NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF CIVIL ENGINEERING

CIVIL ENGINEERING PROGRAM

SYLLABUS - SOIL MECHANICS APPLIED TO FOUNDATIONS

I. GENERAL INFORMATION

CODE	**:**	EC521
SEMESTER	**:**	9
CREDITS	**:**	4
HOURS PER WEEK	**:**	5 (Theory – Practice)
PREREQUISITES	**:**	EC513 Soil Mechanics II
CONDITION	**:**	Elective
DEPARTMENT	**:**	Soil Mechanics
INSTRUCTOR	**:**	Jorge Alva, Cesar Atala
INSTRUCTOR E-MAIL	**:**	jalva@gmail.com

II. COURSE DESCRIPTION

The study of foundations leaned on Peruvian soils and the application of theoretical concepts of soil mechanics taken in basic courses make this specialty course indispensable for the integral training of the civil engineering in the design and construction of foundations in every region of the country which presents special conditions of static and dynamic behavior, strain due to water infiltration in cohesive and granular soil, latitude stability and grounds improvement with modern application systems.
The most important subjects of the course are: Foundations in static and dynamic condition in Peru. earthquake Geotechnics applied to foundations in Peru. Introduction to Mechanics of unsaturated soils. Foundations on expansive soils. Foundation on granular, semi-saturated and saturated soils. Foundations on liquable soils. Foundation in coarse granular soils. Foundation on fine-grained soils. Foundation on tropical rainforest soils. Slope displacement and stability. Geosynthetic Reinforced Foundations. Foundation pathology. Foundation repair. Improvement methods for foundation soils.

III. COURSE OUTCOMES

1. Study methodologies of mechanic and physical behavior of soils in general and some special types of soils in Peru for their corresponding application in the solution of foundations and other special construction procedures.
2. Explain and apply basic soil mechanics with application to the practical foundation engineering in Peruvian soils.
3. Efficiently analyze, manage and lead projects for the socioeconomic development protecting the environment.
4. Supervise and/or execute basic and conceptual engineering surveys analyzing and designing engineering projects, at the same time plan preventions measures in cases of disaster and execute defense and/or mitigation works.

IV. LEARNING UNITS

1. ORGANIZATION, DEFINITIONS AND CONCEPTS OF FOUNDATION SOILS / 7 HOURS
Capability of taking his/her own decisions and have technical sense about foundation soils in Peru and their mechanical behavior before superstructure overloads solicitations and earthquake effects, characteristics of typical strains of the phenomenon studied and consequences of disregarding it. Practical solutions of cases occurred in Peru and abroad.

2. FOUNDATIONS IN STATIC ANS DYNAMIC CCONDITIONS / 7 HOURS
Earthquakes Geotechnics/ Global warming and Geotechnics.

3. EXPANSIVE SOILS IN PERU / 7 HOURS

4. GRANULAR, SEMI-SATURATED AND SATURATED SOILS. LIQUABLE SOILS / 7 HOURS

5. COARSE GRANULAR SOILS. METROPOLITAN LIMA CASE / 7 HOURS

6. FOUNDATION ON FINE-GRANULATED SOILS / 7 HOURS
Foundations on coarse and fine-granulated soils, providing students with professional experience which will broaden their capability of facing with technical sense foundation problems.

7. FOUNDATION ON TROPICAL SOILS IN PERU / 7 HOURS

8. GEOSYNTHETIC REINFORCED FOUNDATIONS / 7 HOURS

9. FOUNDATIONS PAHTOLOGY / 7 HOURS

10. FOUNDATIONS REPAIR. REFOUNDATIONS / 7 HOURS

VI. METHODOLOGY

The methodology of this course is directed to encourage the students' active participation. Students should form field work groups that integrate theory with the investigation and the professional practice of geotechnical engineering.

VII. EVALUATION FORMULA

The average grade PF is calculated as follows:

$$PF = 0.3\,EP + 0.4\,EF + 0.3\,PP$$

EP: Mid-Term Exam EF: Final Exam
PP: Average of four quizzes

VIII. BIBLIOGRAPHY

1. **MUNI, BUDHU**
   Soil Mechanics and Foundations
   Wiled Editions, 2008

2. **DAY, ROBERT**
   Foundations Engineering Handbook
   ASCE Press, 2009

IX. COURSE CONTRIBUTIONS TO STUDENT OUTCOMES ATTAINMENT

Course contributions to Student Outcomes are shown in the following table:

K = Key **R** = Related **Empty box** = Does not apply

	Outcome	Contribution
Engineering Design	Design civil works satisfying requirements and needs as well as given constraints and limitations.	**K**
Problem solving	Identify, formulate and solve engineering problems properly using the methods, techniques and tools of civil engineering.	**K**
Sciences Application	Apply the knowledge and skills of mathematics, sciences and engineering to solve civil engineering problems.	**K**
Experimentation	Conceive and conduct experiments, analyze data and interpret results	**R**
Modern Engineering	Use and apply techniques, methods and tools of modern engineering necessary for the practice of civil engineering.	**R**
Engineering Impact	Understand the impact of engineering solutions on people and society in local and global contexts.	**R**
Project Management	Plan and manage civil engineering projects taking into account efficiency and productivity criteria.	**K**
Environmental Appraisal	Takes into account the importance of preserving and improving the environment in the development of their personal and professional activities.	**K**
Lifelong Learning	Recognize the need to keep their knowledge and skills up to date according to advances of civil engineering and engage in lifelong learning.	**R**
Contemporary Issues	Know and analyze relevant contemporary issues in local, national and global contexts.	**K**
Ethics and Professional Responsibility	Evaluate their decisions and actions from a moral perspective and assume responsibility for the executed projects.	**K**
Communication	Communicate clearly and effectively in oral, written and graphical formats, interacting with different types of audiences.	**K**
Teamworking	Appraise the importance of teamworking and participate actively and effectively in multidisciplinary teams.	**K**