NOTICE OF UNIVERSITY ORAL

GEODESY AND GEOMATICS ENGINEERING

Master of Science in Engineering

Michael Adjei Klu

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Head Hall – Room E-11

Board of Examiners: **Supervisor:** **Dr. Peter Dare, Geodesy & Geomatics Eng.**

Examining Board: **Dr. Marcelo Santos, Geodesy & Geomatics Eng.**
Dr. Juraj Janak, Slovak University of Technology

Chair: **TBA**

Determination of a Geoid Model for Ghana Using the Stokes-Helmert Method

ABSTRACT

One of the greatest achievements of humankind with regard to positioning is Global Navigation Satellite System (GNSS). Use of GNSS for surveying has made it possible to obtain accuracies of the order of 1 ppm or less in relative positioning mode depending on the software used for processing the data. However, the elevation obtained from GNSS measurement is relative to the ellipsoid and this renders the heights from GNSS very little practical value. Conversion of geodetic height from GNSS measurements to orthometric height, which is more useful, will require a geoid model. As a result, the aim of geodesist in the developed countries is to compute a geoid model to centimeter accuracy. For developing countries, which include Ghana, their situation will not even allow a geoid model to decimeter accuracy. In spite of the sparse terrestrial gravity data of variable density distribution and quality, this thesis set out to model the geoid as accurately as achievable. Computing an accurate geoid model is very important to Ghana given the wide spread of Global Positioning System (GPS) in the fields of surveying and mapping, navigation and Geographic Information System (GIS). This gravimetric geoid model for Ghana was computed using the Stoke-Helmert approach which was developed at the University of New Brunswick (UNB) [Ellmann and Vaníček, 2007]. This method utilizes a two space approach in solving the associated boundary value problems, including the real and Helmert's spaces. The UNB approach combines observed terrestrial gravity data with long-wavelength gravity information from an Earth Gravity Model (EGM). All the terrestrial gravity data used in this computation was obtained from the Geological Survey Department of Ghana, due to difficulties in obtaining data from BGI and GETECH. Since some parts of Ghana lacks in terrestrial gravity data coverage, EGM was used to pad those areas lacking in terrestrial gravity data. For the computation of topographic effects on the geoid, the Shuttle Radio Topography Mission (SRTM), a Digital Elevation Model (DTM) generated by NASA and the National Geospatial Intelligence Agency (NGA), was used. Since the terrain in Ghana is relatively flat, the topographic effect, often a major problem in geoid computation, is unlikely to be significant. This first gravimetric geoid model for Ghana was computed on a 1'×1' grid over the computation area bounded by latitudes 4ºN and 12ºN, and longitudes 4ºW and 2ºE. GPS/ trigonometric levelling heights were used to validate the results of the computation.

Faculty Members and Graduate Students are invited to attend this presentation.