Addis Ababa University – Addis Ababa Institute of Technology
School of Civil and Environmental Engineering

Course Outline

1 Course Information

Course Name: Reference System and Coordinate Transformation

Course Code: GeGo 5106

Credit Hour: 6 ECTS

Program: MSc in Geodesy and Geomatics

Semester: Year I, II Semester, 2020

Academic Year: 2019/2020

Instructor: Tulu Besha, PhD, tulubesha@yahoo.com **/ Andenet A.**

2 Course Description

Overview of the shape and size of the earth: concepts of earth's curvature, irregularity of the earth's gravity field, the geoid; concepts of the geometrical shape of the earth; the reference ellipsoids, basic properties of the reference ellipsoids, center of mass, flattening, eccentricity, relationship between eccentricity and flattening, principal parameters of the reference ellipsoid, parameters of commonly used ellipsoid, use of ellipsoid as regional and global datum; coordinate system of reference ellipsoid; geodetic reference systems and frames: introduction to terrestrial and celestial reference systems and Earth rotation as the link between terrestrial and celestial systems; time observance and the relationships between the different time keeping systems; Overview of the dynamic nature of the reference frames due to the dynamicity and changing of earth; transformation between geodetic and Cartesian coordinates for a surface point, Special topics on coordinate transformation; conversion from one reference system to another; geometry of map projections, characteristics of map projections, mathematical concepts of map projections, distortions and scale notation; special topics on UTM and Lambert projections. Fundamentals of datum and 3-D reference system/frame. Datum transformation methods: the knowledge of translation, rotation and scaling between two datum and 7-parameters.

3 Course Objectives

At the end of the course students will be able to

- Understand the geometry of the Earth and its mathematical approximations
- Perform coordinate and datum transformation
- Understand different map projection methods

4 Course Content

Chapter One – The Geometry of the Earth

1.1 Size and shape of the Earth
1.2 Reference Ellipsoid
1.3 Coordinate system of reference ellipsoid

Chapter Two - Geodetic Reference Systems and Frame

2.1 Terrestrial reference system and frame

2.2 Celestial Reference system and frame

2.3 Time system

2.4 Geodynamics

Chapter Three - Coordinate Transformation

3.1 Datum Transformation

3.2 Datum Transformation methods

Chapter Four - Map Projections

4.1 Types of map projection

4.2 Mathematical concepts of map projections

5 Assessment

Assignments	30%
Project	20%
Final Exam	50%

6 Reference

Torge W, Muller J (2012), Geodesy, 4Th Edition, Walter De Guryter

Seeber G. (2003). Satellite Geodesy, 2nd Edition, Walter De Guryter

Fan H. (2010): Theoretical Geodesy
Egeltoft & Stoimenov (2005): Map projections