



**NATIONAL UNIVERSITY OF ENGINEERING**  
**COLLEGE OF PETROLEUM AND PETROCHEMICAL ENGINEERING**  
**PETROLEUM ENGINEERING PROGRAM**

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**PP322 – LABORATORY OF ROCK CORES**

**I. GENERAL INFORMATION**

<b>CODE</b>	: PP322 Laboratory of Rock Cores
<b>SEMESTER</b>	: 6
<b>CREDITS</b>	: 1
<b>HOURS PER WEEK</b>	: 4 (Theory–Laboratory)
<b>PREREQUISITES</b>	: EC310 Mechanics and Strength of Materials
<b>CONDITION</b>	: Compulsory
<b>DEPARTMENT</b>	: Petroleum and Natural Gas Engineering

**II. COURSE DESCRIPTION**

The course prepares students in the understanding and application of the properties and characteristics of petroleum rocks, as well as in the laboratory testing of rock samples for obtaining their porous volume, permeability, fluids saturation and capillary pressure using standard methods and procedures.

**III. COURSE OUTCOMES**

At the end of the course, students:

1. Understand the types of core rock samples obtained from actual fields.
2. Prepare the core sample and determine its petro-physical properties using standard methods.
3. Identify required equipment and materials for core testing.
4. Solve problems related to petro-physical properties of rock cores.
5. Identify and compare errors and precision of different types of equipment for testing and measuring porosity and permeability.

**IV. LEARNING UNITS**

**1. INTRODUCTION**

Petroleum reservoirs / Oil rock sampling / Factors affecting core recovery / Forces that make oil flow into the well / Composition of petroleum sandstone.

**2. SAMPLES PREPARATION**

Types of samples to analyze / Recovery and management of cores / Cores conservation / Preparation of samples for laboratory testing / Cores sample analysis / Description of cylindrical cutter of different diameters / Instructions / Cleaning and drying of cores.

**3. GROSS VOLUME DETERMINATION**

Method of mercury pycnometer / Method of displaced volume (direct reading) / Method of thrust (electric balance).

**4. POROUS VOLUME DETERMINATION**

Method of core saturation / Method of HELIUM porosimeter / Method of Stevens porosimeter / Porosity calculation / Description, calibration and use of Ruska field porosimeter / Use of calibration tables.

## **5. PERMEABILITY MEASUREMENT**

Method of the Ruska gas permeameter / Method of the liquid permeameter / Factors affecting the measurement of K.

## **6. EFFECTIVE PERMEABILITY**

Description, meaning and determination of the effective permeability by gas (cylindrical samples).

## **7. RELATIVE PERMEABILITY**

Determination of oil-gas relative permeability (CORELAB).

## **8. CAPILLARY PRESSURE**

Description, meaning and determination of capillary pressure by the gas-mercury method / Description and determination of capillary pressure by the gas-water method. (CORELAB).

## **9. FLUIDS SATURATION**

Sample preparation for the determination of theoretical fluid saturation / Calibration of retort instruments / Determination of fluid saturation / Retort method / ASTM modified method / Factors affecting the saturation of fluids in rock cores.

## **10. FINAL EVALUATION**

Proper and accurate handling of all equipment and instruments / Calibration / Final test.

## **V. LABORATORY AND PRACTICAL EXPERIENCES**

Laboratory 1: Porosity. Methods: gravimetry, Russel, saturation, electronic, Helium saturation.

Laboratory 2: Core saturation. Retor methods.

Laboratory 3: Core permeability. Methods: gas porosimeter, Boyle.

Laboratory 4: Capillary pressure. Hg-Gas method.

Laboratory 5: Final. Methods for determining the petro-physical properties of rock cores.

## **VI. METHODOLOGY**

The course takes place in theory, practice and laboratory sessions. In theory sessions, the faculty presents and analyzes concepts, methods and applications. In the practice sessions, various problems are solved and their solution analyzed. In laboratory sessions, students use instruments and equipment to test and determine the petro-physical properties of rock. At the end of the course the student should present and expose a project. Student's active participation is promoted.

## **VII. GRADING FORMULA**

The Final Grade PF is calculated as follow:

$$PF = (PC + PL) / 2$$

PC: Average of practical work

PL: Average of laboratory practice

## **VIII. BIBLIOGRAPHY**

1. CRAFT.  
Engineering in Petroleum Deposits.
2. PIRSON.  
Engineering of Petroleum Deposits.
3. MONICARD.  
Properties of Rock Reservoirs.