

**Reservoir Recovery Methods**  
Course TPG 4150  
NTNU / IGP  
Autumn 2019

**Curtis Hays Whitson**  
Professor

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**Class Meetings:**

IGP building room P1  
Tuesday 12.15-14.00  
Wednesday 9.15-10.00  
Friday 14.15-16.00 (no meeting Aug. 23)

First meeting: Tuesday, Aug. 20, 2019  
Last meeting: Friday, Nov. 22, 2019

Videos and other course material can be downloaded from:

<https://pet.geo.ntnu.no/curtis/courses/Reservoir-Recovery/2019-TPG4150/>

**Exam:** Dec. 3, 2019, kl 9.00-13.00 (4 hr).

**Blackboard:**

You need access to Blackboard at NTNU to take this course: mainly for turning-in and receiving graded problems.

**Required Reading List:**

Papers found in course directory **\Handouts** in three subdirectories (\EOR, \Material-Balance, and \Simulation) look in **\Required** subdirectory.

Optional and useful references-for-life are given in subdirectories **\Optional**. Also, the directory **\Handouts\Books** contain three books on reservoir engineering, all of that cover different scopes and levels of detail with *Reservoir Recovery Methods*.

**Whitson Likely Absences:** Oct. 1-2.

**Student Assistant:**

Markus Hays Nielsen, [markushnielsen@gmail.com](mailto:markushnielsen@gmail.com).

Markus will meet on most Fridays in P1 14.15-16 for an optional session with any students wanting to discuss the course material, get an assist on problems, and other fun non-required technical stuff. Markus will post when he can not meet on a given Friday. No meeting Aug. 23.

**Course Problems:**

On the Monday of each week a required hand-in problem via Blackboard is expected (starting Week 3 of this course, where **Week 1=Aug.19-23**). The problem will always include the following information for the lectured materials of Week n, handed in the Monday of Week n+2 (Week 3 Monday = **Sept. 2**, for material lectured on Week 1).

The 2018 exam contained 80 questions (*2018-TPG4150-Exam-Q-list-complete.pdf*). Your task is to list all questions that were discussed in a given week, together with the answers for each of the questions selected. For example, Week 1 lectures talk about Question 1 (answer b), Question 2 (answer a d) and a few other questions. The Monday of Week 3 (**Sept. 2**) should then contain the following two mandatory tasks:

**Task 1. Week 1 Lectures – Exam Questions discussed:**

Question 1 (b)

Question 2 (a d)

... etc.

followed a bullet-list outline of the week's lectures, e.g. week 1:

**Task 2. Week 1 Short Bullet-Point Outline:**

- Reservoir
  - Geologic
  - Fluids
- Recovery
  - Surface products
  - Reservoir phases
  - IOR
    - EOR
      - Water injection
      - Gas injection
    - Well type/completions
      - Vertical
      - Vertical hydraulic fractured
      - Inclined
      - Horizontal
      - Multi-lateral
      - Horizontal multi-hydraulic-fractured
  - Reservoir Flow Unit (RFU)
  - Barriers
    - Faults
    - Ultra-low-permeability layers
    - Differential depletion of reservoir pressure
    - $k_v/k_h$

Deliver as: (a) an Excel file with separate sheets each labeled clearly Week-1, Week-2 etc., or (b) create a pdf file from Word or LaTeX. The problems discussed in class lectures are *optional*. If you submit the solution to any in-class problem or quiz, this will count as extra credit towards the 25% grade (together with the weekly mandatory two-task submission about lectures).

Don't cheat (copy from another student). Obvious copying will result in all participants (with identical / near-identical) submissions losing credit for the hand-in problem (required weekly tasks about lectures, and/or optional in-class problems / quizzes).

**Problem Sessions:**

All five hours of weekly meetings in P1 during the week can be used as a forum for questions about problems (Curtis on Tuesday-Wednesday; Markus on Friday).

**Required Reading Material** (comments):

Required Reading List mentioned above is mandatory to read – *not* to memorize, *not* derivation of equations – *to help you learn and understand lectured material.*

**Material-Balance Required Directory:**

01-1987-DeLeebeeck-Frigg-Gas-Field-North-Sea-MB.pdf  
02-1991-SPE22921-Fetkovich-Reese-Whitson-GAS.pdf  
03-Standing-Notes-Water-Influx-MB.pdf  
04-2011-SPE146066-Juell-Whitson-GAS.pdf  
05-1979-Standing-SGD-MB.pdf  
06-2000-SPE-Phase-Behavior-Chap-7(only7.4.2-7.4.3).pdf  
07-1995-PETSOC-Walsh-MB.pdf  
08-2018-Whitson-SGD-MBO-notes.pdf  
09-2018-Whitson-MB-IPR-notes.pdf  
10-2005-JPSE-Singh-Fevang-Whitson-PVTRE.pdf  
11-1973-Fetkovich-DCA(1980-JPT).pdf

**EOR Required Directory:**

01-197x-Standing-Mobility-Notes.pdf  
02-197x-Standing-BL-Fractional-Flow-Notes.pdf  
03-197x-Standing-BL-Fluid-Displacement-Notes.pdf  
04-197x-Standing-Dystra-Parsons-Layered-WF.pdf  
05-197x-Standing-WF-Pattern-Performance-Notes.pdf  
06-197x-Standing-Water-Flooding-Problems-Solutions.pdf  
07-1950-Muskat-Water-Drive.pdf  
08-1995-SPE29115-Hearn-Whitson-EOR(required).pdf  
09-2009-SPE120743-Singh-Whitson-EORPVT(optional).pdf

**Simulation Required Directory:**

01-2009-SPE-Simulation-Chapter-Coats-etal.pdf