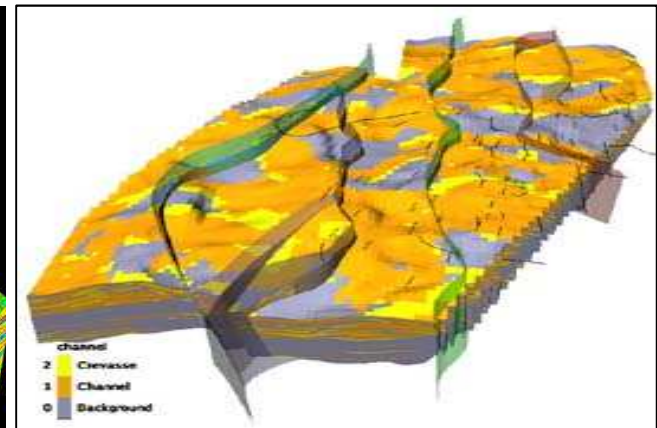
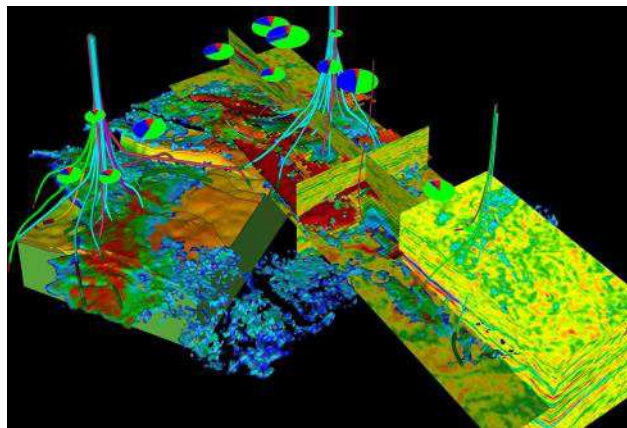
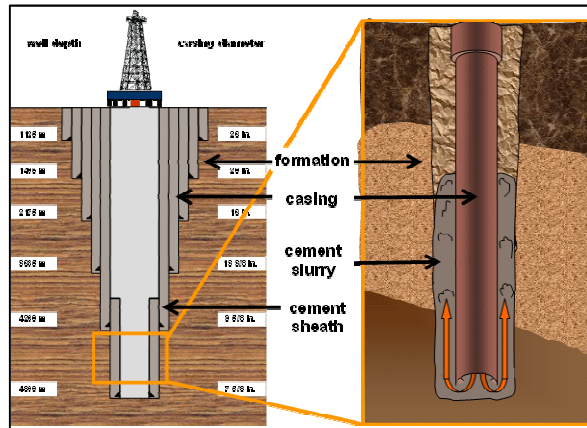


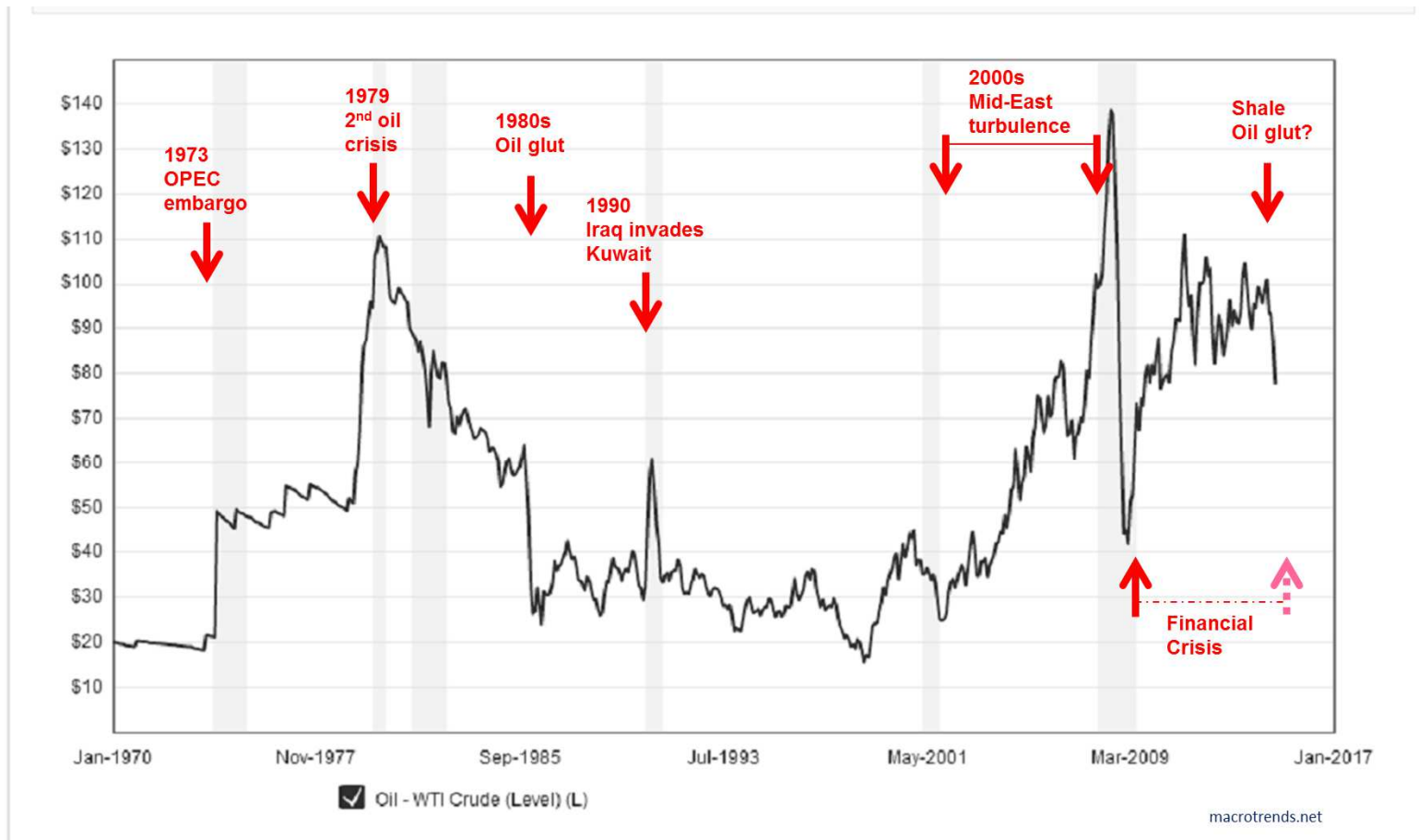
M.Sc. Track

Petroleum Engineering & Geosciences

3-9-2017

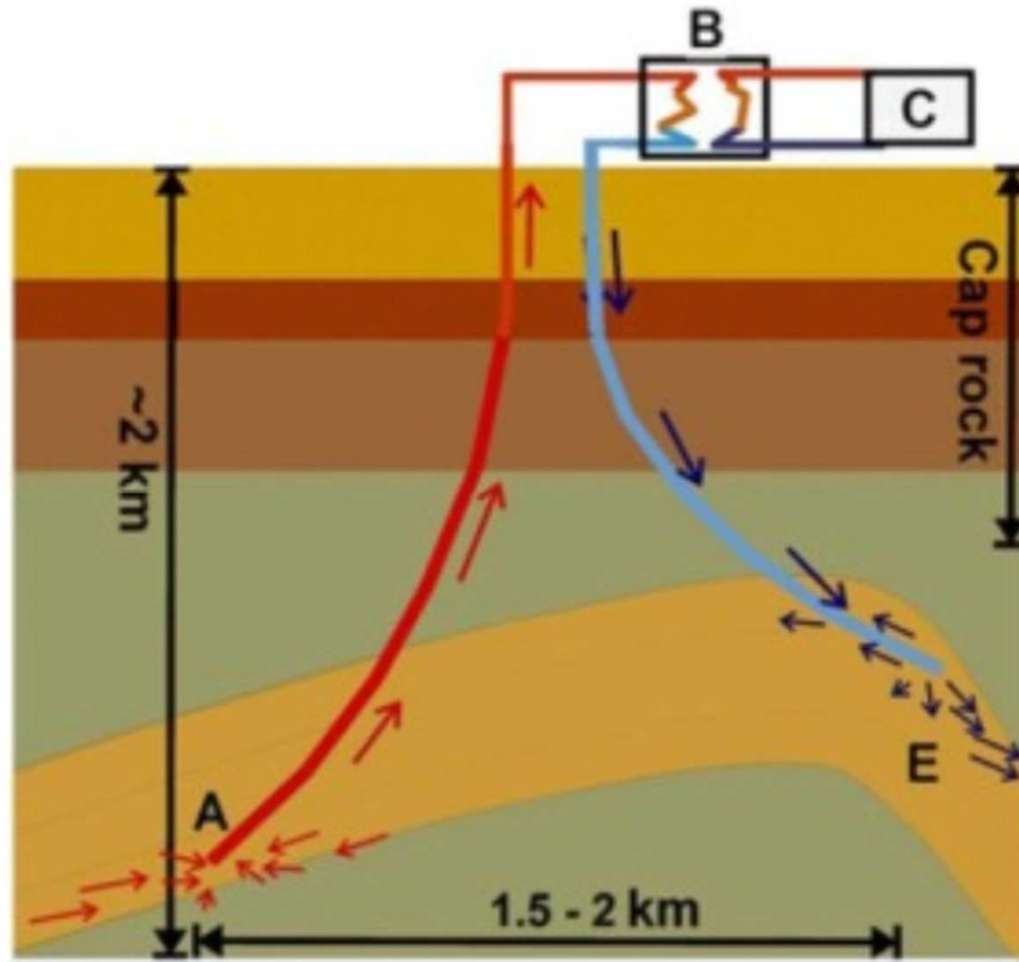


Challenging industry (and study)



Crude Oil Price History Chart

Geothermal Energy



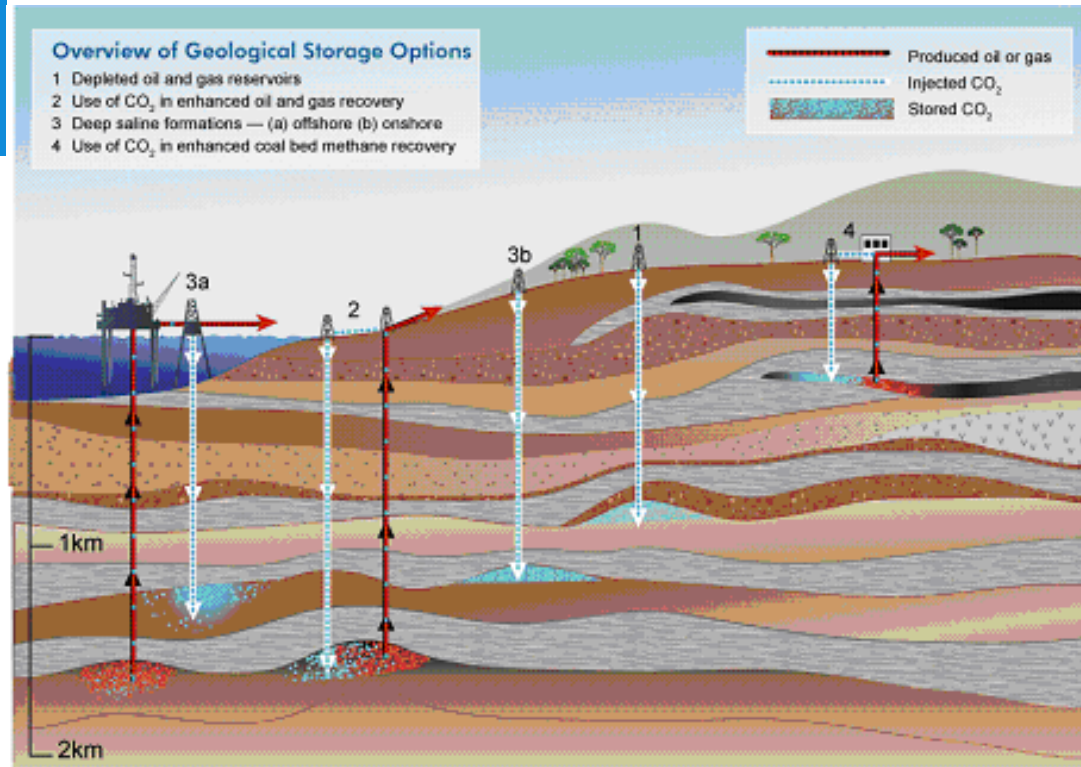
Produce energy (heat) from subsurface for heating; reduce need for fossil or other fuels

Principles same as for producing hydrocarbons from subsurface

Initiated at TU Delft by student project

Plans to build doublet on campus to supply heat and as research facility

Geological storage of CO₂



Depleted oil and gas field

Use of CO₂ to enhance oil and gas production

Deep saline formations (onshore) offshore

Use of CO₂ to enhance coal bed methane production



Outline

1. The end-goals
2. Structure of Master programme
 1. Shared Topics
 2. Specialization: PE
 3. Specialization: RE
3. Advice for a smooth transition
4. Other relevant organizations
 1. MV
 2. SPE
 3. AAPG

Outline

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Aims of the MSc in Petroleum Engineering & Geosciences

- Educate well-rounded geo-engineers
- Prepare students to integrate both geosciences and engineering
- Apply these skills in the *specific* area of petroleum engineering, giving a solid foundation for a career in the petroleum industry
- Also applies to other activities dealing with fluids in the subsurface: geothermal energy, CO2 sequestration, groundwater

Managing the earth's resources for today and **the future**

- **Find new reservoirs**
 - **Hydrocarbons**
 - **Geothermal**
 - **Water**
- **Improve production from existing reservoirs**
- **Develop new techniques to produce challenging reservoirs**
- **Store unwanted fluids permanently and safely underground**

What's Distinctive About Petroleum Engineering and Geosciences?

- Plenty of responsibility early in your career
- Opportunities to live and work **all around the world**
- Opportunities to work outdoors, if desired
- Apply **latest technology** in challenging situations
- **New opportunities** arising in emerging areas of geothermal and groundwater applications
- Work requires ability to cope with and manage huge technical (geological) **uncertainties** – unique in industry
- Work requires **interdisciplinary** skills

Outline

1. The end-goals

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3. Specialization: PE

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2. SPE

3. AAPG

MSc Organization 1st year

M.Sc. Track:

Petroleum Engineering and Geosciences

Specializations:

Petroleum Engineering

Reservoir Geology

35 ECTS

22 ECTS

22 ECTS

MSc Characteristics

- Reservoir Geology and Petroleum Engineering form together the M.Sc. Track “Petroleum Engineering & Geosciences”
- These two specializations have much of the coursework in common with about 25% specialized courses; they are essentially two different flavors of the same idea
- Graduates from both specializations are ideally suited to work in asset teams in major E&P companies
- **Reservoir Geology** students receive additional in-depth courses such as geological modeling, structural geology, sedimentology and field work
- **Petroleum Engineering** students additional receive in-depth courses on reservoir simulation, optimization and production engineering



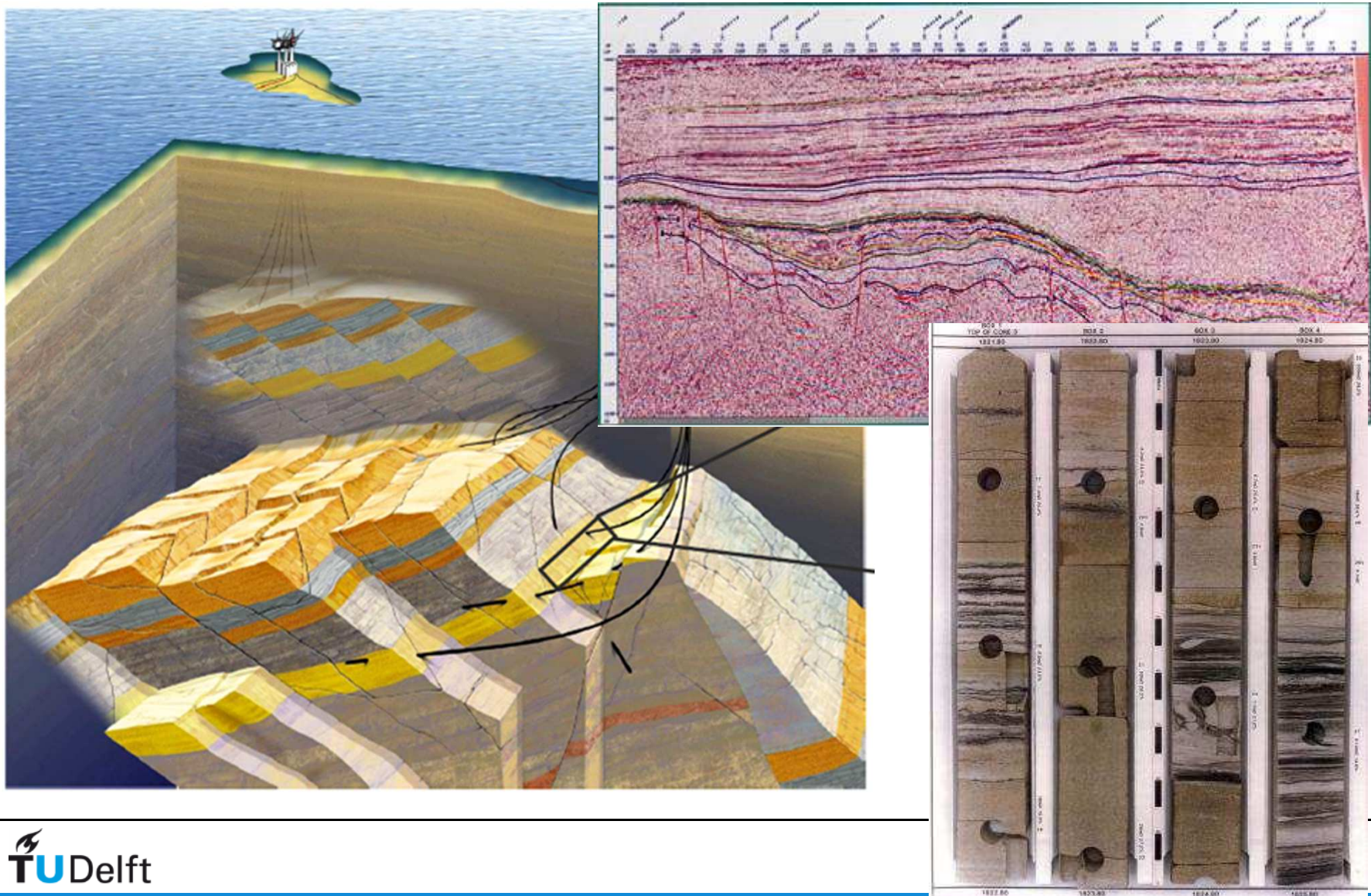
Outline

1. The end-goals
2. Structure of Master programme

1. Shared Topics

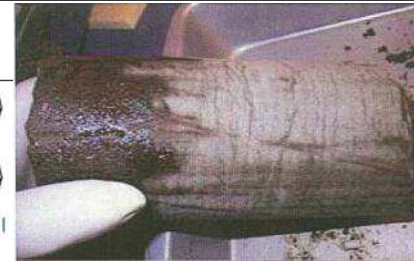
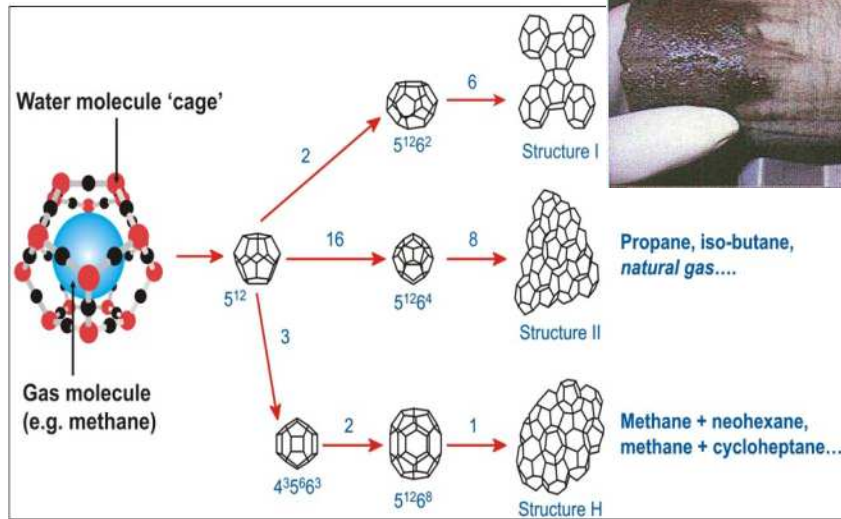
2. Specialization: RG
3. Specialization: PE
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Geology, Geophysics and Petrophysics



Properties of Reservoir Fluids

UNCONVENTIONAL



Gas hydrate

Heavy oil

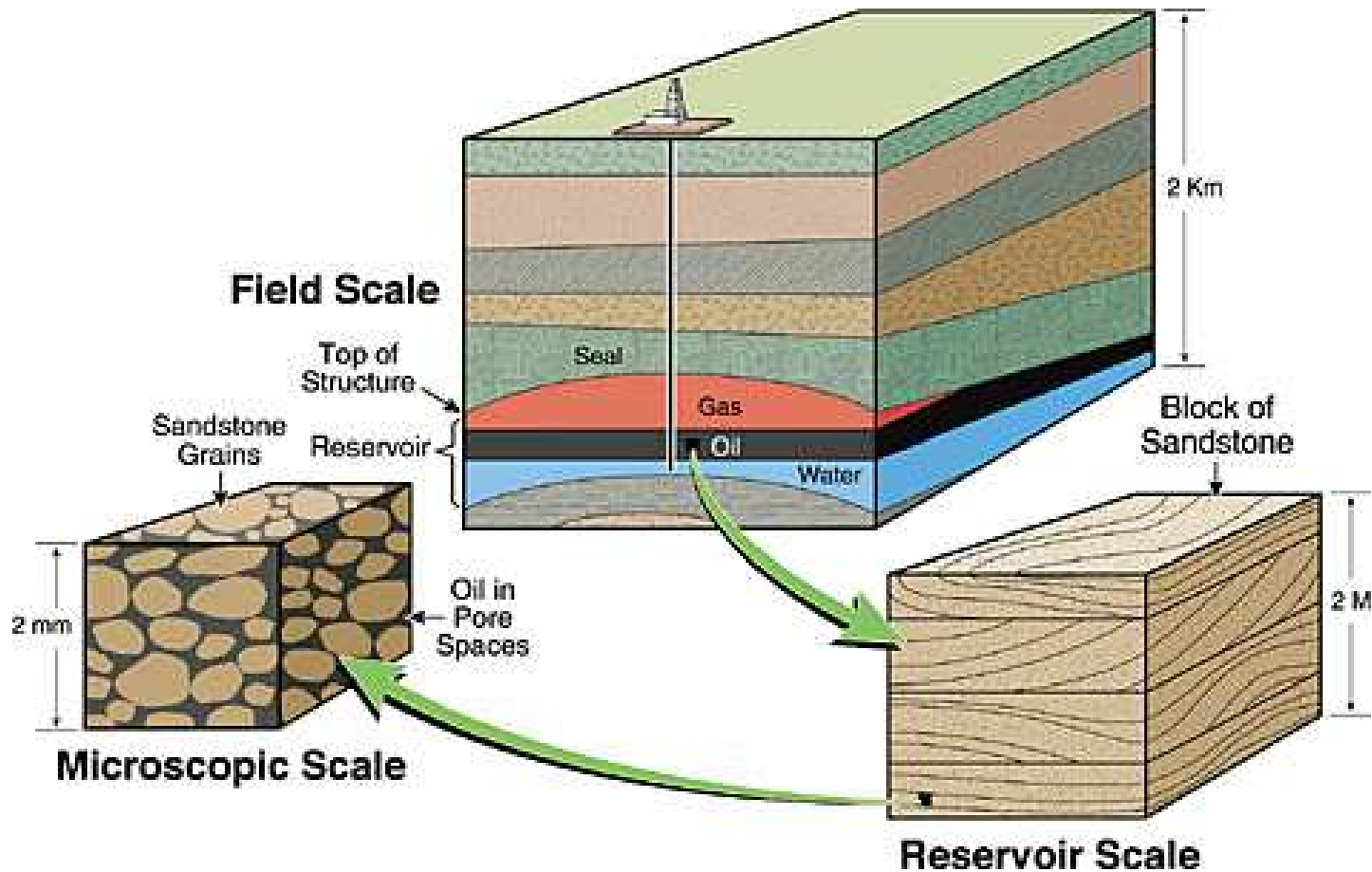


CONVENTIONAL HYDROCARBONS

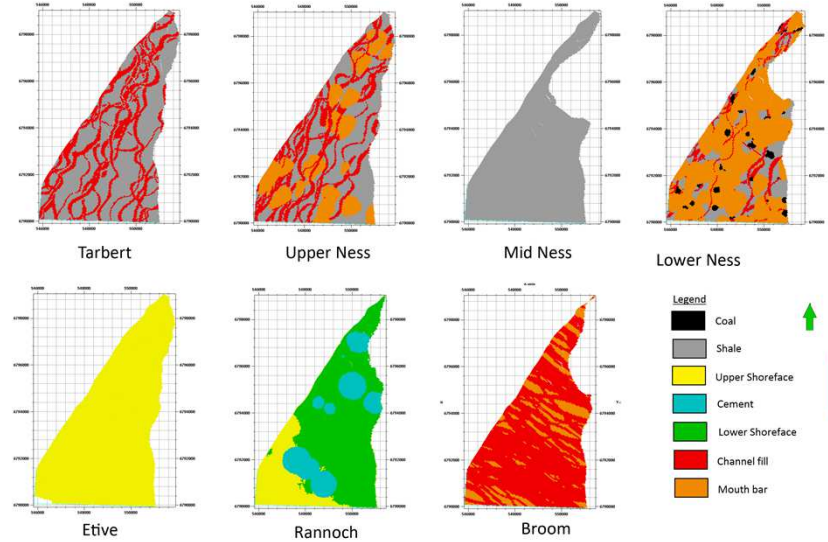
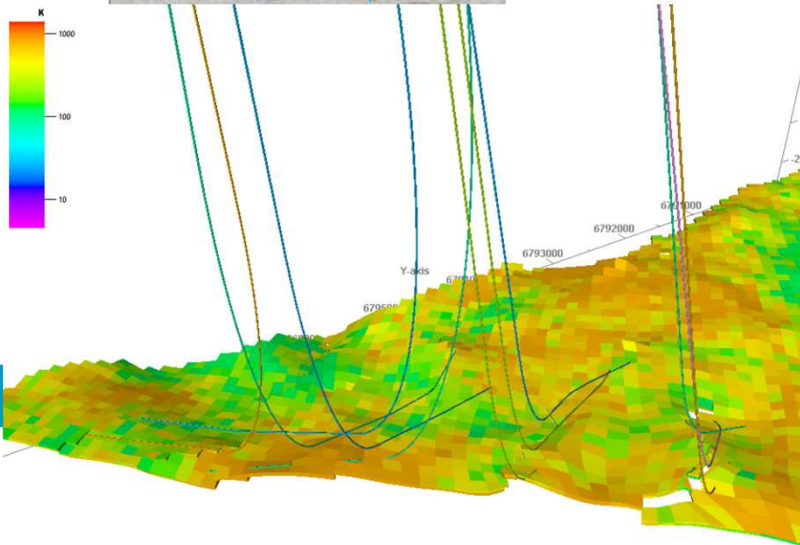
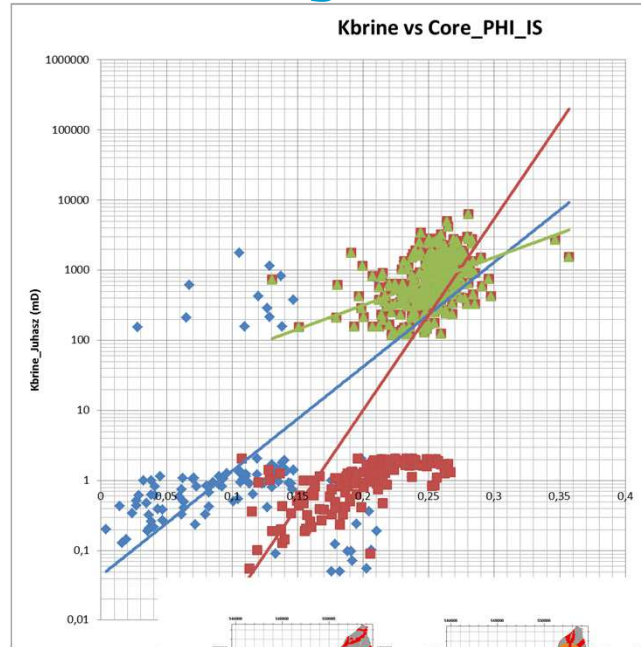
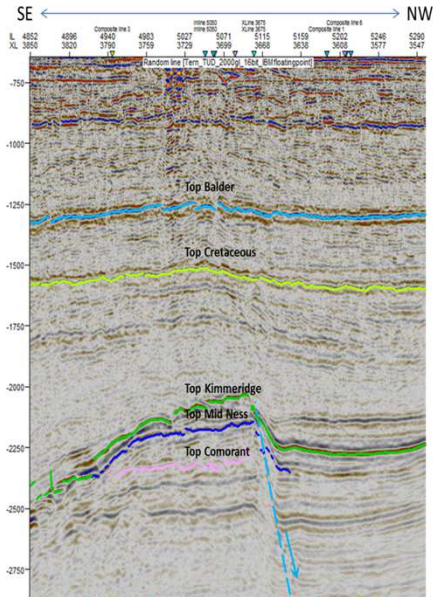


Tar Sands

Reservoir Engineering



Capstone Design Course (2nd year): "Field Development Project"



2nd year: M.Sc. Graduation thesis In-depth and interdisciplinary

Aim: The graduate student learns to apply the skills and knowledge gained in the preceding study in a research project he/she has to carry out independently.

- University or Company (with TUD supervisor)
- Applied or Fundamental
- Theoretical or Field work (or field data)

Usually, MSc research is part of an ongoing research project.

MSc Electives

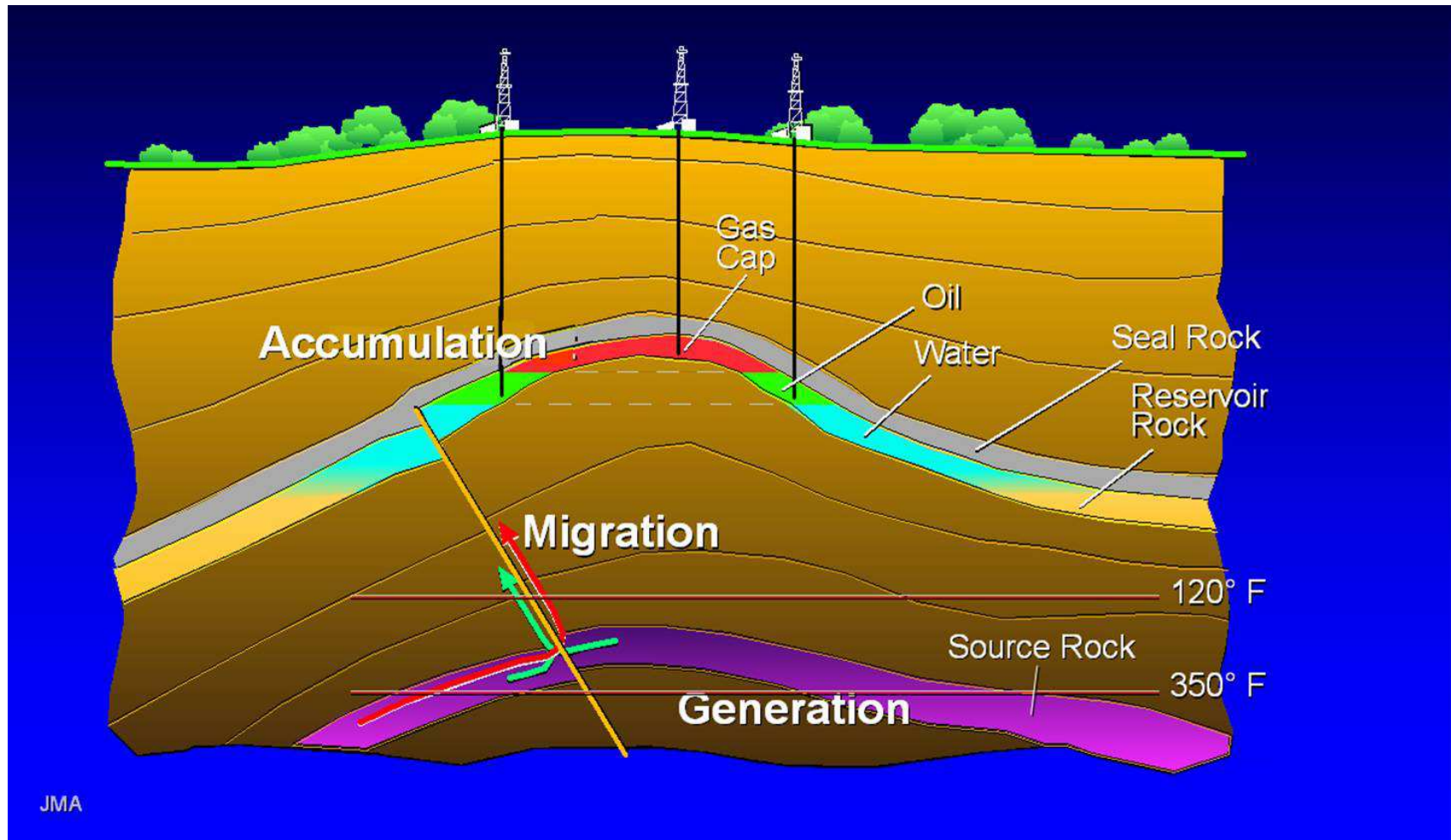
- Need not be in AES, but must be technical courses at the MSc level
 - no language courses
- Must have some relevance to your career track
- Must be approved in advance by the MSc coordinator for your given specialization

September 3, 2017

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Reservoir Geology Specialisation



What is Reservoir Geology?

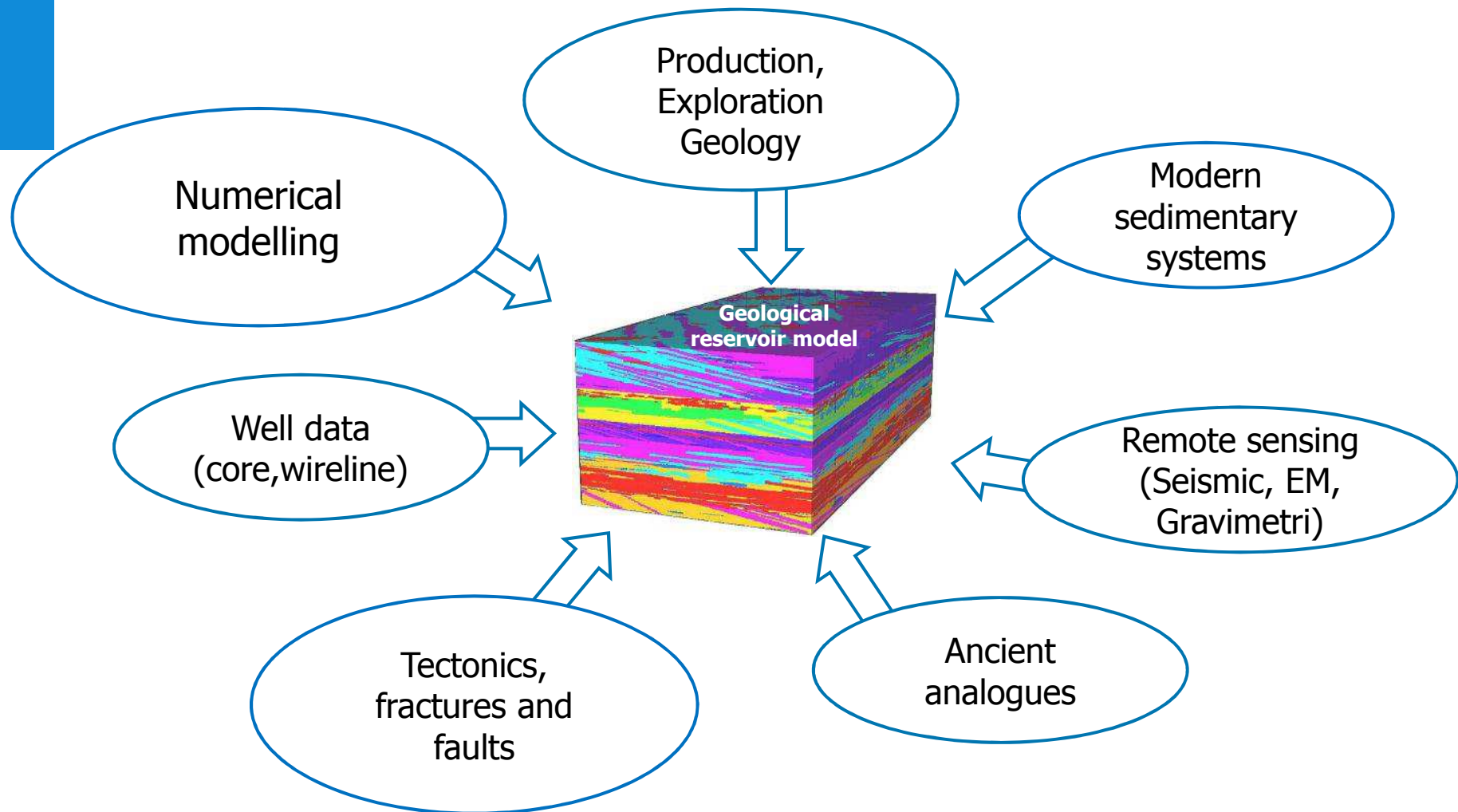
What? → Prediction of subsurface (**Static Modelling**)

- properties (porosity and permeability) based on rock type
- geometries of reservoir bodies
- connectivity
- fractures and faults
- source rocks and the seal

How?

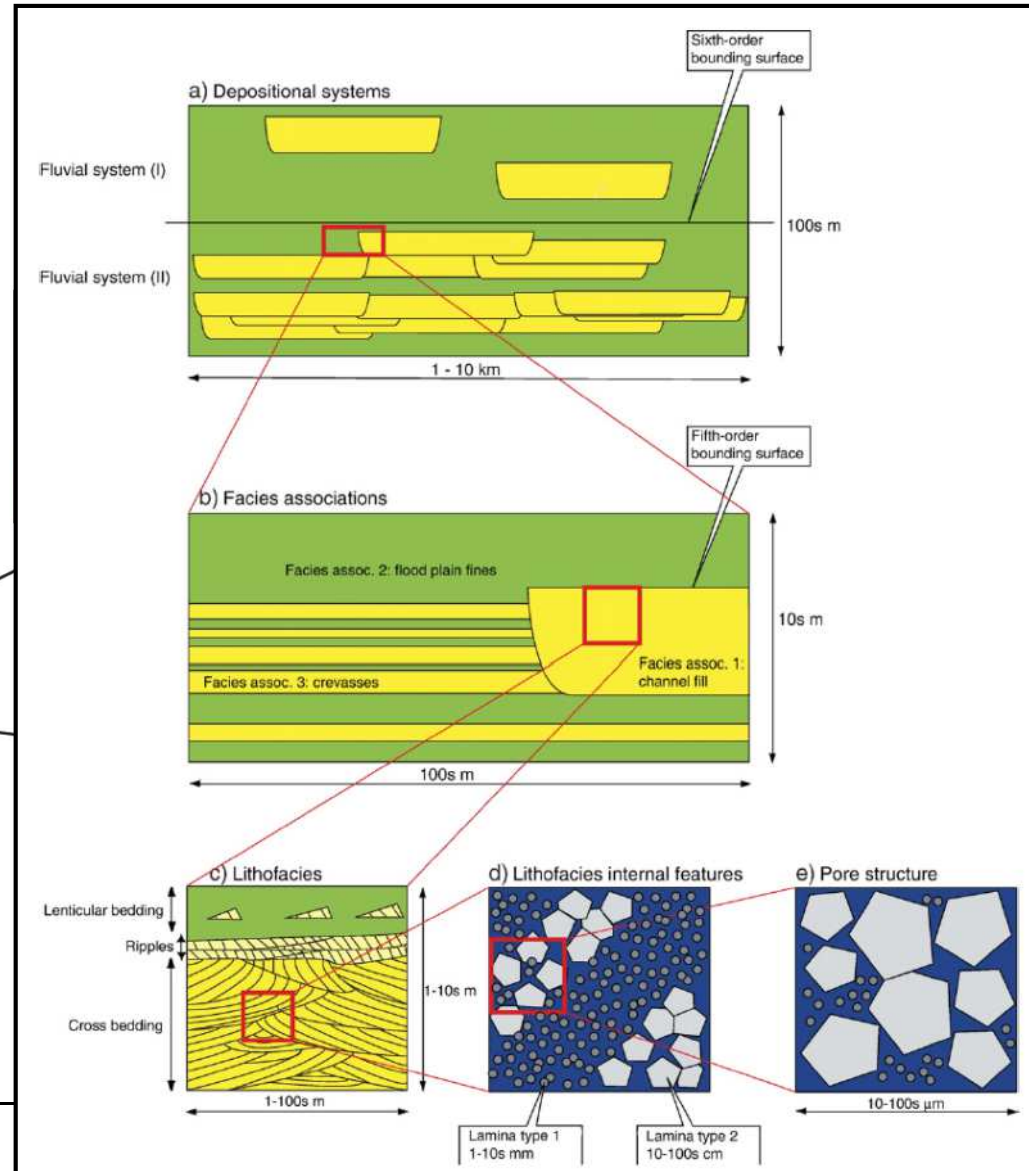
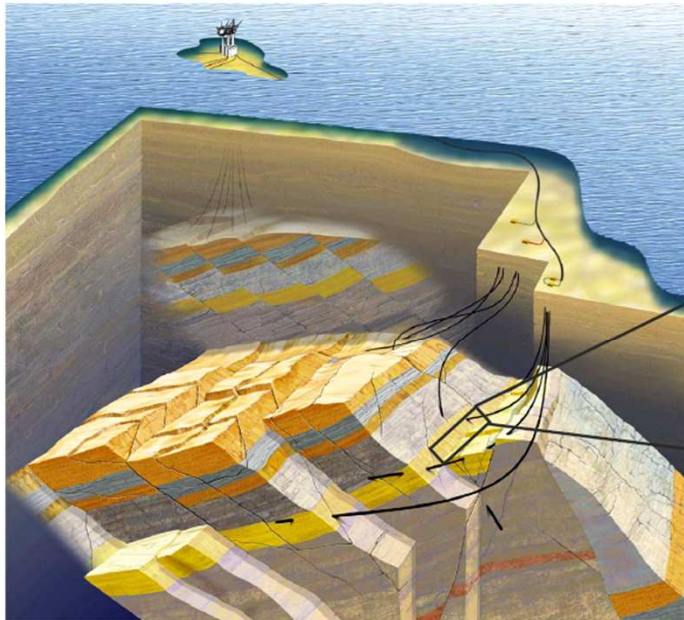
- advanced structural and sedimentary geology knowledge
- modeling skills to predict geometries
(stochastic and process-based)
- field experience working with reservoir rocks
- uncertainty quantification
- state-of-the-art software

Reservoir Geology - disciplines

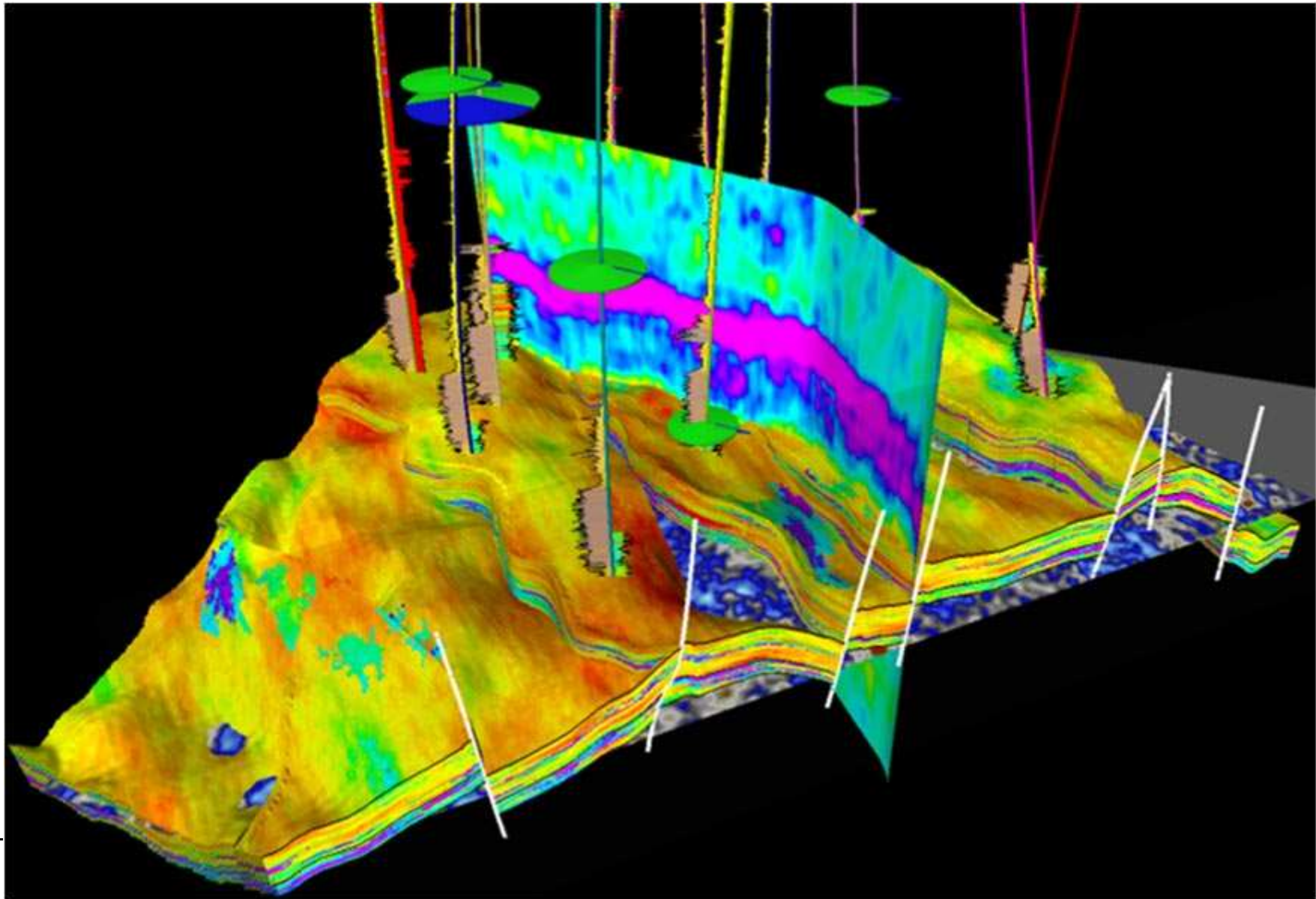


Reservoir Geology – scales!

Keogh et al 2007



Static reservoir model



Getting your hands dirty

RG: fluvial sandstone reservoir analogue

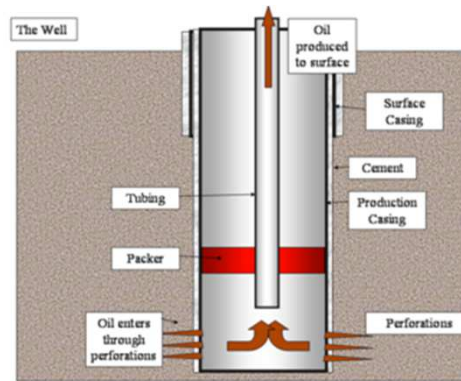
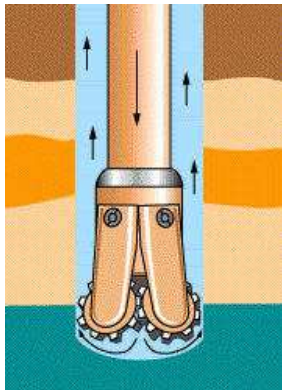


Obligatory for RG
specialization

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Well engineering



Rig Name: Enafor Rig 08
 RTE: 7.65 m
 RTE to Hang off point: 8.01 m

Note: All depths referenced to Enafor Rig 08 RTE = 7.62 mAGL

Well Data:

Hole Size	Depth (mDDbft)
24"	100
17-1/2"	735
12-1/4"	2109
8-1/2"	2324

Casing	Depth (mDDbft)
28"	11.0
18-5/8"	100.0
13-3/8"	716.0
10-3/4" XO	103.0
9 5/8"	2091.0
7" TOL	1987
7"	2283

Completion Summary:

	Depth (mDDbft)
7" TRSV	72.5
5.963" RPT Profile on TRSV	72.6
7" DHPG	1917.3
Retrievable Latch - Shear Type	1934.9
9.5/8" x 7" MHP Packer	1935.7
5.875" RPT Nipple	1956.6
5.75" RPT Nipple	1974.3
Half Mule shoe (tubing end)	1989.6

Suspension Details:

Closed TRSCSSV

Reservoir Sections

MS2 Top in Seq	2104.7 mMDbft
MS2 Bottom:	2279.4 mMDbft

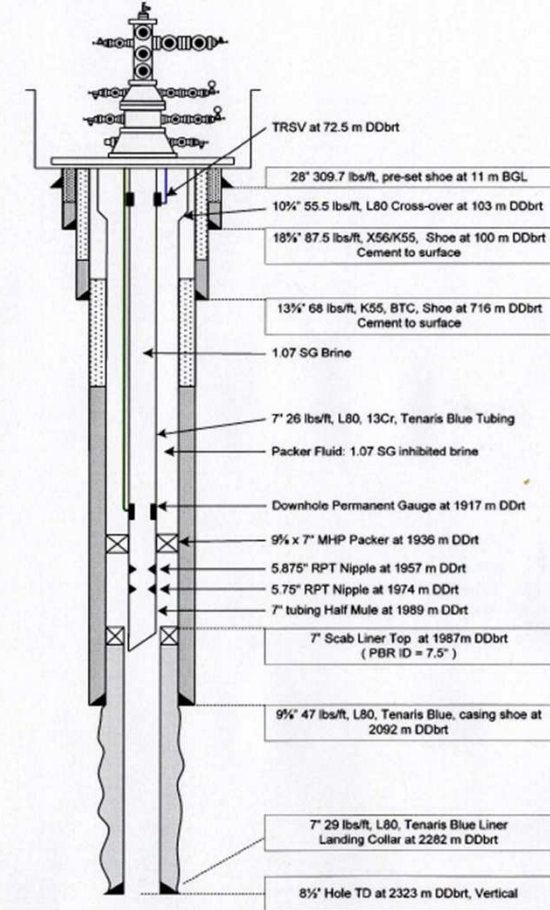
Pressure/ Temp: 2073 psi, 98°C @ Top of MS2

Note: All running depths in Red to be confirmed when run

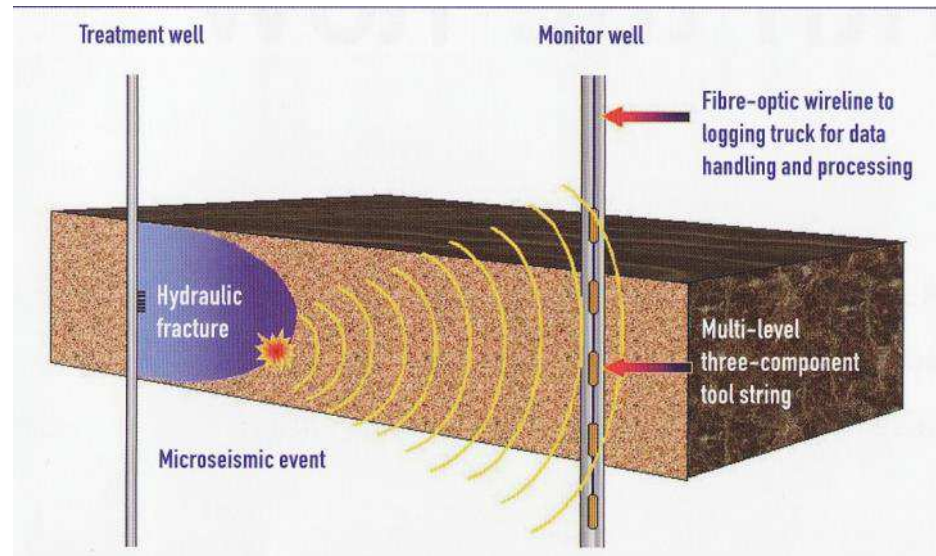
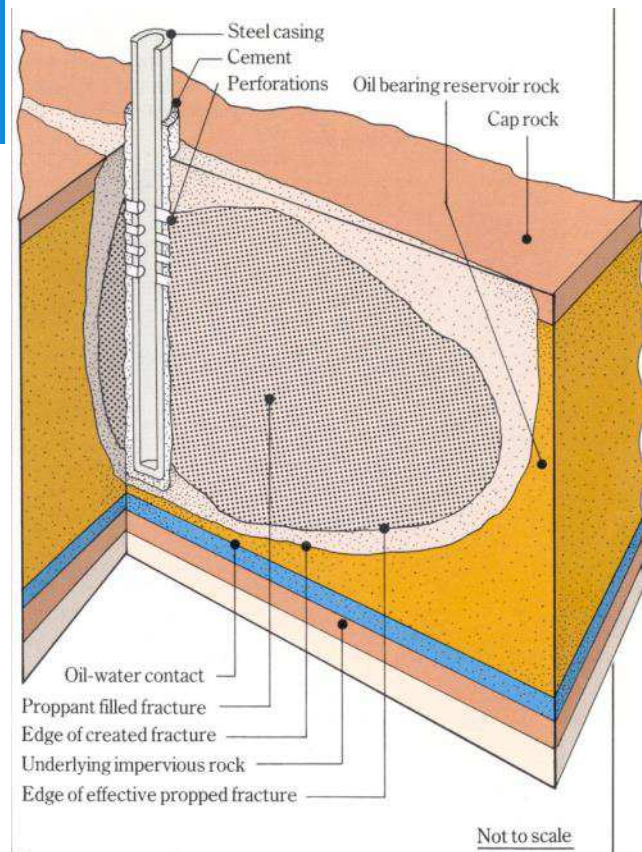
Revisions:

Version 1: R Harwood
 Updated: Hamish Thompson
 Updated: S. J Hart 18 Feb 2010

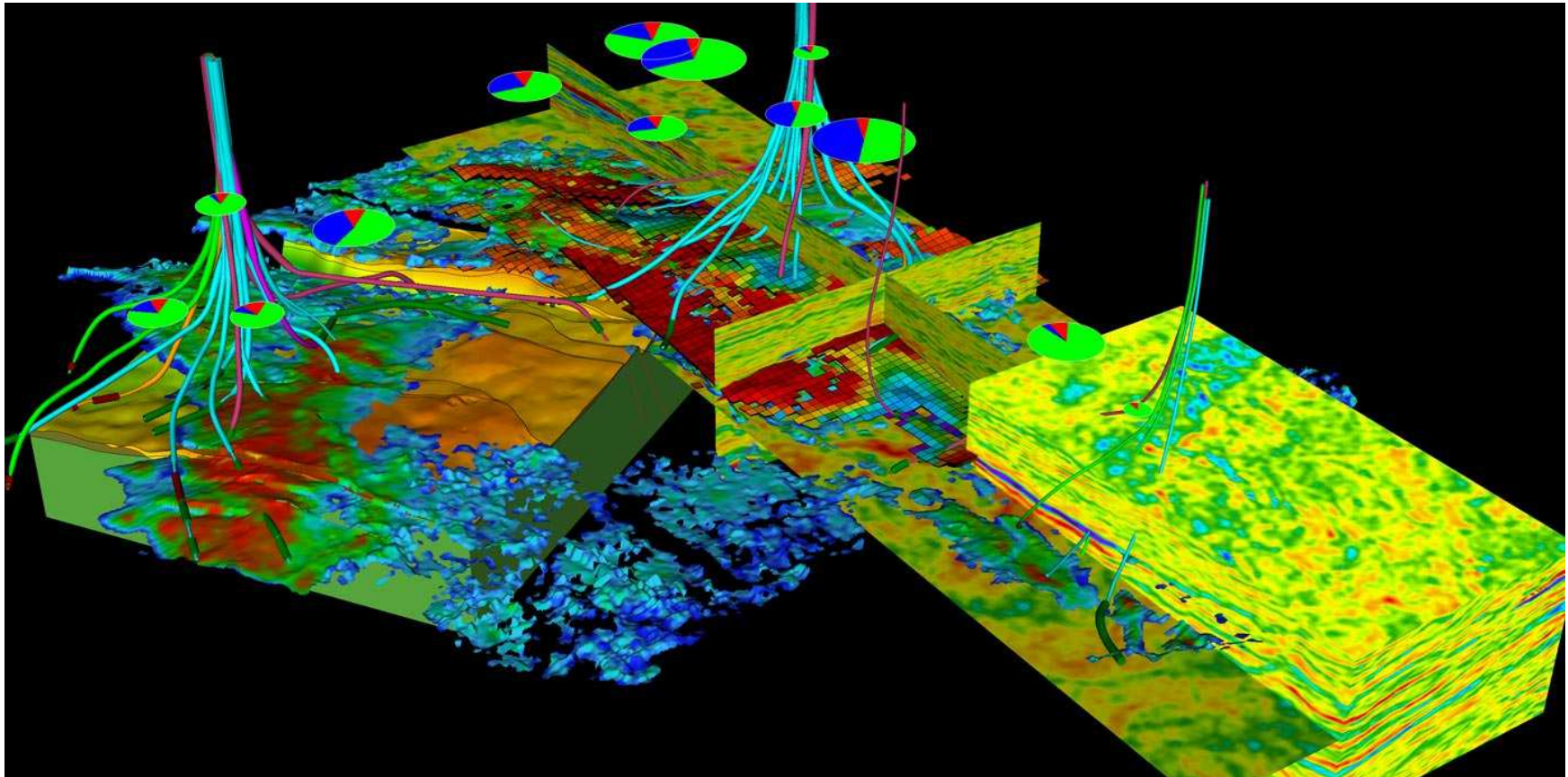
Tg-352 Suspension Schematic - Final



Production Stimulation



Numerical Reservoir simulation





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Some Advice for Making a smooth Transition

- First quarter is relatively light for first four weeks: **use them!**
 - Spend the first four weeks strengthening background in geology and/or math if needed
- Don't delay on preparing for exams
- Some courses are required for the Field Development Project at start of year 2; delay could postpone graduation
 - in Q1, required courses include AES1300, AES1310, AES1920 (properties of hydrocarbons, rock-fluid physics, geostatistics)

Convergence Process for those of Diverse Backgrounds

- If you are weak or rusty in **geology**, spend the first four weeks attaining some background
 - Reference books on geology
 - MOOC by Prof. Bertotti (more information to come on this)
- Unless you are confident in your knowledge of **well-log interpretation** and **seismic interpretation**, take the convergence courses on these subjects (AES1760, AES3520)
 - Students find these challenging; but persevere!
 - They are **essential** to later courses
 - You can count 1 ECTS credit for each against electives requirement

Convergence Process for those of Diverse Backgrounds

- If you are weak or rusty in **math**, build up your background (see list of topics in email sent out)
 - textbooks and notes from your own BSc
 - reference books on convergence course web site
- Students report that the amount of computer programming in our MSc is challenging
 - Treat the required course in **Matlab** seriously!
 - **Ask for help** during the course if you are struggling. You will need these skills to thrive in our program

Web site with information on convergence process

- <https://www.tudelft.nl/en/ceg/about-the-faculty/departments/geoscience-engineering/sections/petroleum-engineering/education/convergence-courses/>
- The web site has detailed advice on getting needed background in a variety of different subjects.

More information will be forthcoming

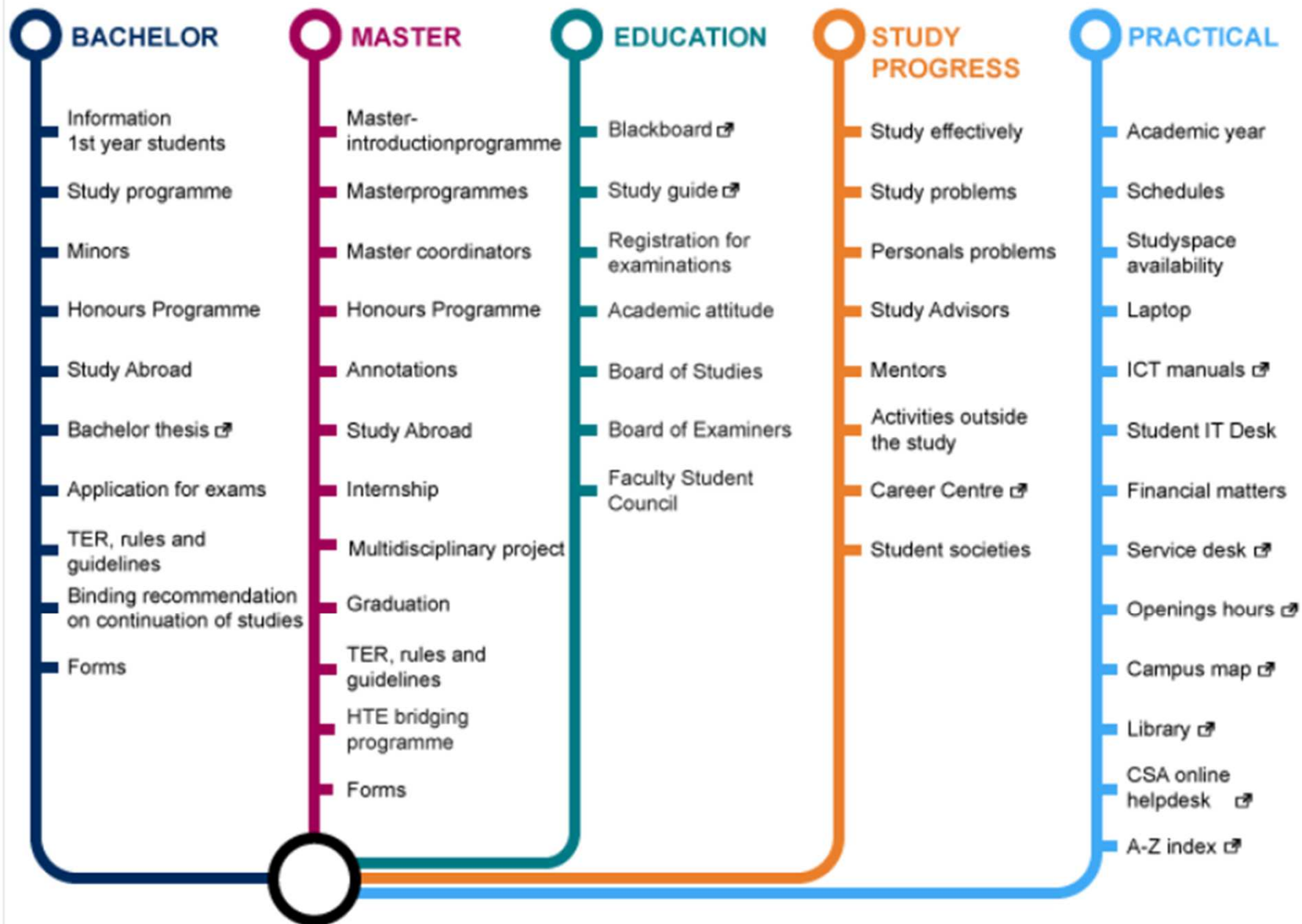
- To reach you all by email, we will use the student list for AES1300 (Properties of Reservoir Fluids), which you all must take in Q1
- Sign up for this course on Brightspace immediately:
<http://brightspace.tudelft.nl>
 - click on the "catalog" button at the top.
 - type AESM2006 into the box that appears
 - Click on box for the class
 - On page that opens, click "log in to enroll"
 - help page: <https://brightspace-support.tudelft.nl/>
- Important announcements will be coming out with a few days; enroll immediately

Take responsibility for your own program and progress

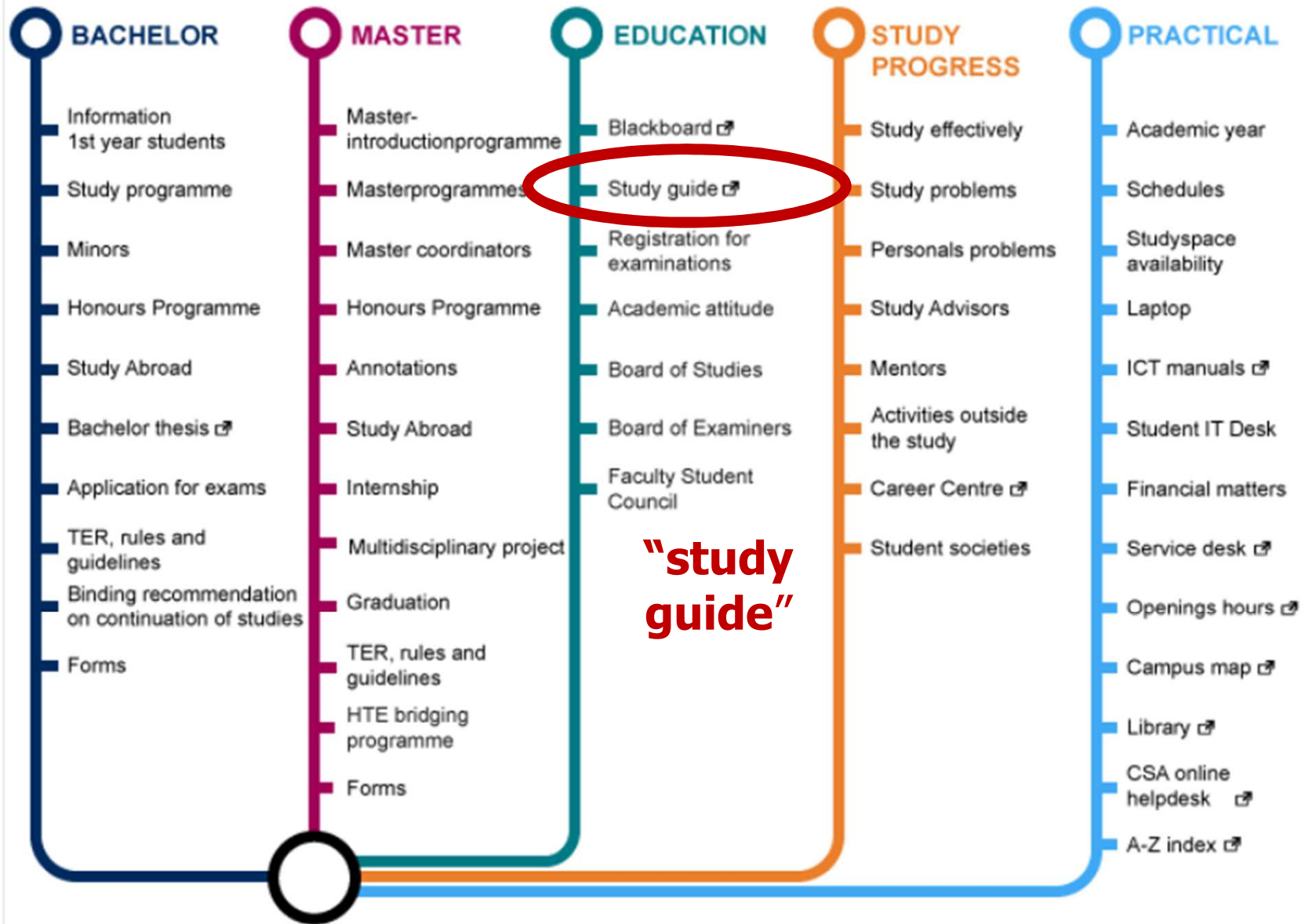
- Information on program, regulations, where to go for help:

<http://studenten.tudelft.nl/en/ceg/>

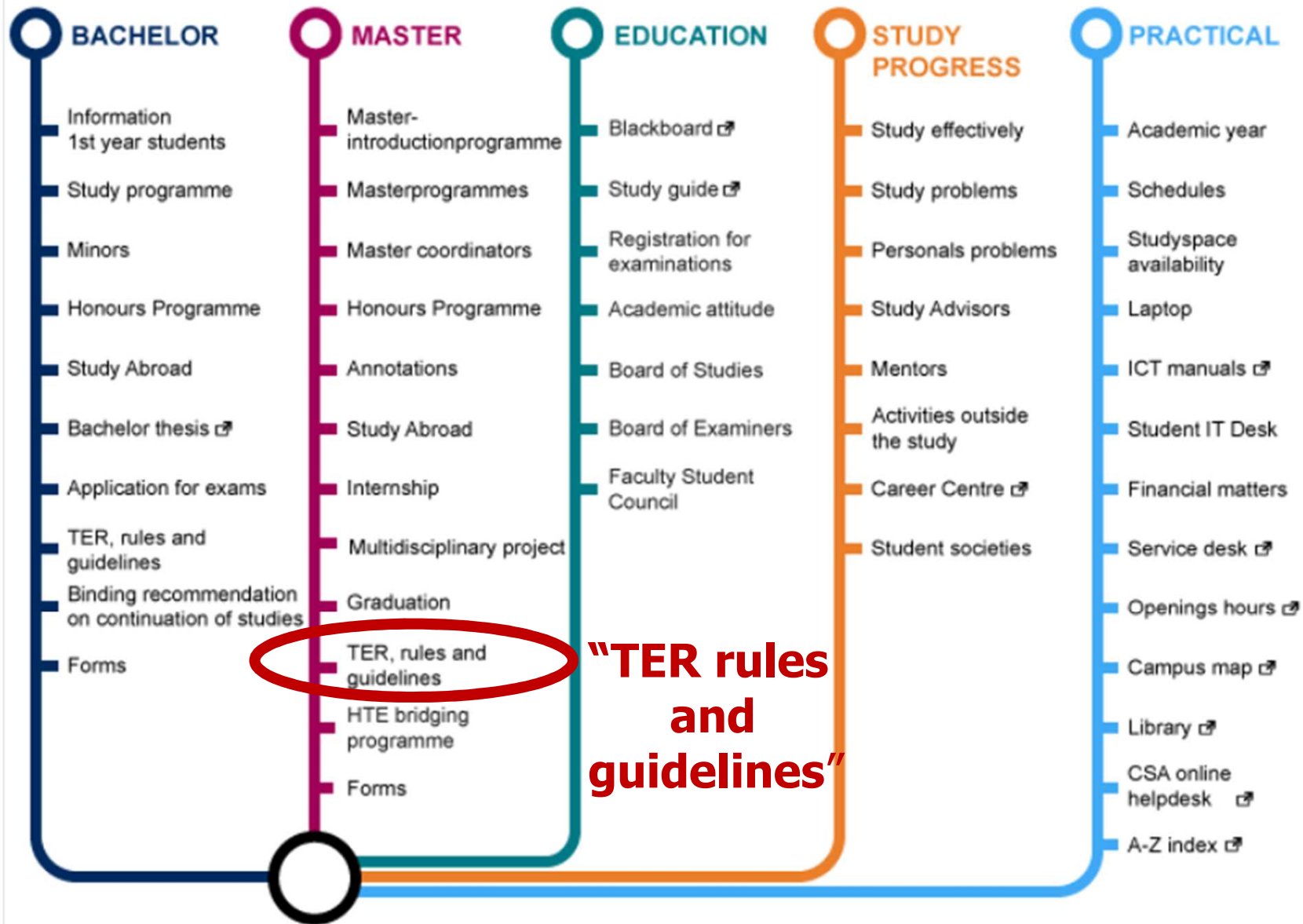
- Check the rules and regulations yourself, *before* you contact the study advisor or MSc coordinator



<http://studenten.tudelft.nl/en/ceg/>



"study guide"



Regulations: TER, Rules and Guidelines

Academic year 2016-2017

Bachelor

For the regulations of the BSc CE programmes; see the [Dutch](#) page.

BSc Applied Earth Sciences

- [Teaching and examination regulations BSc AES \(TER\)](#)
- [Implementation Regulations BSc AES \(IR\)](#)
- [Rules and Guidelines Board of Examiners BSc AES \(BoE BSc AES\)](#)

Masters

MSc Civil Engineering

- [Teaching and examination regulations MSc CE and AES \(TER\)](#)
- [Implementation Regulations MSc CE \(IR\)](#)
- [Rules and guidelines Board of Examiners MSc CE and AES \(BoE MSc CE/AES\)](#)

MSc Applied Earth Sciences

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Take responsibility for your own program and progress

- Information on program, regulations, where to go for help:

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- Check the rules and regulations yourself, *before* you contact the study advisor or MSc coordinator
- Class schedules

<http://huidigeroosters.tudelft.nl/>

Web Roosters 2016-2017

Studieprogramma

Vak

Studentengroep

Activiteitsgroep

Zaalgroep

Zaal

Docent

Studiegroep

Activiteitsgroep roosters:

Faculteit

Maak selectie...

Kies (en druk de knop)

Selecteer activiteitsgroep(en)

- BK-Afstuderen
- BK-GO/NO GO
- BK-Inlevemomenten
- BK-P2
- Collegerama 3mE
- Computertentamen
- Tentamens BK

Selecteer week(en)

Deze week

Selecteer dag(en)

Werkdagen (maandag t/m vrijdag)

Selecteer tijd

08:00 - 23:00

Rooster weergave

Grafisch Individueel

- Voor individuele roosters zie alternatieve roosterinterface 'My Timetable' <https://mytimetable.tudelft.nl/>

- Voor tentamens is uitsluitend de zaal in [OSIRIS](#) leidend (1 week voorafgaand aan het tentamen)

- Bouwlandstudenten [klik hier](#)

[Algemene roosterinformatie](#)

Some Advice for Making the Most of the Next Two Years

- Get involved with student organizations
 - Society of Petroleum Engineers
 - American Association of Petroleum Geologists
 - Mijnbouwkundige Vereeniging
- Be careful about properly enrolling for exams when they come up
- Start thinking about your MSc thesis topic; talk with instructors you like, or in courses you find interesting, about their research

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WELCOME!





Questions?

Study Advisor, Pascal de Smidt:
P.deSmidt@tudelft.nl

J.E.A.Storms@tudelft.nl (RG specialization):
w.r.rossen@tudelft.nl (PE specialization)

MV: mv@tudelft.nl

SPE student chapter: SPEDelft@tudelft.nl

AAPG student chapter:
aapg-GSE-CITG@tudelft.nl

A question for continuing students of TU Delft

What should incoming students know about

- Living in The Netherlands?
- Living in Delft?
- Studying at TU Delft?
- Studying Applied Earth Sciences at TU Delft?

Two questions for students new to TU Delft

- What has been most surprising about The Netherlands and Delft since you arrived?
- Any additional questions ... ?

RG

Courses

Course code	Course Title	Ects points	p1	p2	p3	p4	p5
AES0102	Image Analysis	1	✓				
AES1011	Matlab / Programming	2	✓				
AES1300	Properties of Hydrocarbons & Oilfield Fluids	3	✓	●	●		
AES1310-10	Rock Fluid Physics	3	✓	●	●		
AES1320	Modelling of Fluid Flow in Porous Media	3		✓	●	●	
AES1340	Reservoir Engineering	2			✓	●	●
AES1510	Geologic Interpretation of Seismic Data	3		✓	●	●	
AES1520	Log Evaluation	2			✓	●	●
AES1800	Exploration Geology (including Remote Sensing)	3		✓	●		
AES1802	Geological Fieldwork	3				✓	●
AES1820-09	Reservoir Characterisation & Development	4				✓	●
AES1830	Reservoir Sedimentology	3		✓			
AES1840	Advanced Structural Geology	3			✓	●	
AES1850	Geological Modelling	4			✓	●	
AES1860-05	Analysis of Sedimentary Data	3	✓	●			
AES1890	Sedimentary Systems	3		✓	●	●	
AES1902	Reservoir Geological Fieldwork (Huesca)	6				✓	●
AES1920	Geostatistics	2	✓	●	●		
AES1930	Quantification of Rock Reservoir Images	1		✓			
AES3820	Petroleum Geology	3	✓	●	●		

PE

Courses

Course code	Course Title	Ects points	p1	p2	p3	p4	p5
AES0102	Image Analysis	1	✓				
AES1011	Matlab / Programming	2	✓				
AES1300	Properties of Hydrocarbons & Oilfield Fluids	3	✓	●	●		
AES1304	Introduction to Petroleum Engineering and NAM Visit	3	✓			✓	
AES1310-10	Rock Fluid Physics	3	✓	●	●		
AES1320	Modelling of Fluid Flow in Porous Media	3		✓	●	●	
AES1330	Drilling & Production Engineering	4		✓		●	●
AES1340	Reservoir Engineering	2			✓	●	●
AES1350	Reservoir Simulation	2				✓	
AES1360	Production Optimisation	3				✓	●
AES1500	Fundamentals of Borehole Logging	4			✓	●	●
AES1510	Geologic Interpretation of Seismic Data	3		✓	●	●	
AES1520	Log Evaluation	2			✓	●	●
AES1802	Geological Fieldwork	3				✓	
AES1820-09	Reservoir Characterisation & Development	4				✓	●
AES1890	Sedimentary Systems	3		✓	●	●	
AES1920	Geostatistics	2	✓	●	●		
AES1930	Quantification of Rock Reservoir Images	1		✓			
AES3820	Petroleum Geology	3	✓	●	●		
WI4012ta	Mathematics, Special Subjects	4		✓			