# Course Outline (*please complete as appropriate*)

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| **COURSE TITLE** | Data Structure |
| **NAME OF LECTURER** | Tonny Oyana |

## COURSE DESCRIPTION

The central objective of this 1-credit summer course is to provide an introduction to data management in the context of data science concepts and related applications. The critical role of data management has heightened due to the recent increase in data size and volume that is generated per second through social media, sensor technology, research and citizen science, and other platforms. The data is normally in different formats, some of it is unstructured, semi-structured, or structured. The era of Big data is here with us. Big data is a concept used to identify the datasets that whose size is beyond the ability of typical databa se software tools to store, manage, and analyze. We live in increasingly data-rich and computationally-rich environments this environment introduces unique computational and statistical challenges, including scalability and storage bottleneck, noise accumulation, spurious correlation and measurement errors. Yet current knowledge discovery tools and algorithms could increase the rate at which structured data can be easily exploited if appropriate data management strategies were in place.

## RECOMMENDED READINGS

References

1. Date, C.J. 2003. An Introduction to Databa se Systems, 8th Edition, Addison-Wesley Longman Publishing Co., Inc. Boston, MA, USA.

2. Oyana T.J. and Margai, F. 2016. Spatial Analysis: Statistics, Visualization, and Computational Methods. Taylor and Francis, CRC Press, USA—for Lectures, especially Chapter 9.

3. Foster I, Ghani R, Jarmin RS, Kreuter F, and Lane J. 2017. Big Data and Social Science: A Practical Guide to Methods and Tools. Chapman & Hall/CRC Press, Boca Raton, London, New York.

4. Oyana TJ. 2017. The use of GIS/GPS and spatial analyses in community-ba sed participatory research. In S.S. Coughlin, S.E. Smith, and M.E. Fernandez (ed.) Handbook of Community-ba sed Participatory Research. Oxford University Press.

## TEACHING METHODS

Course material will be presented in organized lectures and informal discussions. Problem sets and discussion questions will highlight each lecture. Lecture notes and problem sets will be available to students at the beginning of each session. In addition to organized sessions, students are encouraged to present their own projects and will have ample opportunities for personal interaction with Professor Tonny Oyana to discuss issues of particular interest to them in depth. This course will be primarily ba sed on lectures and active learning experiences including assignments, group tasks, secondary data compilation, and computer exercises. The course is designed to enrich the participant's data computing skills and provides hands-on experiences in Sensor-ba sed data collection, processing, data management, work flow productivity, tools and analytics, strategies, and data communication. This is a core skill set for those who expect to work with emerging technologies in data science and sensor technology.

## ASSESSMENT METHODS

This course will use proven educational pre- and post-assessment instruments for educational outcomes. Of particular interest are four assessment tools: content knowledge surveys, concept maps of understanding, oral, and written interview protocols. Broadly, the course instructor will measure cognitive and affective aspects using a

survey (and observations) that will be administered at the beginning and on the last day of the course. Exercises, problem sets and a midterm will be assessed using oral and written assessment protocols. Data will be collected through several instruments, including pre/post-tests, interviews and observations protocols. The course instructor will also work in consultation with the project team to assess the success of this course relative to the overall program.

Expected Learning Outcomes

1. Expose students to fundamental principles of data management, data structures and algorithms for handling big data
2. Introduce basic data design and models, mathematical, and computational methods, strategies, and tools for managing big data
3. Effectively use, explore, analyze, and synthesize big data
4. Develop actionable knowledge and information from big data

**CLASS TOPICS** *(each class is 3 hrs)*

This summer course will provide basic concepts of data management in data science context. The 1-credit course will draw from principles of data management, visual analytics, citizen science and sensor technology, computational intelligence, and data communication. Data science, as we know it, draws from a wide range of disciplines, for example, computer science, statistics, geography, cartography, informatics, engineering, visualization, cognitive science, psychology, and mathematics. The course targets students looking to gain a better understanding of fundamentals in data management in data science context.

**SPECIAL COMMENTS**

Instructor: Tonny Oyana, PhD
Professor & Principal
College of Computing and Information Sciences
GIS and Spatial Science for Environmental Health (GISSE) Lab
Makerere University
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해외우수교수초빙강좌 수강 제한 및 유의사항 (Notice for KNU students)

a. 2018년 8월 졸업예정자(조기졸업자 포함)

b. 국내 타대학 교류학생

c. 재이수의 경우 개강 전 수강취소만 가능(7.4-7.5에 한함)

d. 해외우수교수초빙강좌 수강과목은 2018.2학기 수강꾸러미로 신청불가