NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF CIVIL ENGINEERING

CIVIL ENGINEERING PROGRAM

SYLLABUS - GENERAL HYDROLOGY

I. GENERAL INFORMATION

CODE	**:**	HH113
SEMESTER	**:**	7
CREDITS	**:**	3
HOURS PER WEEK	**:**	4 (Theory – Practice)
PREREQUISITES	**:**	Fluid Mechanics II, Statistics and Probabilities
CONDITION	**:**	Compulsory
DEPARTMENT	**:**	Hydraulics and Hydrology
INSTRUCTOR	**:**	Miguel Zubiaur
INSTRUCTOR E-MAIL	**:**	mzubiaur534@gmail.com

II. COURSE DESCRIPTION

This course is theoretical and practical and provides students with the main fundamentals and concepts of the characteristics of water resources behavior present in hydraulic projects. Its main purpose is to build professionals with kwowledge in hydrology and watershed management.
This course uses base elements and methods to be employed for carrying out a rational exploitation of hydraulic and hydrologic resources. Contents of subjects such as application of statistics and hydraulics are given for designing civil works destined to Peruvian hydraulic projects.

This course will facilitate the study of hydrographic watersheds and their potentialities, analyzing through inductive and deductive methods, likewise, quantitative, qualitative and explanatory methods also will be applied for the explanation of hydrologic and watershed phenomena.

III. COURSE OUTCOMES

1. Identify the scientific-experimental nature of hydrology and hydraulics.
2. Assess with equations and basic mathematical tools the study of hydraulics and hydrology.
3. Organize data for their adequate analysis and interpretation and calculate and interpret its fundamental statistics properties (average value and variance).
4. Analyze the fundamental fluid laws and apply them to certain situations in watersheds.
5. Interpret the concept of distributions and apply it to calculate the probability of an event or variable.
6. Built linear regression models to represent the relationship between the representative parameters of a set of data in hydrologic watersheds.

IV. LEARNING UNITS

1. APPLIED STATISTICS / 16 HOURS

Introduction / Basic statistics application / Population, sample and variable / variable classification /Methods for presenting and organizing data / Qualitative data / Quantitative data / Frequency distribution tables / Graphic representations /Central tendency measures: average, medium average weighted / Dispersion measures: variance, standard deviation, variation coefficient / Hydrologic cycle / Hydrology objectives / hydrology in Peru / Hydro-meteorological information / Time series / Characteristics curves / Hydrometrical methods / Statistics in applied to hydrology / Basic considerations / Statistic analysis / Empirical distributions / Theoretical distributions / Assessment methods / Normal density function / Logarithmic normal density function / Extreme

events function / Maximal events / Gumbel's method / Pearson's method / Minimal events / Gumbel's method / Pearson's method / Application to the hydrographic watershed.

2. WATERSHED HYDROGRAPHIC MORPHOLOGY / 28 HOURS

Introduction / Basic Information / Activities planning / Basic information gathering / Consistency analysis / Graphic analysis / Double mass analysis / Statistic analysis / Computer program elaboration / Analysis of falls in the average / Identification / Assessment / Interpretation / Application / Analysis of falls in the standard deviation / / Identification / Assessment / Interpretation / Application / Analysis of tendencies / Properties / Analysis procedure / Tendency in average / Identification / Assessment / Interpretation / Application / Tendency in standard deviation / Identification / Assessment / Interpretation / Application / Meteorology and hydrology / Meteorological elements / Relative humidity / Total evaporation / Winds / Precipitation / Discharges.

3. APPLICATIONS TO HYDROLOGICAL WATEERSHEDS, PROJEECTS / 12 HOURS

Group work: HYDROLOGICAL SURVEY / Cartography / Thematic maps / Hydrographic plan / Roadway plan / Basic information gathering / topographic plan / Geologic plan / Mining plan / Soil plan / Season plan / Statistic analysis / Basic Information gathering / Soil classification plan / Irrigation infrastructure plan / Ecology plan / Precipitation analysis / Average precipitations / Assessment methods / Elaboration of Isohyets plan / Mass curve / Histogram / Storm Analysis / Frequency-intensity-duration survey / hydrometrics / Concepts / Assessment methods / RIPPL diagram / Reservoir characteristic curves / Gagging methods / Domestic projects.

V. METHODOLOGY

The course is carried out in computing lab, theory and practice sessions. In theory sessions, the instructor introduces concepts, theorems and applications. In practice sessions, several problems are solved, and their solutions are analyzed. In lab sessions, Hydrology application software is used to solve problems and analyze their solution. At the end of the course, students must hand over and expose a paper or project on watersheds. In all sessions student's active participation is encouraged. Software HEC-HMS is used.

VI. EVALUATION FORMULA

The average grade PF is calculated as follows:

PF = 0,33 EP + 0,33 EF + 0,34 PC

EP: Mid-Term Exam EF: Final Exam
PC: Average of Quizzes and Project

VII. BIBLIOGRAPHY

1. **GUIDE TO HYDROLOGYCAL PRACTICE N° 168 .**
   OMM, 2008

2. **RAY LINSLEY – MAX KOHLER – JOSEPH PAULUS**
   Hydrology For Engineers
   Mc Graw – Hill Book Company Inc., 2005

3. **VEN TE CHOW – DAVIS MAIDMENT – LARRY W. MAYS**
   Applied hydrology
   Mc Graw – Hill Science Ed. 2005.

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.	
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.	
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.	**R**
Ethics and Professional Responsibility	Evaluate their decisions and actions from a moral perspective and assume responsibility for the executed projects.	**R**
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.	