NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF GEOLOGICAL, MINING AND METALLURGICAL ENGINEERING
GEOLOGICAL ENGINEERING PROGRAM

GE265 – GEOTECTONICS

I. GENERAL INFORMATION

CODE	**:**	GE265 Geotectonics
SEMESTER	**:**	9
CREDITS	**:**	3
HOURS PER WEEK	**:**	3
PREREQUISITES	**:**	GE511 Structural Geology, GE701 Mineral Deposits
CONDITION	**:**	Compulsory

II. COURSE DESCRIPTION

The course prepares students for the understanding of the processes that controls the structure and properties of Earth crust and its evolution through time, describing the process of mountain building, the growth and behavior of the cores of continents, and the ways in which the rigid plates that constitute Earth outer shell interact with each other. Students also apply geotectonics for analyzing earthquakes and volcanic belts.

III. COURSE OUTCOMES

At the end of the course, students:

1. Understand the concepts and methods of Geotectonics.
2. Understand and explain the hypothesis of continental derivative.
3. Understand and explain Tectonic Plates Theory or Global Tectonics.
4. Understand the concept of rift, its geometry, geographical distribution, as well as the concept of hotspots.
5. Understand the process of destruction of Earth crust or subduction.
6. Analyze tectonic plates as fundamental units of Earth crust.

IV. LEARNING UNITS

1. OBJECTIVE OF GENERAL GEOTECTONICS

Development of geotectonics as science / Research methodology in geotectonics / Earth internal structure / Earth crust and lithosphere / Continental and oceanic crust / Mantle and core / Models of Earth internal structure. Elemental and petrographic composition, temperature, density, pressure and speed of seismic waves / Comparative planetology / Internal structure and composition of bodies in solar system / Stony interior planets group / Condensate planets group / Pluton and its difficult classification /Moons, asteroids, comets / Oort cloud.

2. HYPOTHESIS OF CONTINENTAL DERIVATIVES

Hypothesis of Alfred Wegener. Evidences and arguments / Geophysical evidences / Geological evidences / Paleontological and biological evidences / pale-climate evidences / Models of continents and oceans reconstructions in different geological stages / Reconstruction from Triasic to Quaternary / Geographic conformation of Pangea, Gondwana, Laurasia, Tethis Sea, Panthalassa Sea. Reconstruction at the end of Proterozoic and Triasic / Geographic conformation of Rodinia hypothetical continent / Block of Congo, North Africa, Antarctic, India, Australia, Greenland, Amazon, Liberia, Scandinavia, West Africa, Florida / Panafrica ocean / Continental

plates hypothetical conformation towards future / Theory of tectonic plates / Sonar and the study of ocean floor / Seismic and geophysic methods / Hugo Bennioff contribution / Plaeomagnetism and the inversion of the magnetic field / Rock radiometry /

3. THEORY OF TECTONIC PLATES

Dynamics of tectonic plates: causes and effects / Fred Vine and Drummond Mattews and the paleo-magnetism / Tuzo Wilson and subduction plates / Harry Hammond Hess and accretion and subduction compensation / Xavier Le Pichon and the types of plates and the geometry of plates according to seismicity / Robert Sinclair Dietz and the geological reconstruction of plates and continents / Formation of sea floor / Geometry of ocean dorsal / Plains and abyssal basins / Layers, ages and types or ocean floor rocks / Geographic distribution of ocean dorsal / Geometry and types of transforming faults / Difference between transforming and dorsal faults /

4. RIFTS

Rifts geometry / Rifts geographical distribution / Nomenclature / Hotspots and mantles / Geometry of hotspots / Geographical distribution of hotspots and their effect on Earth crust / Submarine volcano dorsal as a result of hotspots / Deep seismic focus directly related to inferior mantle.

5. DESTRUCTION OF EARTH CRUST - SUBDUCTION

Geometry of ocean fossa and Bennioff plane / Insular volcano arcs in continents / Plate subduction / Magmatism / Geological cuts / Geographical distribution of ocean fossa and its correlation with Alps and Andean mountains / Folded mobile belts / Formation of mountain range.

6. TECTONIC PLATES AS FUNDAMENTAL UNITS OF EARTH CRUST

Major, middle and minor plates / Dynamics and direction of tectonic plates / Volcanism and seismicity in Earth crust / Geo-synclinal theory / Steps in geo-synclines development / Mio-geosynclinal and eu-geosynclinal / Tectonic phases in the evolution and development of Earth crust / Structural tectonic constitution of mountain ranges and platforms / Main tectonic features of five continents and their relationship with mineral and hydrocarbon deposits / Main tectonic features of Peruvian territory.

VI. METHODOLOGY

The course takes place in theory and practice sessions. In theory sessions faculty presents concepts and methods. In practice sessions, students analyze and solve diverse problems related to continental derivatives, tectonic plates and Earth crust. Students present written reports summarizing their findings and conclusions. Active student participation is promoted.

VII. EVALUATION FORMULA

The average grade PF is calculated as follows:

PF = (EP + EF + PP) / 3

EP: Partial examination EF: Final examination
PP: Average grade of practice and experimental work

VIII. BIBLIOGRAPHY

1. **BELOUSSOV, V.**
   Geotectonics
   Springer-Berlag, Germany, 2012
2. **VAN DER HILST, R.D., McDONOUGH W.F.**
   Developments in Geotectonics
   Elsevier, 2015