



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

**PETROLEUM ENGINEERING PROGRAM**

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**PP411 – WELL ELECTRIC LOGS**

**I. GENERAL INFORMATION**

<b>CODE</b>	: PP411 Well Electric Logs
<b>SEMESTER</b>	: 7
<b>CREDITS</b>	: 4
<b>HOURS PER WEEK</b>	: 5 (Theory–Practice)
<b>PREREQUISITES</b>	: PP321 Drilling Fluids, PP324 Reservoirs I
<b>CONDITION</b>	: Compulsory
<b>DEPARTMENT</b>	: Petroleum and Natural Gas Engineering

**II. LEARNING UNITS**

1. Introduction / Well profile / Common well profiles. Uses / Resistivity measurement methods / Fundamental parameters / Porosity / Saturation / Permeability / Relationship between formation resistivity and water salinity / Properties of rock and flow quantity / Petroleum geology.
2. Formation resistivity factor and porosity / Formation classification / Fluid distribution and resistivity of an invaded permeable layer / Formation with uniform inter-granular porosity / Quantitative determination factors / Anisotropy.
3. Spontaneous potential / Origin / Membrane potential / Liquids contact potential / Current circulation SP / Static SP / Effect of inertial clay on SP / Pseudo-statics.
4. Factors affecting SP shape and amplitude / Soft and hard formations / Interpretation / RW determination (resistivity of water formation) from SP profile / Determination of static SP / Practical exercises for RW determination.
5. Induction profiles / Scales / Geometric factor / Characteristics / Advantages / Interpretation of induction profile / Profile affecting factors / Induction profile corrections / Practical examples.
6. Conventional profile / Current circulation in isotropic means / Resistivity normal devices / Lateral devices / Apparent and true resistivity / Spacing and measurement point / Electrodes combination / Visual interpretation.
7. Resistivity conventional devices: properties, advantages, drawbacks / Interpretation of conventional profiles / Example: sand-clay formation / Hard formations / Interpretation together with SP curves / Y resistivity / Measured resistivity corrections (measured with lateral devices).
8. Micro-profile / Basic information / Permeable and hard porous layer / Clays / Micro-profile interpretation / Practical examples.
9. Determination of  $R_{xo}$  and porosity from the micro-profile / Radioactive profile / Gamma ray profiles / Properties / Applications / Statistical fluctuations / Calibration / Interpretation / Practical examples.
10. Formation density profile (formation density log) / Contribution of density profile in formation evaluation / Neutron profile / Basic information / Qualitative interpretation.
11. Quantitative interpretation / Porosity determination / Compensated sonic profile / Practical application of electric, radioactive and sonic profiles / Correlation.
12. Bases for quantitative interpretation / Determination of micro-profile porosity / Porosity determination using short normal method / Rock mountain method / Porosity of neutron and sonic profile / Comparison of methods / Practical examples.

13. Saturation determination / Electric induction method / Conventional profile example / Rock mountain method / Determination of water-petroleum and gas-petroleum contact / Producible petroleum index / Porosity balance / Verification of water saturation.
14. Well diameter profile / Conventional caliper / Micro-caliper / Temperature profile. Basics, applications and interpretation / Determination of cement limit / Location of circulation losses zones / Location of gas zones.

### **III. METHODOLOGY**

The course takes place in theory and practice sessions. In the theory sessions, faculty presents concepts, methods and applications. In practice sessions, students solve diverse problems related to well electric logs and well profiles for different cases and conditions. At the end of the course, students complete a project and defend it. Student's active participation is promoted.

### **IV. GRADING FORMULA**

The Final Grade PF is calculated as follow:

$$PF = (EP + EF + PC) / 3$$

EP: Mid-term Exam

EF: Final Exam

PC: Practical Work

### **V. BIBLIOGRAPHY**

1. Schulumberger Well Sureging Corporation  
Introduction to Schulumberger Method for Well Profile.
2. Oil Wechly  
Electris Log Interpretation