018. What is the need for building parts? - A comparison of CityGML, INSPIRE Building and a Swedish building standard. *Proceedings of 3D GeoInfo*, Delft 1-2 October.

Gröger G., Kolbe T.H., Nagel C. and Häfele K.-H. (eds.), 2012. OGC City Geography Markup Language (CityGML) Encoding Standard, Version 2.0, OGC Doc No. 12-019, Open Geospatial Consortium.

Gröger G., and Plümer L., 2012. CityGML – interoperable semantic 3D city models. ISPRS J. Photogramm. Rem. Sens. 71:12–33.

Lindberg F, Grimmond, C.S.B., Gabey, A., Huang, B., Kent, C.W., Sun, T., Theeuwes, N., Järvi, L., Ward, H., Capel-Timms, I., Chang, Y.Y., Jonsson, P., Krave, N., Liu, D., Meyer, D., Olofson, F., Tan, J.G., Wästberg, D., Xue, L., Zhang, Z. (2018) Urban Multi-scale Environmental Predictor (UMEP): An integrated tool for city-based climate services. Environmental Modelling and Software. 99, 70-87.

Lindberg, F., Jonsson, P. & Honjo, T. and Wästberg, D. (2015) Solar energy on building envelopes - 3D modelling in a 2D environment. Solar Energy. 115 (2015) 369–378

Lindberg, F. and Grimmond, C. (2011) Nature of vegetation and building morphology characteristics across a city: Influence on shadow patterns and mean radiant temperatures in London. Urban Ecosystems 14:4, 617-634.

Lindberg, F. (2005) Towards the use of local governmental 3-d data within urban climatology studies. Mapping and Image Science 2, 4-9.

Liu X., Wang X.Y., Wright, G., Cheng, J.C.P., Li, X., Liu, and R., 2017. A State-of-the-Art Review on the Integration of Building Information Modeling (BIM) and Geographic Information System (GIS). *International Journal of Geo-Information*, 6:53.

OGC, 2012. OGC City Geography Markup Language (CityGML) Encoding Standard 2.0.0, Technical Report.

Olsson, P.-O. Conversion of an IFC-model to a lod2-3 3D-GIS building model. In Proceedings of the AGILE Conference, Lund, Sweden, 12–15 June 2018.

Olsson P.-O., Axelsson J., Hooper M., Harrie L., 2018. Automation of Building Permission by Integration of BIM and Geospatial Data. *ISPRS Int. J. Geo-Inf.* Vol. *7*, pp. 307-328. doi: 10.3390/ijgi7080307. Available at: https://doi.org/10.3390/ijgi7080307

SS-EN ISO 16739:2016 Industry Foundation Classes (IFC) för datautbyte i byggande och förvaltning.

Svensk geoprocess, 2018. Geodataspecifikation, Byggnad, version 3.0, 2018-01-15.

Tarandi V., 2015. A BIM collaboration lab for improved through life support. *Procedia Economics and Finance*, 21, pp. 383 – 390.

COURSE SYLLABUS – THIRD-CYCLE EDUCATION

Course 3: Risks, uncertainties and decision making in the modern building process (5 ECTS credits)

Examiner	Oskar Larsson Ivanov / Ivar Björnsson
Contact	oskar.larsson_ivanov@kstr.lth.se/ ivar.bjornsson@kstr.lth.se
Study period	January to March 2020
Target group	Practicing engineers, PhD-students
Prerequisites	MSc in Civil Engineering or equivalent

Aim

The course considers the influence of risks and uncertainties on decisions related to building design and construction and shall provide the course participants with a better understanding of how to deal with these issues in a systematic and rational way. There are a number of different types of uncertainties that can affect the building process and systematic and rational approaches for risk assessment, evaluation and treatment are essential. Such approaches have been applied in different ways and to differing degrees within varying industries including construction, chemical, nuclear and aerospace.

Learning outcomes

After completing the course, the student should be able to:

- understand and evaluate uncertainties related to the performance of building systems

- understand and apply relevant methods and tools for analysis and management or risks and uncertainties in design, planning and construction
- have the insight that engineering methods used as a basis for decisions lead to results associated with uncertainties
- understand and apply formal decision analysis methods for decision problems in construction engineering applications
- be able to collect and critically evaluate information about uncertainties in factors affecting performance of building systems

Examination

The examination is based on hand-in exercises and a project task.

Course literature

Course literature includes hand-outs & lecture material. Course textbooks have not been fully decided but could include one or two of the following:

Stewart MG & Melchers RE (1997) *Probabilistic risk assessment of engineering systems*. Springer.

Ayyub BM (2014) *Risk analysis in Engineering and Economics*. Chapman and Hall.

Rychlik I & Rydén J (2006) *Probability and Risk Analysis. An Introduction for Engineers.* Springer Verlag.

Contents and scheduled sessions

The course includes:

- Fundamentals in probability theory
- Review of failures in engineering systems
- Risk analysis methods, evaluation and treatment
- Stochastic/uncertainty modeling
- Reliability assessment
- Decision analysis theory & methods

The course will be held in two sessions (2-3 days each) at Lund University.

COURSE SYLLABUS – THIRD-CYCLE EDUCATION

Course 4: Using BIM-based automated design for production (4 ECTS credits)

Examiner	Gustav Jansson
Contact	gustav.jansson@ltu.se +46 920 491835
Study period	April to June 2020
Target group	PhD students, Professionals
Prerequisites	Familiar with BIM-software like ArchiCAD or Autodesk Revit.
Aim	The overall aim of the course is to increase the knowledge of how to automate manual design work.
Learning outcomes	As support for the learning outcome, a theoretical foundation of applied BIM and industrialised construction will be penetrated and discussed. The laboratory part of the course will evaluate possibilities and obstacles with digital application on research questions or knowledge gap in the construction context. Managing object structures and classes, as a central part of platform products, will be demonstrated with digital tools and methods for the information flow.
Examination	Examination in the course will be a mix of practical demonstrations and theoretical findings in scientific paper manuscripts.
Course literature	Journal papers in the field of: Industrialised construction, Bill-of-materials, Design Automation, BIM.

Contents and scheduled sessions	Introduction lecture, Industry visits, Seminar lectures, Computer laboratory sessions, Final seminar.

COURSE SYLLABUS – THIRD-CYCLE EDUCATION

Course 5: Digitalization structures for industrialised construction processes (2 ECTS credits)

Examiner	Gustav Jansson
Examiner	Gustav Jansson
Contact	gustav.jansson@ltu.se +46 920 491835
Study period	June to September 2019
Target group	PhD students, Professionals
Prerequisites	Interest in design work and information structures.
Aim	The overall aim of the course is to increase the knowledge in object and process structures for production.
Learning outcomes	As support for the learning outcome, a theoretical foundation of object structures for construction processes and PLM product life-cycle will be penetrated and discussed. The seminary part of the course will evaluate possibilities and obstacles with structures to manage the information flow in relation to the building process. Managing object structures and classes, as a central part of platform products, will be demonstrated with examples from industry to manage the information flow.
Examination	Examination in the course will be a mix of seminar discussions and theoretical findings in scientific paper manuscripts.

Course literature	Journal papers in the field of: Industrialised construction, Bill-of-materials, flow efficiency, PLM.
Contents and scheduled sessions	Introduction lecture, Industry visits, Seminar lectures, Guest lectures, Final seminar.