NATIONAL UNIVERSITY OF ENGINEERING

COLLEGE OF PETROLEUM AND PETROCHEMICAL ENGINEERING

PETROLEUM ENGINEERING PROGRAM

PP523 – RESERVOIRS SIMULATION

I. GENERAL INFORMATION

CODE	**:**	PP523 Reservoirs Simulation
SEMESTER	**:**	10
CREDITS	**:**	4
HOURS PER WEEK	**:**	5 (Theory–Practice)
PREREQUISITES	**:**	PP415 Reservoirs II, PP512 Well Testing
CONDITION	**:**	Compulsory
INSTRUCTOR	**:**	Luis Alberto Colán García
INSTRUCTOR E-MAIL	**:**	lcolang@gmail.com

II. COURSE DESCRIPTION

The course covers the knowledge and insights on the behavior of reservoirs. Introduce the theoretical and practical fundamentals of numerical simulation of oil reservoirs based on models under different scenarios and risk conditions, analyzing the sensibilities of mesh type and well architecture. Students analyze the real behavior of a reservoir, using a model that includes the integration of reservoir engineering techniques. Get a broad view of management of numerical reservoir simulation as a tool commonly used in the working area. Having defined the numerical simulation model, the current reserves are defined, determining the optimal reservoir distribution, the drainage points in different scenarios and exploitation strategies.

III. COURSE OUTCOMES

1. Develops simulation reservoir models based on the review and validation of historical data, production and pressure of a reservoir, fluid analysis and core available, and other information necessary to develop and/or revise the static model and dynamic model integrated to the Numerical Simulation Model for a reservoir applicable in practical situations.
2. Analyze reservoirs response under different scenarios and risk conditions.
3. Determine the best exploitation scheme that represents an improvement of the recovery factor associated with the lowest possible investment.

IV. LEARNING UNITS

1. FUNDAMENTALS

Explain the fundamentals of reservoir simulation - the underlying equations and numerical techniques used to solve them / General vision / Theory of numerical simulation / Planning of a simulation study / Geomechanical and Geostatistical applications.

2. DESIGN OF A RESERVOIR SIMULATION MODEL

Design a model for a reservoir simulation, data collection, the use of the simulator, and to observe the results using visual simulation by using post-processing software. Data acquisition and analysis of validation / Fluid properties / Relations of fluid-rock interaction / Development of the geological model / Gridding construction / Gridding features and other uses.

3. CALLIBRATION OF A RESERVOIR SIMULATION MODEL

Plan and carry out the calibration of a reservoir simulation model.

4. PREDICTION AND RESERVOIR SIMULATION

Prediction and optimization of future scenarios of oil reservoirs using reservoir simulation / Wells history / Adjustment of the history / Cases of prediction / Display of simulation models and examples / Study of cases.

5. RESERVOIRS IN WELLS OR INDIVIDUAL PATTERNS

Apply the reservoir simulation technology to solve the production and engineering problems of reservoir in wells or individual patterns.

6. FIELD'S RESERVOIRS IN PRODUCTION

Apply the reservoir simulation technology to solve the production and engineering problems of field's reservoirs in production.

7. REGRESSION MODELS

Apply the technology of the regression equation to construct a fluid model, making data adjustments of PVT laboratory tests.

8. COMPOSITIONAL RESERVOIR SIMULATION

Apply compositional reservoir simulation to solve the problems of production and reservoir engineering.

9. CREATING TECHNICAL REPORTS

Effectively present the results of an engineering study of reservoir simulation in a written report.

V. METHODOLOGY

The course is developed by combining exposition (slides) of the different techniques with a critical analysis and applicability with practical exercises, theoretical and field data in the industry of our country, so that each student can use the information and validate to work with the simulator.

The exercises include typical cases preset by the rapporteur and/or the actual own with reading and interpretation of process diagrams and analysis applied in reservoir simulation. Using Excel and simulator programs for Black Oil reservoirs for radial applications, including 3D models, allowing the student to establish the analysis criteria before the information used and the results obtained.

To cover the theoretical aspects of geology, reservoir, production and completions that are mainly the basic principles for a better understanding.

VI. EVALUATION FORMULA

The Average Grade PF is calculated as follow:

PF = (EP + EF + PP) / 3

EP: Mid-Term Exam
EF: Final Exam
PP: Average of practices

VII. BIBLIOGRAPHY

1. Computer Modelling Group Ltd. 2010-2011.

2. Practical Reservoir Simulation, 2010.

3. AZIZ, KHALED
Reservoir Simulation, 1999.

4. SOLLEIRO, J.L.
Two Phase Flow, 2012.