Studyguide MSc. PGsE, 2023-2026, Cohort-06

Petroleum Geoscience and Engineering

- The science concerned with finding oil and gas resources and exploiting them in an environmentally and economically sound manner.
- The program combines mathematics, geology, engineering and applied earth sciences to study the developments within the petroleum industry.
- Students master a combination of geosciences and engineering for the specific needs of petroleum exploration and production
- Three specialization tracks:
  - Petroleum Geology
  - Petroleum Engineering
  - Offshore Engineering

Program Objectives

- Offering an interdisciplinary Master's degree in which petroleum geology and engineering are central, with a choice of one of the specializations: Petroleum Geology, Petroleum Engineering or Offshore Engineering.
- Educating to professionals who can function at an academic level of work and thinking, whereby a solid foundation has been laid for employment as a starting geoscientist or engineer, mainly in the professional field onshore and offshore Suriname and the Caribbean.
- Educating to professionals who have knowledge of current developments within the field of petroleum exploration and exploitation, both onshore and offshore, with a focus on Suriname and the Caribbean.
- Teaching lifelong learning skills that enable the graduate to continue his/her education in scientific research or to further professionalize within the field.

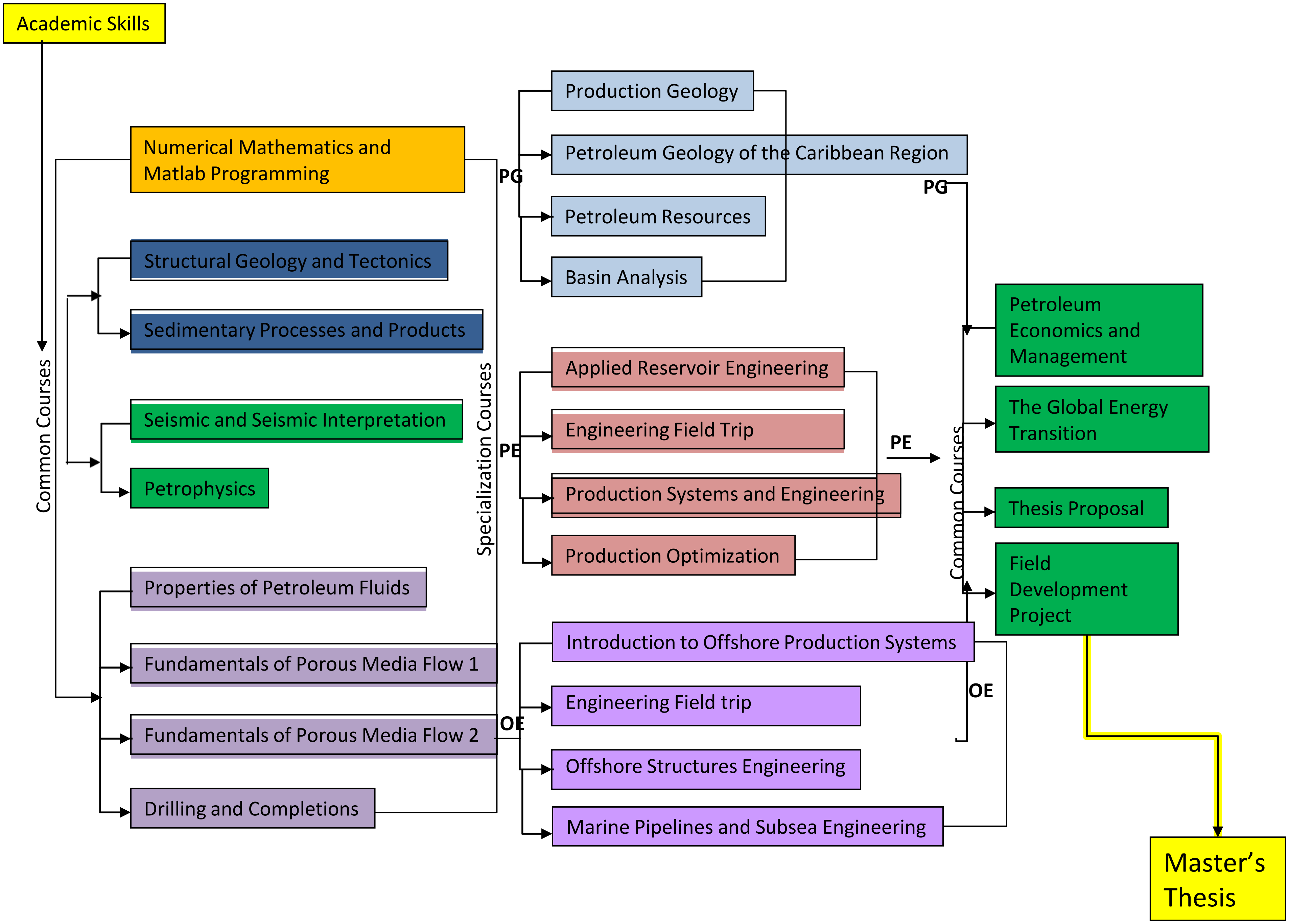
Program Outline

- **DURATION:** 3 YEARS (120 ECTS)
- **NUMBER OF STUDENTS:** 10
- **START:** May 2023
- **DEGREE:** Master of Science
- **EDUCATIONAL SYSTEM**: MODULAR (COURSE START TO FINISH, INCL. EXAMINATION)
- **CREDIT POINTS DISTRIBUTION**: 40 WEEKS & CREDIT POINTS/ YEAR (~1 POINT/WEEK~28 HRS/WEEK)
- **DAYS/ TIME (LECTURE):** MON- FRI (17-21u), SAT. (09-13u); TYPICALLY TWO WEEKS OF LECTURE PER COURSE
- **FEES:** USD2000,- college fee & *SRD3500,- registration fee ANNUALLY *(registration fee subject to change depending on MINOWC)
- **VENUE:** Onsite/ Online/ Hybrid (Covid Depending; Laptop/ Internet required)

Deficiency Courses (Pre-Master)

- Required prerequisite courses for admission to master program:
-
  Physical Geology
  Sedimentology
  Structural Geology
  Geology of the Guiana Basin
  Petroleum Geology
  Historical Geology
  Petroleum Winning

  Numerical Analysis & Technical Calculus (WB Course)
  Differential Equations (WB Course)


Academic Skills
Common Courses
Numerical Mathematics and Matlab Programming
Structural Geology and Tectonics
Sedimentary Processes and Products
Seismic and Seismic Interpretation
Petrophysics
Properties of Petroleum Fluids
Fundamentals of Porous Media Flow 1
Fundamentals of Porous Media Flow 2
Drilling and Completions
Specialization Courses
PG
PE
OE
Production Geology
Petroleum Geology of the Caribbean Region
Petroleum Resources
Basin Analysis
Applied Reservoir Engineering
Engineering Field Trip
Production Systems and Engineering
Production Optimization
Introduction to Offshore Production Systems
Engineering Field trip
Offshore Structures Engineering
Marine Pipelines and Subsea Engineering
PG
PE
OE
Common Courses
Petroleum Economics and Management
The Global Energy Transition
Thesis Proposal
Field Development Project
Master's Thesis

COURSE OVERVIEW YEAR-01 MSC.PGsE

YEAR:	COURSE CATEGORY:	#:	COURSE CODE:	COURSE NAME:	# OF ECTS:	# OF WEEKS:
01	**COMMON COURSES**	01	GW700	ACADEMIC SKILLS	3	3
		02	GW701	NUMERICAL MATHEMATICS AND MATLAB PROGRAMMING	5	5
		03	GW702	STRUCTURAL GEOLOGY AND TECTONICS	7	7
		04	GW703	SEDIMENTARY PROCESSES AND PRODUCTS	7	7
		05	GW800	SEISMIC AND SEISMIC INTERPRETATION	5	5
		06	GW801	PETROPHYSICS	4	4
		07	GW802	PROPERTIES OF PETROLEUM FLUIDS	4	4
		08	GW803	FUNDAMENTALS OF POROUS MEDIA FLOW: SINGLE PHASE FLOW	5	5

COURSE OVERVIEW YEAR-02 MSC.PGsE

YEAR:	COURSE CATEGORY:	#:	COURSE CODE:	COURSE NAME:	# OF ECTS:	# OF WEEKS:
02	COMMON COURSES	01	GW900	FUNDAMENTALS OF POROUS MEDIA FLOW: MULTI PHASE FLOW	5	5
		02	GW901	DRILLING AND COMPLETIONS ENGINEERING	5	5
	SPECIALISATION COURSES PG	03	GW902	PRODUCTION GEOLOGY	4.5	4.5-5
		04	GW905	PETROLEUM GEOLOGY OF THE CARIBBEAN REGION	7.5	7.5-8
		05	GW907	PETROLEUM RESOURCES	4.5	4.5-5
		06	GW1000	BASIN ANALYSIS	3.5	3.5-4
	SPECIALISATION COURSES PE	07	GW903	APPLIED RESERVOIR ENGINEERING	5.5	5.5-6
		08	GW906	ENGINEERING FIELD TRIP	3.5	3.5-4
		09	GW908	PRODUCTION SYSTEMS AND ENGINEERING	5.5	5.5-6
		10	GW1001	PRODUCTION OPTIMIZATION	5.5	5.5-6
	SPECIALISATION COURSES OE	11	GW904	INTRODUCTION TO OFFSHORE PRODUCTION SYSTEMS	4	4
		12	GW906	ENGINEERING FIELD TRIP	3.5	3.5
		13	GW909	OFFSHORE STRUCTURES ENGINEERING	6.5	6.5-7
		14	GW1002	MARINE PIPELINES AND SUBSEA ENGINEERING	6	6
	COMMON COURSES	15	GW1003	PETROLEUM ECONOMICS AND MANAGEMENT	5	5
		16	GW1004	THE GLOBAL ENERGY TRANSITION	4	4

COURSE OVERVIEW YEAR-03 MSC.PGsE

YEAR:	COURSE CATEGORY:	#:	COURSE CODE:	COURSE NAME:	# OF ECTS:	# OF WEEKS:
03	**COMMON COURSES**	01	GW1100	THESIS PROPOSAL	4	4
		02	GW1101	FIELD DEVELOPMENT PROJECT	7	7
		03	GW1102	THESIS	30	30-38

Geïntegreerd Overzicht Docenten en Counterparts

Year	Course	Lecturer	Counterpart Lecturer
Y01	Academic Skills	Prof. Dr. Ir. R. Nannan	N/A
	Numerical Mathematics and Matlab Programming	Ir. S.R.Kisoensingh	N/A
	Structural Geology and Tectonics	Dr. A. Dijksman	D. Howard, MSc.
	Sedimentary Products and Processes	S. Kalapnat-Kisoensingh, MSc.	N/A
	Seismic and Seismic Interpretation	Dr. J. Ten Veen	C. Griffith, MSc.
	Petrophysics	Drs. J. Lutgert	S. Kuhn MSc
	Properties of Petroleum Fluids	Prof. Dr. Ir. R. Nannan	D. Makhanlal PH.D.
	Fundamentals of Porous Media Flow: Single Phase Flow	Ir. S.R.Kisoensingh	N/A
Y02	Fundamentals of Porous Media Flow: Multi Phase Flow	T. Ravestein MSc	V. Gopal, MSc.
	Drilling and Completions Engineering	Ir. S. Leijnse	R. Bhajan, MSc.
	Production Geology	Drs. C. Geel	R. Ramdajal, MSc.
	Petroleum Geology of the Caribbean Region	Prof Dr. H. Doust	C. Griffith, MSc.
	Petroleum Resources	Dr. A. Dijksman	I. Goelaman, MSc.
	Basin Analysis	K. Reuber, PhD	I. Goelaman, MSc.
	Applied Reservoir Engineering	Prof Dr. W. Schulte	K. Tjadikrama MSc
	Field Trip- Engineering	Prof. Dr. Th. Wong	N/A
	Production Systems and Engineering	A. Mohan, MSc.	N/A
	Production Optimization	Ir. W. Botermans	X. SewbaratMisser MSc
	Petroleum Economics and Management	Drs. Lucia Van Geuns	R. Mangnoesing MSc
	The Global Energy Transition	Drs. Lucia Van Geuns	R. Mangnoesing MSc

Y03	Thesis Proposal	Various
	Field Development Project	
	Thesis	

GW700 ACADEMIC SKILLS

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW700
Course Name:	ACADEMIC SKILLS
Study Load [ECTS]:	3
Assumed Knowledge, Prerequisites or Co-requisites:	No pre-requisities
Relationship to other courses within the program:	This course assists the student in maximizing his/her study success. The student is prepared to become a successful learner. In this regard emphasis is placed on critical thinking, reading, writing and listening skills and other skills which aid in academic development and learning.
STAFF	
Lecturer:	**Contact details:**
Name: Dr. Ir. R. Nannan	
Counterpart Lecturer:	**Contact details**
Name: N/A	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	20	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[2]Literature Study-01 [hrs]:	24	
[2]Take Home Practical-Hand In Exercises/ Paper/ Presentation [hrs]:	32	
[1]Practical- Presentation/ Feedback [hrs]:	8	
[2]Examination- Preparation/ Literature Study-02 [hrs]:	0	
[1]Examination- Oral [hrs]:	0	
[1]Examination- Written [hrs]:	0	
Total Hours (ECTS x 28hrs):	**84**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

This course prepares the student for scholarly work necessary during the Master's program. It also introduces the student to academic writing and thinking that enables the student to become reflective and a critical thinker. The course emphasizes the importance of developing academic skills early on and teaches the student to design graduate level research proposals and final thesis.

- Searching for, critically evaluating and interpreting, studying and reproducing scientific information,
- Performing a literature search and literature review successfully and ways to properly reference information and avoid plagiarism,
- Use of ICT tools,
- The importance of proper research (and experiment) design,
- Testing for feasibility and relevance of the object under scrutiny,
- Formulating the research problem and hypothesis
- Testing the hypothesis
- Designing the materials and methods chapter
- Data generation, importance of statistical analysis, interpretation and presentation
- The importance of drawing the correct conclusions and making recommendations for follow-up research

Learning Outcomes:

- Search for relevant scientific sources using specific search engines and compile a short list of literature from a long list.
- Formulate a problem statement.
- Identify the preconditions for the critical application of knowledge.
- Determine own study style.
- Consult relevant sources for active learning, reading and listening.
- Is able to use specific internet sources (information and documentation systems) to search for scientific literature, and to evaluate scientific sources under supervision on the basis of value;
- Can read scientific texts and professional literature and interpret the data in it with guidance;
- Has developed the vocabulary relevant to the field;
- Can give an overview of the tool-building domain and thus make a more specific choice of the subject when graduating.
- Can give a short presentation/ summary of 10 minutes on the content of two scientific texts and/ or professional literature within the geosciences domain.

Teaching Method:

Skills will be developed and tested through academic assignments consisting of one or more of the following formats: homework, class room assignments, critical interpretation of scientific publications, discussion sessions, individual and/or group written and verbal presentations; all contributing factors to help shape the academic skills of the participants.

Course Contents:

a. Lecture Content:

i) Study/ Academic skills
ii) Research methodology
iii) Scientific publications
iv) Academic reading
v) Academic writing
vi) Literature review
vii) Problem Definition
viii) Critical thinking

b. Practical:

ix) take-home
x) ‘in-class’ exercises

Conditions for Examination:

Assessment is based on take-home exercises, presentation and MSc-thesis. The score will be either “voldaan/satisfied if >= 5,50” or “niet voldaan/not satisfied”.

Course Evaluation:

- Reporting, presentations, peer-to-peer feedback and mandatory attendance at lectures.
- Students will receive the term "satisfied":
  xi) the compulsory attendance at the lectures and tutorials
  xii) the application of the software tools
  xiii) the presentation
  xiv) the style and structure of the report in the field of experimental skills

Task:	Knowledge and Abilities Assessed:
Take-home exercises	Abstract writing, peer review, tables, reference style, figures, poster
Presentation	Peer review of poster, plenary poster presentation
MSc-thesis	Overall style assessment: references, problem definition, conclusions in relation to problem definition and hypothesis, captions and citations, plagiarism

Course Necessities:

No specific necessities.

Textbooks and/or Reference Books:

- Gaast van der, K., Koenders, L, Post, G. (2015). Academische vaardigheden voor interdisciplinaire studies. Amsterdam, Nederland: Amsterdam University Press
- Van Cleemput, O. and Saso, L. (2017). Manual on Scientific Communication for Postgraduate Students and Young Researchers in Technical, Natural and Life Sciences. DOI 10.5772/intechopen.69870. ISBN: 978-953-51-3442-8 (download as pdf)

GW701 NUMERICAL MATHEMATICS AND MATLAB PROGRAMMING

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW701
Course Name:	NUMERICAL MATHEMATICS AND MATLAB PROGRAMMING
Study Load [ECTS]:	5
Assumed Knowledge, Prerequisites or Co-requisites:	• Basic knowledge of mathematics (analytical integration, derivation, linear algebra) and informatics or relevant computer science course. • Applied skills in the use of MS Office Modules.
Relationship to other courses within the program:	This course is required for: - GW801 Petrophysics - GW802 Properties of Petroleum Fluids - GW803 Fundamentals of Porous Media Flow: Single Phase Flow - GW900 Fundamentals of Porous Media Flow: Multi-phase Flow - GW1101 Field Development Project

STAFF	
Lecturer:	**Contact details:**
Name: Ir. Shailesh R. Kisoensingh	
Counterpart Lecturer:	**Contact details**
Name: N/A	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	44	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[2]Literature Study-01 [hrs]:	43	
[2]Take Home Practical- Hand In Exercises/ Paper [hrs]:	52	
[1]Practical- Presentation/ Oral Examination [hrs]:	1	
[2]Examination- Preparation/ Literature Study-02 [hrs]:	0	
[1]Examination- Oral [hrs]:	0	
[1]Examination- Written [hrs]:	0	
Total Hours (ECTS x 28hrs):	**140**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

The Numerical Mathematics and Matlab Programming course allows students to become familiar with non-analytical mathematical subjects such as numerical errors, Taylor series and its application in Euler's method, finite method calculations and how numerical solutions can be programmed with a tool such as Matlab.

Learning Outcomes:

Students will generally be able to:

- Describe the various numerical methods to solve 1st order differential equations (e.g. Euler's Method)
- Describe the various numerical methods to solve 2nd or higher order differential equations (e.g. Finite Volume/ Difference Method)
- Determine the order of magnitude of the error adhering to different numerical methods and describe its significance
- Develop Matlab-scripts for various numerical methods to have a computer perform multiple iterations
- Describe the developed Matlab-scripts
- Use of software packages (incl. computer graphics output etc)
- Application of academic skills (technical writing & presentation skills)
- Teamwork
- Ability to answer questions/ substantiate/ improvise
- Theory, application and analysis of various numerical methods as well as the magnitude of the error associated

Teaching Method:

The teaching method for this course implies lecture presentations, classroom exercises, take home exercises per group, where the exercises should be handed in by writing a short technical paper where the problem, assumptions, method for solution and solution is described, followed by a presentation and Q&A as a formal oral examination.

Course Contents:

c. Lecture Content
    i. Basic Matlab introduction
    ii. Derivatives and integration
    iii. Euler's method for solving differential equations
    iv. Newton-Raphson method
    v. Taylor series
    vi. Error calculations
    vii. Runge-Kutta method
    viii. Matrix factorization
    ix. Finite Difference Method (incl. Richardson's error estimation)
    x. Finite Volume Method

d. Practical

The practical aspect of this course implies exercises which need to be solved, where the solution is documented by writing a short technical paper per exercise subject, followed by a presentation & oral exam.

Conditions for Examination:

The examination of this course implies handing in a technical paper per target date, followed by a presentation and oral examination per planning. The oral examination will cover Q&A from the presentation as well theoretical questions regarding the lecture content.

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Practical- Hand in exercises through three (3) Papers	• Develop Matlab-scripts for various numerical methods to have a computer perform multiple iterations • Describe the various numerical methods to solve 1st order differential equations (e.g. Euler's Method) • Describe the various numerical methods to solve 2nd or higher order differential equations (e.g. Finite Volume/ Difference Method) • Determine the order of magnitude of the error adhering to different numerical methods and describe its significance • Use of software packages • Application of academic skills (technical writing) • Teamwork	50%* (30% Paper-01, 35% Paper-02 & 35% Paper-03)
Practical- Presentation of Results followed by Oral Examination	• Theory, application and analysis of various numerical methods as well as the magnitude of the error associated • Teamwork • Application of academic skills • Ability to answer questions/ substantiate/ improvise	50%* Oral Examination

*For all subtasks, a minimum grade of 5.0 (no round-off) is required, however the final course grade should be at least 5.5 (after round-off)

Course Necessities:

- MS Words/ Excel/ PowerPoint
- Matlab (Laptop)

Textbooks and/or Reference Books:

- Numerieke Methoden voor Differentiaalvergelijkingen, C. Vuik, P. van Beek, F. Vermolen, J. van Kan, 2004, Delft Univeristy of Technology, Faculty Elektrotechniek, Wiskunde en Informatica Delft Institute of Applied Mathematics.
- Introduction to MATLAB (syllabus), E. Pekalska, 2001-2005, Delft University of Technology.
- FVM, Long Chen Literature
- Anziam J 54 (CTAC2012), FVM & FDM Literature
- Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven C. Chapra Dr. (z-lib.org)

GW702 STRUCTURAL GEOLOGY AND TECTONICS

General Course Information

GENERAL	
Course Code:	GW702
Course Name:	STRUCTURAL GEOLOGY AND TECTONICS
Study Load [ECTS]:	7
Assumed Knowledge, Prerequisites or Co-requisites:	Familiarity with basic Structural Geology, in particular the description and standard terminology of structures, map reading and understanding of basic processes.
Relationship to other courses within the program:	This course is part of the Geology common courses of the MSc degree program Petroleum Geoscience and Engineering. The topics of this course are applicable for courses such as Seismic and Seismic Interpretation, and for all specialization tracks, especially courses such as Basin analysis, Petroleum Geology of the Caribbean Region and the Field trip.
STAFF	
Lecturer:	**Contact details:**
Name: Prof. Dr. J.H.P. De Bresser	
Counterpart Lecturer:	**Contact details**
Name: D.Howard, MSc	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	48	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[2]Literature Study-01 [hrs]:	40	
[2]Take Home Practical- Hand In Exercises/ [hrs]:	48	
[1]Practical- Feedback [hrs]:	9	
[2]Examination- Preparation/ Literature Study-02 [hrs]:	48	
[1]Examination- Oral [hrs]:	N/A	
[1]Examination- Written [hrs]:	3	
Total Hours (ECTS x 28hrs):	**7*28=196**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

This course focuses on the nature, origin and interpretation of deformation structures preserved in the Earth's crust, on scales ranging from that of basins and orogens, to those of folds, fault zones and microfabrics. Aspects covered include structural geometry and kinematics, rock deformation mechanisms, tectonic setting, and geodynamic significance.

Learning Outcomes:

At the end of the course, the student:

- Knows and understands the processes involved in the development of crustal deformation structures, at the macro-, meso- and microscales;
- Can recognise "structural styles" (associations of structures characteristic of specific tectonic settings), based on observations, and understands their development;
- Has insight in features and processes that are important in analyzing deformed terrains and in constructing tectonic models.

In terms of key skills, the student has learned to:

- Analyze, structure and synthesize information;
- Apply various methods and techniques of structural analysis;
- Efficiently write short reports and make poster presentations.
-

Teaching Method:

The course will consist of lectures alternating with exercises and each student will have to prepare a written report on a relevant topic.

- Lecture presentations using PowerPoint for illustrations;
- In class questions and quizzes;
- In class exercises to engage students during lectures;
- Practical assignments, reporting via (email) posters or reports.

Course Contents:

e. Contents:
  i. Geometry of structures
    - Fault properties,
    - Fault patterns, kinematics
  ii. Kinematics: "Structural styles"
    - Salt, rift, delta tectonics
    - Inversion, thrust, strike slip tectonics
  iii. Dynamics: rock Mechanics
    - Fracturing
    - Flow

f. Assignments:
  Home Assignments:
    1. Fault correlation and depth contour map

2. Fault and salt tectonics
3. Structural styles
4. The use of brittle-ductile models in understanding structure development
5. Experiments with sandstones
6. Flow law for rock salt

Practical Assignments:
- (1) Fault associations and tectonic regimes: Rottumeroog – Groningen
- (2) Structural styles of Salt tectonics
- (3) Structural style of Delta tectonics
- (4) Designing a scale model for the Eastern Alps
- (5) On fractures, failure and healing: Explaining low production rates from a producing oil reservoir
- (6) The rocksalt paradox: deformation behavior and microstructure of salt in nature and experiment

Conditions for Examination:

All practical assignments should be delivered before the final exam unless otherwise stated.

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Home Assignments 1-4	Making observations Interpretation in terms of structural styles Basic calculations	25%
Practical Assignment 1-4	Making observations Analyze, structure and synthesize Application of theoretical concepts Interpretation in terms of structural styles Basic calculations	35%
Written exam	Knowledge and understanding of subject Making observations Analyze, structure and synthesize Application of theoretical concepts Interpretation in terms of structural styles Basic calculations	40%

Course Necessities:

- Basic Microsoft Office

- MS Teams
- Laptop
- Degree triangle (gradendriehoek)

Textbooks and/or Reference Books:

Fossen, H. (2016). Structural Geology 2nd edition. Cambridge: Cambridge University Press
Selected papers from the geological literature

GW703 SEDIMENTARY PROCESSES AND PRODUCTS

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW703
Course Name:	SEDIMENTARY PROCESSES AND PRODUCTS
Study Load [ECTS]:	7
Assumed Knowledge, Prerequisites or Co-requisites:	• Sedimentology (BSc. Course); see textbooks below • BSc Sedimentary Systems, textbook G. Nicholson - Sedimentology and Stratigraphy, second (2009) or later edition.
Relationship to other courses within the program:	• Elementary knowledge for Petroleum Geosciences and Applied Petroleum Technology. • Complementary courses: Structural geology and tectonics; Seismic and seismic interpretation. • The course complements future courses on Properties of Petroleum Fluids, Petroleum economics and management, petroleum geology and resources, porous media, reservoir engineering.
STAFF	
Lecturer:	**Contact details:**
Name: S. Kalapnat-Kisoensingh, MSc.	
Counterpart Lecturer:	**Contact details:**
Name: N/A	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	28	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[2]Literature Study-01 [hrs]:	12	
[2]Take Home Practical-Essay [hrs]:	76	
[1]Practical- Presentation/ Feedback [hrs]:	12	
[2]Examination- Preparation/ Literature Study-02 [hrs]:	65	
[1]Examination- Oral [hrs]:	0	
[1]Examination- Written [hrs]:	3	
Total Hours (ECTS x 28hrs):	**196**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

The course shows how observations of the rock record lead to questions about causes and effects in the genesis of (3D) sedimentary successions. Focus is on river-delta-shelf-open marine/oceanic systems (from source to sink), and on the relevant physical, chemical and biological processes and other controls.

- Quantification of sediment flux and landscape evolution in association with tectonics and climate;
- Features of river - delta – shelf – deep marine stratigraphy that can be used to reconstruct past climate and sea-level change;
- Using knowledge about past climates, sea-level (change) and tectonics to predict the character of sedimentary successions away from points of control;

Learning Outcomes:

After successful completion of the course students will be able to interpret the physical, chemical and biological processes and other controls that led to the formation of 3D sedimentary successions.

Teaching Method:

The lectures demonstrate the important issues and questions with regards to the analysis and interpretation of 3D sedimentary successions. During the practical hours, generally directly after or in between the lectures, student presentations, short assignments, further guidance on the course content and assistance in essay writing will be given. The latter also through e-mail/Moodle.

Course Contents:

g. Lecture Content
    i. Discussion of sedimentary systems and processes that have been active, with emphasis on the Suriname region since the Palaeozoic;
    ii. Subaerial sedimentary systems: origin and character of sediments; transport by water and wind; hydrodynamics; alluvial (and aeolian) systems;
    iii. Sedimentation in deltas, clastic coastlines and shallow seas; similarities and differences with carbonate systems; effects of sea-level changes; sequence stratigraphy;
    iv. Evolution of basin dynamics (tectonics, paleoclimate, palaeoceanography, palaeogeography, vegetation) in northern S. America during the Phanerozoic;
    v. Sedimentation along continental margins and in the pelagic realm; formation of source and reservoir rocks

h. Practical
    i. Oral presentations
    ii. Essay writing

Conditions for Examination:

The examination of this course includes an individual presentation, handing in an individual essay, and closed off by a written exam.

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Oral presentation on topic related to course to be chosen by the student before the start of the course	• Using scientific literature	10%
Essay	• Scientific writing • illustrate how sedimentological observations can be used to gain insight into the processes that formed landscape and sedimentary successions	45%
Written Examination	• Theoretical assessment of the course content	45%

Course Necessities:

- MS Teams
- MS Words/ PowerPoint

Textbooks and/or Reference Books:

- Einsele, G. (2000), Sedimentary Basins: evolution, facies and sediment budget, second edition, Springer.
- G. Nicholson -Sedimentology and Stratigraphy, Wiley-Blackwell; second (2009) or later edition.

  N.B.: For those who participated in the Bachelor course on sedimentology by Sharista Kalapnat-Kisoensingh, MSc., the content of the book of Nicholson is expected to be common knowledge. Other students are requested to familiarize themselves with the content of this book.

- Reprints of scientific papers related to the course content handed out during the lectures.

GW800 SEISMIC AND SEISMIC INTERPRETATION

General Course Information

GENERAL		
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**	
Course Code:	GW800	
Course Name:	SEISMIC AND SEISMIC INTERPRETATION	
Study Load [ECTS]:	5	
Assumed Knowledge, Prerequisites or Co-requisites:	The student is expected to have good knowledge in: • Structural geology • Petroleum geology • A basic (geo)physical understanding • Applied skills in the use of MS Office Modules	
Relationship to other courses within the program:	This course is compulsory for students pursuing the MSc Programme in Petroleum Geosciences and Engineering. The course is complementary to the following courses: • Structural Geology and tectonics (GW702) • Sedimentary processes and products (GW703) This course complements all future courses of the specialization Petroleum Geosciences and some of the specialization Petroleum & Offshore Engineering.	
STAFF		
Lecturer:	**Contact details:**	
Name: Dr. J. Ten Veen		
Counterpart Lecturer:	**Contact details**	
Name: C. Griffith, MSc.		
ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	40	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[2]Literature Study-01 [hrs]:	20	
[2]Take Home Practical- Hand In Exercises/ Paper/ Essay/Report/ Field Excursion [hrs]:	36	
[1]Practical- Presentation/ Feedback [hrs]:	9	
[2]Examination- Preparation/ Literature Study-02 [hrs]:	32	

[1]Examination- Oral [hrs]:	0	
[1]Examination- Written [hrs]:	3	
Total Hours (ECTS x 28hrs):	**140**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

The course covers the theory of the seismic methods (reflection seismics), including acquisition and (basic) processing of seismic data. This theory will be used to perform seismic interpretation exercises and assignments. The course will be completed with a written, closed book exam.

Learning Outcomes:

After completion of the course the student will be able to:

- Understand the principles and pitfalls of the seismic method.
- Perform a basic and sensible seismic interpretation that shows the ability to apply general geological background knowledge.
- Understand its value as a subsurface exploration and production tool to find hydrocarbons (or to characterize the subsurface in general).
- Give an overview of workflows in subsurface modelling and highlight dependencies between seismic interpretation (and its uncertainties) and further E&P activities.
- Communicate the performed work (exercises) and motivate solutions

Teaching Method:

- Lectures on specific topics (see course description)
- Students will perform practical assignments on paper and in Petrel both in class and at home
- Solutions will be discussed by performing demonstrations of seismic interpretation with PC-based software (Petrel©) where possible

Course Contents:

a. Contents
    - Introduction: seismic interpretation as a step in subsurface modelling for exploration and production of hydrocarbons / Fundamentals of the seismic method / Storage and display of seismic data / Seismic resolution. Short Introduction to Seismic Interpretation software (Petrel) / Demonstration of simple horizon interpretation
    - Volume attributes as aid in structural and stratigraphic interpretation / Structural styles / Interpretation of fault planes in 3D / Links to Framework Modelling / 3D visualization techniques
    - Time-depth conversion methods and their input data and tying seismic to well data
    - 3D seismics/Auto-tracking techniques for interpretation of continuous reflections / Jump correlation across faults / Enhancement techniques for improving interpretability

- Large-scale depositional geometries and controlling processes / Interpretation techniques for unconformities and lap surfaces / Direct Hydrocarbon Indicators (DHI)/ Spectral decomposition for stratigraphic visualization and DHI
- Seismic attributes/imaging/ volume visualisation for prediction of reservoir quality, fluid fill and as indicator for morphological feature
- Introduction to Seismic Inversion Methods and AVO as aid in determining physical structure and properties of the subsurface
- Overview of current state-of-the-art and upcoming technologies
- Unscheduled (i.e., will be used throughout): Seismic Artefacts, Pitfalls, Case Examples

b. The lectures are supplemented by practical exercises to be made by the students during practical class hours (in the week the teacher will be present at AdeKUS) and to finalize at home. The solutions will be discussed in class. Solutions of all the exercises need to be documented by writing one (1) individual short technical report (preferably in WORD or Powerpoint (saved as pdf) and following the requirements listed in the exercise manual). This document should also cover the final practical exercise. The results of the final practical exercise latter should be also documented in Powerpoint presentation that forms the basis for a subsequent presentation and Q&A.

Conditions for Examination:

Students need hand in a report with all practical exercises per target date and need to have taken part in the final practical exercise and its (oral) presentation as per target date.

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Theoretical (TE1-5) and Practical Exercises (PE1-9) focused on theory of the seismic method and seismic interpretation methods, respectively. Exercises will be introduced, made and explained in class hours. Grade depend on quality, correctness and number of exercises handed in.	• Perform a basics seismic interpretation • Understand its value as a subsurface exploration and production tool to find hydrocarbons (or to characterize the subsurface in general) • Understand the basic principles of the seismic method (simple formulas need to be reproduced) • Understand pitfalls of the seismic method.	25%
Bonus for handing in all exercises on time (target date).	-	10%

Final Exercise (PE10): -	• Apply workflows in subsurface interpretation and highlight dependencies between seismic interpretation (and its uncertainties) and further E&P activities • Understand the principles and pitfalls of the seismic method. • Perform a basic and sensible seismic interpretation that shows the ability to apply general geological background knowledge. • Understand its value as a subsurface exploration and production tool to find hydrocarbons (or to characterize the subsurface in general). • Communicate the performed work and motivate solutions by means of a powerpoint presentation (10 min) and ability to answer question about the work performed (5 min)	15%
Written exam -Theoretical assessment of subject knowledge (all lecture material, including theoretical assignments (TE), practical seismic interpretation exercises (PE) and solutions	• Give an overview of workflows in subsurface modelling and highlight dependencies between seismic interpretation (and its uncertainties) and further E&P activities • Understand the principles and pitfalls of the seismic method. • Perform a basic and sensible seismic interpretation that shows the ability to apply general geological background knowledge. • Understand its value as a subsurface exploration and production tool to find hydrocarbons (or to characterize the subsurface in general).	50%

Course Necessities:

- MS Teams
- MS Office (Word, Powerpoint, Excel)
- Petrel software (provided by AdeKUS and Petrel project with exercises (provided by lecturer) to be used for exercises

Textbooks and/or Reference Books:

Bond, C.E., Lunn, R.J., Shipton, Z.K.2 and Lunn, A.D., 2012. What makes an expert effective at interpreting seismic images? Geology, 40-1, p. 75–78; doi:10.1130/G32375.1

Brown, A.R., 2005. Pitfalls in 3-D Seismic Interpretation, Search and Discovery Article #40145 (2005), Posted March 12, 2005.

Brown, A.R., Interpretation of Three-Dimensional Seismic Data, AAPG Memoir 42, 7th Edition/SEG Investigation in Geophysics, No. 9 – Chapter 1

Brown, A.R., Interpretation of Three-Dimensional Seismic Data, AAPG Memoir 42, 7th Edition/SEG Investigation in Geophysics, No. 9 – Chapter 5

GW801 PETROPHYSICS

General Course Information

GENERAL	
Course Code:	GW801
Course Name:	PETROPHYSICS
Study Load [ECTS]:	4
Assumed Knowledge, Prerequisites or Co-requisites:	• Sedimentology • Stratigraphy and stratigraphic correlation • Structural geology (basins, faults and fractures). • Basics of Petroleum Geology
Relationship to other courses within the program:	This course is compulsory for students pursuing specialization in petroleum engineering or offshore engineering. The course is complementary to the following courses: • Applied Reservoir Engineering • Petroleum Economics and Management • Field Development Project
STAFF	
Lecturer:	**Contact details:**
Name: Drs. J. Lutgert	
Counterpart Lecturer:	**Contact details**
Name: Sharon Kuhn, MSc	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	32	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[2]Literature Study-01 [hrs]:	10	
[2]Take Home Practical-Hand In Exercises [hrs]:	32	
[1]Practical- Presentation/ Feedback [hrs]:	0	
[2]Examination- Preparation/ Literature Study-02 [hrs]:	35	
[1]Examination- Oral [hrs]:	0	
[1]Examination- Written [hrs]:	3	
Total Hours (ECTS x 28hrs):	**112**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

During the course it will be explained how subsurface properties can be derived and quantified from well logging measurements. The techniques discussed include openhole wireline interpretations, logging while drilling and measurement while drilling methods and coring techniques. The importance of interaction with other geoscience disciplines will be highlighted. Special attention will be given to subjects where petrophysics interacts with:

- Reservoir geology, i.e. interpolation and extrapolation of reservoir properties
- Reservoir engineering, i.e. upscaling of reservoir properties
- Volumetrics and economics, i.e. through uncertainty quantification of reservoir properties.

Learning Outcomes:

After successful completion of the course the student will be able to:

- Conduct an independent petrophysical evaluation of a well (including properties as clay content, porosity and saturation)
- Critically review existing petrophysical evaluations.
- Understand the importance of uncertainties and sensitivity analyses, especially for volumetric evaluations.

Teaching Method:

The working of petrophysical tools and interpretation techniques will be explained using PowerPoint presentations, videos and spreadsheets/ matlab. After the introduction of each new tool type or interpretation technique the theory is put into practice by performing a series of spreadsheet/ matlab calculations. Also, during lectures students are actively queried on their understanding of the subjects explained. The availability of a laptop with excel & matlab is a prerequisite to performing the exercises.

Course Contents:

During the course the following topics will be discussed:

- A thorough description of physical principles and responses of all the commonly used open hole logging devices such as: Spontaneous Potential, Gamma Ray, Acoustic, Neutron, Density and resistivity devices.
- Introduction level presentations of the use of LWD techniques, image logs, Nuclear Magnetic Resonance logging, coring techniques and cased hole logging tools.
- Several interpretation techniques will be explained to derive:
    - Volumetric estimates of reservoir components including shale volume, porosity, permeability and hydrocarbon content. Interpretation techniques will include Clean Sand Evaluation (Archie), Shaly Sand Evaluation (Simandoux, Indonesia)
    - Capillary Pressure
    - Application of core measurements for reservoir evaluation and calibration

    - Cross plot interpretation for lithology, porosity and hydrocarbon effects
    - Comparison of shale volume, porosity, saturation and permeability methods
    - How to derive cut-off criteria for net reservoir and net pay

At the end of the course, a petrophysical evaluation of typical sandstone reservoirs has been performed using spreadsheet/ matlab calculations. The spreadsheet/ matlab script can be used by the students as a template to evaluate other wells.

Conditions for Examination:

All exercises to be handed in before exam date as per instructions.

Course Evaluation:

Students will be graded based on the written exam. The exam will test the theoretical subject knowledge using a multiple choice section as well as open questions containing both theory and calculations.

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Written exam	• Test the ability to perform a standard petrophysical evaluation and critically review existing evaluations. • Understand the importance of uncertainties and sensitivity analyses, especially for volumetric evaluations.	70%
Hand In Exercise	• Conduct an independent petrophysical evaluation of a well (including properties as clay content, porosity and saturation) in Matlab (group based)	30%

Course Necessities:

- MS Teams
- MS Office
- Matlab

Textbooks and/or Reference Books:

Malcolm H. Ryder (2002), The Geological Interpretation of Well Logs, 2nd ed.

GW802 PROPERTIES OF PETROLEUM FLUIDS

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW802
Course Name:	PROPERTIES OF PETROLEUM FLUIDS
Study Load [ECTS]:	4
Assumed Knowledge, Prerequisites or Co-requisites:	• Knowledge of engineering and chemical thermodynamics/physical chemistry • Understanding of mass and energy conservation relations • Undergraduate calculus and linear algebra • GW701: Numerical Mathematics portion
Relationship to other courses within the program:	This course follows GW801-Petrophysics and precedes GW803-Fundamentals of Porous Media Flow: Single Phase Flow. This course provides tools for the quantitative and qualitative analysis of crude oil transport, storage and processing systems. It gives the students insights into various models for predicting/calculating relevant fluid properties under field conditions.
STAFF	
Lecturer:	**Contact details:**
Name: Dr. N.R. Nannan	
Counterpart Lecturer:	**Contact details**
Name: -	

ESTIMATED STUDY LOAD		
Lecture hrs (contact) [hrs]:	42 (1.5 ECTS)	NOTES: • The literature study hours (2.25 ECTS) includes numerical exercises (0.75 ECTS) as well as reading and understanding relevant topics of the course material
Literature Study [hrs]:	63 (2.25 ECTS)	
Examination- Oral [hrs]:	1	
Examination-Written [hrs]:	6	
***Total Hours (ECTS x 28hrs):**	**112**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

The increasingly sophisticated drilling and hydrocarbon production technologies require a good knowledge of the properties of fluids that are both reservoir borne and external to the reservoir. The reservoir borne fluids are the hydrocarbons (i.e., oil and gas, and water) and a large variety of mixtures of these fluids, while the external fluids include essentially water and non-Newtonian fluids such as drilling mud. The flow of oil and gas in the reservoir and the production stream is strongly dependent on the thermodynamic behaviour of the fluids. The material properties that are needed to describe the flow and the volumetric behaviour (densities, viscosities, etc.) depend on the pressure, temperature, and composition. The variations of these parameters may lead to considerable modifications of the phase behaviour, which in turn can cause drastic changes of the flow pattern. The thermodynamic behaviour of hydrocarbons classically described in terms of the pressure, volume and temperature (*PVT* behaviour) will be the major concern of this course.

Topics:

- Hydrocarbons and oilfield fluids
- Nomenclature and basic organic chemistry
- Phase behaviour and Equations of state
- Black oil correlations

Learning Outcomes:

After successful completion of this course students will be able to:

- Understand nomenclature of organic compounds
- Understand the properties of hydrocarbons and oilfield fluids
- Understand and have insight in phase behavior of gases and oil mixtures (VLE)
- Understand Equations of state and be able to apply them under field conditions (also knowing drawbacks of various model Equations of State). Be able to contextualize the results.
- Understand Black oil correlations and be able to apply them

Teaching Method:

- Lectures using PowerPoint format for illustrations
- Exercises from the various books used.

Course Contents:

Lecture Content

1. Ahmed, T.H. (2007). Equations of State and PVT Analysis: Applications for Improved Reservoir Modeling. Gulf Publishing Company, Houston (TX) [2nd ed. from 2016]
2. McCain, W.D. (1990). The Properties of Petroleum Fluids. 2nd Edition, PennWell Books, PennWell Publishing Company, Tulsa (OK). [3rd ed. from 2017]

Practical

- Classroom exercises

Conditions for Examination:

The exam will be a take-home project. The student will have 3 full days to work on the exam and may use all tools to his or her disposal (course material, online resources, etc.). Additionally, afterwards (a separate schedule will be made) an oral exam will be taken.

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Take-home Examination	Being able to critically think and solve complex problems related to fluid property predictions	67%
Oral Examination	Assess that the student indeed understood what he or she did during the take home exam AND assess and evaluate why errors were made (if any). Additionally, insights of the students will be assessed with regards to use of equations of state and ancillary equations in predicting fluid properties.	33%

Course Necessities:

Moodle, MS Teams for lectures and exercises. The student must have access to Microsoft Excel (licensed version 2012 or later).

Textbooks and/or Reference Books available on Moodle:

- Ahmed, T.H. (2007). Equations of State and PVT Analysis: Applications for Improved Reservoir Modeling. Gulf Publishing Company, Houston (TX) [2nd ed. from 2016]
- McCain, W.D. (1990). The Properties of Petroleum Fluids. 2nd Edition, PennWell Books, PennWell Publishing Company, Tulsa (OK). [3rd ed. from 2017]
- Standing, M. B. (1952). Volumetric and Phase Behavior of Oil Field Hydrocarbon Systems. Reinhold Publishing Corp., New York (NY)
- Smith J. M., Van Ness H. C., Abbott M. M. and Swihart M. T. (2018). Introduction to Chemical Engineering Thermodynamics. 8th Edition, McGraw-Hill, Boston (MA).
- Poling, B. E., Prausnitz, J. M. and O'Connell, J. P. (2001). Properties of Gases and Liquids. 5th Edition. McGraw-Hill Education.
- "Properties of Hydrocarbons and Oilfield Fluids "P.L.J. Zitha, P.K. Currie, TA3410

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GW803 FUNDAMENTALS OF POROUS MEDIA FLOW: SINGLE PHASE FLOW

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW803
Course Name:	FUNDAMENTALS OF POROUS MEDIA FLOW: SINGLE PHASE FLOW
Study Load [ECTS]:	5
Assumed Knowledge, Prerequisites or Co-requisites:	Basic knowledge of physics, calculus, numerical mathematics, ordinary and partial differential equations. Applied skills in the use of MS Office Modules and Matlab Programming.
Relationship to other courses within the program:	This course is the first engineering based course in the master program and provides fundamentals for applied courses such as multiphase flow, applied reservoir engineering and the field development project.
STAFF	
Lecturer:	**Contact details:**
Name: Ir. Shailesh R. Kisoensingh	
Counterpart Lecturer:	**Contact details**
Name: N/A	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	24	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[2]Literature Study [hrs]:	26	
[2]Take Home Practical [hrs]:	62	
[1]Practical- Oral Examination [hrs]:	1	
[2]Examination- Preparation [hrs]:	27	
[1]Examination- Written [hrs]:	0	
Total Hours (ECTS x 28hrs):	**140**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

This course generally introduces the principles and methods necessary to quantify single phase flow through saturated porous media in a theoretical as well as practical approach as well as an introduction to pressure transient testing and analysis (the remaining part of pressure transient analysis will be covered in applied reservoir engineering course)

Learning Outcomes:

Students will generally:

- Develop basic knowledge and understanding on single phase flow behavior in saturated porous media, such as:
    - Recognize physical principles (isothermal flow problems (Conservation of Mass, Momentum Balance, Darcy's law) that describe the flow of fluids in porous media.
    - Describe the basic form of Darcy's law and the concept of fluid potential.
    - Describe the coordinate systems typically used to represent fluid flow geometries and their areas of application.
    - Recognize the representations of the general flow equations for single-phase flow of slightly compressible and compressible fluids in terms of vertical, horizontal & radial flow.
- Develop basic knowledge and understanding on pressure transient testing & analysis (single phase) in saturated porous media, such as:
    - Describe the basic principles and objectives of well test analysis.
    - Describe the various methods (build-up, drawdown, Horner, Type Curve) through which pressure transients are initiated in a reservoir.
    - Describe the reservoir parameters that may be derived from a properly designed well test.
- Develop the ability to build models from scratch where single phase flow behavior pressure transient analysis in porous media is modeled under certain assumed conditions, such as:
    - Apply Darcy's law to the description of fluid flow in porous media in terms of vertical, horizontal & radial flow.
    - Permeability models (CK & Klinkenberg)
    - Drawdown, Build Up, Horner plot, Type curves

Teaching Method:

The teaching method for this course implies lecture presentations; take home exercises per group where the exercises should be handed in by documenting the solutions of the exercises (details to follow in instruction document).

Course Contents:

i. Lecture Content:
   i. Isothermal Flow Problems (Mass Conservation Law & Momentum Balance)
   ii. Darcy's Experiment & Law (single phase)
   iii. Permeability Models (CK & Klinkenberg)
   iv. Flow in various directions (vertical, horizontal & radial)
   v. Type of well tests
   vi. Data acquisition
   vii. Typical design
   viii. Superposition & Solutions
   ix. PTA (Drawdown, Build Up, Horner Plot, Type Curve)

j. Practical:
   The practical aspect of this course implies exercises which need to be solved (by use of matlab), where the solution is documented and handed, followed by an oral exam.

Conditions for Examination:

The examination of this course implies handing in the practical per target date, followed by an oral examination per planning. The oral examination will cover the exercises as well theoretical questions regarding the lecture content.

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Practical	• Develop basic knowledge and understanding on single phase flow behavior in saturated porous media • Develop basic knowledge and understanding on pressure transient testing & analysis (single phase) in saturated porous media • Develop the ability to build models from scratch where single phase flow behavior pressure transient analysis in porous media is modeled under certain assumed conditions • Use of software packages. • Teamwork.	50%*
Practical- Oral Examination	• Develop basic knowledge and understanding on single phase flow behavior in saturated porous media • Develop basic knowledge and understanding on pressure transient testing & analysis (single phase) in saturated porous media	50%*

	• Develop the ability to build models from scratch where single phase flow behavior pressure transient analysis in porous media is modeled under certain assumed conditions • Ability to answer questions/ substantiate/ improvise.	

*For all subtasks, a minimum grade of 5.0 (no round-off) is required, however the final course grade should be at least 5.5 (after round-off)

Course Necessities:

- MS Teams
- MS Words/ Excel/ PowerPoint
- Matlab

Textbooks and/or Reference Books:

- Reservoir Engineering Handbook, H. Bruining, May 30, 2019
- Norwegian University of Science and Technology, Professor Jon Kleppe Department of Petroleum Engineering and Applied Geophysics, TPG4160 Reservoir Simulation 2018
- Norwegian University of Science and Technology, Professor Jon Kleppe Department of Petroleum Engineering and Applied Geophysics, TPG4150 Reservoir Recovery Techniques 2017
- Well Testing Analysis
- Transient, Semi Steady-State, and Steady-State Flow
- SPE 15278 Dynamic Data Analysis v5.30, C.S.Matthews

GW900 FUNDAMENTALS OF POROUS MEDIA FLOW – MULTI PHASE FLOW

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW900
Course Name:	FUNDAMENTALS OF POROUS MEDIA FLOW: MULTIPHASE FLOW
Study Load [ECTS]:	5
Assumed Knowledge, Prerequisites or Co-requisites:	Basic knowledge of physics, calculus, and chemistry. Followed course GW803 Fundamentals of Porous Media Flow: Single Phase Flow and course GW802: Properties of Petroleum Fluids Affiliated with using MS Office.
Relationship to other courses within the program:	The contents of this course succeed Fundamentals of Porous Media Flow: Single Phase Flow, and Properties of Petroleum Fluids, and, precede Applied Reservoir Engineering.
STAFF	
Lecturer:	**Contact details:**
Name: Thomas Ravestein	
Counterpart Lecturer:	**Contact details**
Name: Vedika Gopal	

ESTIMATED STUDY LOAD		
Lecture & Exercises [hrs]:	48	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Assignment includes presentation and reporting, incl. preparation
Assignment [hrs]:	40	
Exam preparation [hrs]:	24	
Written exam [hrs]:	3	
Self-study [hrs]:	25	
Total Hours (5 ECTS x 28hrs):	**140**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description

This is part two of Fundamentals of Porous Media Flow: Multiphase flow. It builds on the knowledge gained on single phase flow. Key concepts of petroleum engineering are extensively discussed, such as wettability, capillary pressures, relative permeability, sweep efficiency, recovery factors, fractional flow, displacement, flow regimes and Improved/Enhanced Oil Recovery methods.

Learning Outcomes

- Apply the basic surface rock-fluid interaction phenomena to describe two-phase flow in porous media and apply the standard two-phase flow models to laboratory and field observations
- Use the formulation of two-phase flow equations and standard Buckley-Leverett theory to solve oil/water displacement problems
- Describe and understand the limitations of standard solutions for two-phase flow equations
- Relate the two-phase flow theory to oil recovery by processes, with emphasis on how capillary phenomena limits the efficiency of secondary and tertiary oil recovery
- Understand and describe how the efficiency of oil recovery can be improved by using IOR/EOR methods, with simple calculations of recovery factors
- Understand how capillary phenomena limits efficiency of primary and secondary oil recovery
- Application of standard two phase models to field observations.

Teaching Method

The teaching method for this course implies lecture presentations, an assignment that involves reservoir modelling and simulation, a presentation and report about this assignment, and finally a written examination.

Course Contents

0. Introduction
    a. Course planning & expectations -
    b. Recap Single Phase Flow -
1. Wettability
    a. Interfacial tension Ex. 1, Ex. 2, Ex. 3, Ex. 4
    b. Drainage & imbibition cycles -
    c. Primary drainage & imbibition Ex. 5
2. Capillary Pressures
    a. Capillary pressures Ex. 6
    b. Entrapment model Ex. 7, Ex. 8
    c. Measurements Ex. 9, Ex. 10, Ex. 11
    d. Drainage & imbibition curves Ex. 12, Ex. 13, Ex. 14, Ex. 15
    e. Capillary Pressure in models Ex. 16
3. Relative Permeability
    a. Permeability -
    b. Relative permeability Ex. 17
    c. Hysteresis Ex. 18

d. Measurements Ex. 19
e. Gas & oil Ex. 20, Ex. 21

4. Displacement
   a. Sweep & Recovery Factor Ex. 22
   b. Fractional Flow Ex. 23
   c. Displacement Ex. 24, Ex. 25, Ex. 26, Ex. 27
   d. Flow Regimes Ex. 28, Ex. 29, Ex. 30
5. IOR & EOR
   a. Water flooding Ex. 31
   b. Chemical recovery methods Ex. 32
   c. Thermal recovery methods Ex. 33

Conditions for Examination

The written examination requires passing the assignment (both presentation and report) with a minimum grade of 5.0. The final course grade should be at least 5.5.

Course Evaluation

Task:	**Knowledge and Abilities Assessed:**	**% of Total Mark:**
Assignment	• Ability to describe and understand the limitations of standard solutions for two-phase flow equations • Ability to describe how the efficiency of oil recovery can be improved with IOR/EOR methods, with calculations of recovery factors • Basic reservoir modelling and simulation • Presentation skills and collaboration	40%
Written examination	• Ability to apply the basic surface rock-fluid interaction phenomena to describe two-phase flow in porous media and apply the standard two-phase flow models to laboratory and field observations • Ability to use the formulation of two-phase flow equations and standard Buckley-Leverett theory to solve oil/water displacement problems • Ability to relate the two-phase flow theory to oil recovery by processes, with emphasis on how capillary phenomena limits the efficiency of secondary and tertiary oil recovery • Formulating clear and concise answers	60%

Course Necessities

- Laptop with MS office incl. Teams
- CMG software suite

Textbooks and/or Reference Books

- Reservoir Engineering Handbook, H. Bruining, 2019

GW901 DRILLING AND COMPLETION ENGINEERING

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW901
Course Name:	Drilling and Completion Engineering
Study Load [ECTS]:	5
Assumed Knowledge, Prerequisites or Co-requisites:	Fundamentals of flow in porous media Basic math, physics and chemistry
Relationship to other courses within the program:	Elementary knowledge of wells, the design process, the construction, the well life cycle, the well components and terminology is essential when working in the oil- and gas industry
STAFF	
Lecturer:	**Contact details:**
Name: Ir. S. Leijnse	
Counterpart Lecturer:	**Contact details**
Name: Rayen Bhajan	

<table>
<tr><th colspan="3">ESTIMATED STUDY LOAD</th></tr>
<tr><td>[1]Lecture & Classroom Practical – 01 [hrs]:</td><td>56 hrs
2 x 6 lectures of 4 hrs and 8 hours preparation time</td><td rowspan="8">NOTES:
N/A if not applicable to the course
Totals should match ECTS load equivalent
Practical includes contact hours and hours required by student to solve practical.
1: Contact Hours
2: Self Study Hours</td></tr>
<tr><td>[2]Literature Study-01 [hrs]:</td><td>11 hrs</td></tr>
<tr><td>[2]Take Home Practical-Hand In Exercises -02 [hrs]:</td><td>6 hrs</td></tr>
<tr><td>Presentation – 01 [hrs]:</td><td>12 hrs</td></tr>
<tr><td>[2]Examination- Preparation/ Literature Study -01 [hrs]:</td><td>50 hrs</td></tr>
<tr><td>[1]Examination- Oral [hrs]:</td><td>N/A</td></tr>
<tr><td>[1]Examination- Written [hrs]:</td><td>5 hrs</td></tr>
<tr><td>Total Hours (ECTS x 28hrs):</td><td>140 hrs</td></tr>
</table>

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

The course covers the design, the construction, maintenance during the well life cycle of wells. The emphasis is on practical and operational aspects, but it is grounded upon fundamental principles of Petroleum Engineering. The course consists of lectures, exercises covering casing design, well control, cementing and directional drilling. The course will be completed with a written, open book exam.

Learning Outcomes:

Students will develop:

- Understanding of the process for the construction of wells and the well components
- Assessment and management of risks, environmental, technical and non-technical
- Theoretical prediction of the most important factors in the design of wells
- Mastery of the terminology and concepts of drilling and completions engineering: drilling technology, well-, casing- and drill string design, deviated drilling, drilling dynamics, well control, cementation, completions, interventions, well heads and trees, for both on- and offshore
- Understanding the differences and similarities in the on- and offshore drilling
- Improved presentation skills
- Team work

Teaching Method:

- Lectures using PowerPoint format for illustrations
- Classroom exercises
- Hand in exercise
- Presentation per team
- Self-study

Course Contents:

Lecture contents:

- Well life cycle
- HSE and Contracting
- Well elements
- Drilling fluids and solids control
- Directional drilling
- Casing design
- Cementing
- Well control
- Drilling problems
- Completions and interventions

In the second part of the daily lectures an exercise will be made in class.
No lab experiments will be part of the lectures.

At the start of the allocated time for the courser a small introduction regarding the first exercise will be held. The student group will be divided in three groups. Each group will come up with a solution to a technical problem using a data set, the local regulation and company policy. The students will collaborate to come up with a solution. The solution will be presented by the groups to the class (20 minutes including Q and A).

Conditions for Examination:

Sufficient attendance and participation in the group presentations are mandatory to participate in the exam.

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Group presentation	Presentation skills, group work and subject knowledge	20%
Class room/ Hand In exercises	The class room exercises will be handed in a week after the lectures. The exercises will cover casing design, volume calculations, cementing, well control, directional drilling, hydraulics, pressure calculation.	20%
Examination- Written Open Book	Theoretical assessment of subject knowledge Understanding of the process for the construction of wells and the well components Assessment and management of risks, environmental, technical and non-technical Theoretical prediction of the most important factors in the design of wells Mastery of the terminology and concepts of drilling and completions engineering: drilling technology, well-, casing- and drill string design, deviated drilling, drilling dynamics, well control, cementation, completions, interventions, well heads and trees, for both on- and offshore Understanding the differences and similarities in the on- and offshore drilling	60 %

Course Necessities:

Microsoft Office, scientific calculator, MS Teams

Textbooks and/or Reference Books:

Well Engineering Manual (Moodle)

Applied Drilling Engineering, SPE Textbook Series Bourgoyne, Chenevert, Millheim and Young (Moodle)

Fundamentals of Drilling Engineering, SPE Textbook Series, by Mitchell and Miska

GW902 PRODUCTION GEOLOGY

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW902
Course Name:	PRODUCTION GEOLOGY
Study Load [ECTS]:	4.5
Assumed Knowledge, Prerequisites or Co-requisites:	• Geology: structural geology, sedimentology, lithology, mineralogy • Engineering: Basic knowledge of physical properties of rocks, porous media, and fluids
Relationship to other courses within the program:	This course sits in between geology, petrophysics, seismic interpretation, and petroleum engineering
STAFF	
Lecturer:	**Contact details:**
Name: drs. C.R. (Kees) Geel	
Counterpart Lecturer:	**Contact details**
Name: Rakesh Ramdajal, MSc.	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	44	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[2]Literature Study-01 [hrs]:	12	
[2]Take Home Practical-Model Exercise [hrs]:	23	
[1]Practical- Presentation/ Feedback [hrs]:	0	
[2]Examination- Preparation [hrs]:	44	
[1]Examination- Oral [hrs]:	0	
[1]Examination- Written [hrs]:	3	
Total Hours (5ECTS x 28hrs):	**126**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:
This course seeks to bridge the gap between geology and petroleum engineering. Many aspects of the day-to-day work of the production geologist are covered. Both static (volumetric) and dynamic (fluid flow) modeling are addressed. We'll start off by learning the tools of the trade: well logs, both open hole and production logging tools; cross sections; maps; we then proceed by calculation of static volumes (STOIIP or GIIP); reservoir characterization; well planning; and assessment of remaining hydrocarbons.

Learning Outcomes:
At the end of the course, the student will have a good overview of the tools, techniques, and way of thinking needed for the assessment of volumes of hydrocarbon fields. In addition, the three-dimensional insight into the geometry of hydrocarbon fields, combined with knowledge of fluid flow through heterogeneous rocks will allow the student to make field development plans or redevelopment plans.

Teaching Method:
Lecture presentations, exercises, home assignment.

Course Contents:
a. Lecture Content

Well logs, both open hole and production logging tools; cross sections; maps; calculation of static volumes (STOIIP or GIIP); reservoir characterization; well planning; and assessment of remaining hydrocarbons.

b. Practical

Every student will make a (individual) home assignment in the form of a written paper.

Conditions for Examination:
Handing in all required practical (per target date).

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Home assignment	• Theoretical assessment of subject knowledge	20%*
Closed Book Written Exam	• Theoretical assessment of subject knowledge	80%* Examination

*For all subtasks, a minimum grade of 5.0 (no round-off) is required, however the final course grade should be at least 5.5 (after round-off)

Course Necessities:

- MS Teams
- MS Words/ PowerPoint/Excel
- Pencil and colour pencils, ruler, protractor
- Calculator

Textbooks and/or Reference Books:

- Oil Field Production Geology (Shepherd, 2009 AAPG M91)
- AAPG Development Geology Reference Manual
- DPS20 Geology in Petroleum Production (1985, Dikkers)
- Geological Interpretation of Well Logs (1996, Rider)
- Petroleum Geoscience (2004, Gluyas & Swarbrick)

GW903 APPLIED RESERVOIR ENGINEERING

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW903
Course Name:	Applied Reservoir Engineering
Study Load [ECTS]:	5.5
Assumed Knowledge, Prerequisites or Co-requisites:	• Sedimentology and petroleum geology • Properties of Petroleum Fluids • Single and multi-phase flow in porous media
Relationship to other courses within the program:	Preceding course of fundamentals of porous media flow- Single and Multiphase flow (GW803 & GW 900)

STAFF	
Lecturer:	**Contact details:**
Name: Prof. Dr. W.Schulte	
Counterpart Lecturer:	**Contact details**
Name: K.Tjadikrama, MSc.	

<table>
<tr><th colspan="3">ESTIMATED STUDY LOAD</th></tr>
<tr><td>[1]Lecture & Classroom Practical [hrs]:</td><td>40</td><td rowspan="8">NOTES:
• N/A if not applicable to the course
• Totals should match ECTS load equivalent
• Practical includes contact hours and hours required by student to solve practical.
• 1: Contact Hours
• 2: Self Study Hours</td></tr>
<tr><td>[2]Literature Study-01 [hrs]:</td><td>21</td></tr>
<tr><td>[2]Take Home Assignments [hrs]:</td><td>20</td></tr>
<tr><td>[1]Practical-Presentation/Report and Feedback [hrs]:</td><td>40</td></tr>
<tr><td>[2]Examination- Preparation [hrs]:</td><td>30</td></tr>
<tr><td>[1]Examination- Oral [hrs]:</td><td>N/A</td></tr>
<tr><td>[1]Examination- Written [hrs]:</td><td>3</td></tr>
<tr><td>Total Hours (ECTS x 28hrs):</td><td>154</td></tr>
</table>

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

This course integrates the learnings from Petroleum Geology, Rock-fluid physics, Petroleum Fluid properties and illustrates how they are used to understand and predict the behavior and performance of oil and gas reservoirs during primary, secondary and tertiary hydrocarbon recovery.

The course will start with revisiting material balance calculations stressing general principles and their applications for the analyses of oil and gas reserves. Next the course will concentrate on decline curve analysis and well testing, again starting with basic principles and illustrating its applications for estimating reservoir parameters. The course will proceed with Improved Oil Recovery (IOR) focusing first on water flooding. Both the microscopic and macroscopic (up to reservoir scale) aspects of water flooding will be discussed to some depth.

Finally, the fundamentals of Enhanced Oil Recovery (EOR) will be introduced followed by the treatment of the most important chemical and gas injection EOR methods. Assignments covering several topics will be proposed to students where they will integrate the knowledge acquired in the course and further deepen their understanding of the topics treated.

Learning Outcomes:

The main goal of this course is to develop an understanding of the reservoir engineering methodology that is required to predict and optimize recovery from petroleum reservoirs and gain mastery of the Reserves Estimation, Well Testing, Improved Oil Recovery and Enhanced Oil Recovery Methods.
At the end of this course students should be able to:

- Describe the principles and limitations behind the material balance equation and identify the data that is needed to apply the material balance equation and the uncertainties associated with collecting such data
- Identify and explain the different mechanisms influencing the production of hydrocarbons and how they are incorporated in the material balance analysis
- Conduct material balance analysis calculations
- Perform Decline Curve Analysis and Reserves Estimations
- Understand and apply Pressure Transient Analysis concepts, equations and procedures
- Understand the impact of rock-fluid properties on secondary and tertiary recovery and apply them to the most common IOR and EOR processes
- Apply the EOR and IOR concepts and quantify the corresponding incremental recovery factor
- Understanding the principles and selection of IOR/EOR screening and selection

Teaching Method:

The course will be based upon lectures where students will receive a short explanation on a particular topic (about 20 minutes) and then they are required to work on one to three problems of increasing complexity (exercises or micro-project). In addition, during lectures take home assignments will be given to the students to examine that the lecture material is understood. A mini project that consists of solving a reservoir engineering problem will be given at the end of the lecture to illustrate the application of the concepts learned in class. Students will be directed to the literature to complement the understanding of the subjects. The mini project will be evaluated by a presentation and written report.

Course Contents:

1. Lecture Content:
    - Material Balance: General Principles and Formulation
    - Material Balance: Application to Oil Reservoirs
    - Material Balance: Application to Gas Reservoirs
    - Decline Curve Analysis
    - Principles of Well Testing
    - Applications of Well Testing Analyses
    - Water flooding of clastic reservoirs: microscopic aspects
    - Enhanced Oil Recovery: principles and classification
    - Enhanced Oil Recovery: polymer flooding
    - Enhanced Oil Recovery: surfactant flooding
    - Enhanced Oil Recovery: gas flooding
    - Enhanced Oil Recovery: Thermal Recovery

2. Practical:
    - Exercises or micro-projects during lecture
    - Short take away assignments
    - Mini project at the end

Conditions for Examination:

Students will have to attend all lectures in order to be able to participate in the exam. Exemptions can be made on a case by case basis, but then the students need to demonstrate sufficient motivation.

Course Evaluation:

Task:	**Knowledge and Abilities Assessed:**	**% of Total Mark:**
Completion of mini project combined with a presentation & written report. The presentation and the report account equally.	Application of the knowledge acquired to a specific data set	40%
Examination- Written	Assessment of the theoretical knowledge covering the main chapters of the course: Material Balance Analysis, Decline Curve Analysis, Pressure Transient Analysis, IOR and EOR	60%

Course Necessities:

- MS Teams
- MS Words/ PowerPoint/Excel
- MATLAB

Textbooks and/or Reference Books:

Books:

- L.P. Dake, Fundamentals of Reservoir Engineering
- Charles Marle, Multiphase Flow in Porous Media
- G. Paul Willhite, Waterflooding
- Larry W. Lake, Enhanced Oil Recovery

GW904 INTRODUCTION TO OFFSHORE PRODUCTION SYSTEMS

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW904
Course Name:	Introduction to Offshore Production Systems
Study Load [ECTS]:	4
Assumed Knowledge, Prerequisites or Co-requisites:	As an introduction course, no specific prior knowledge is required for this course. It is assumed that students have an academic background and skills ensued from it.
Relationship to other courses within the program:	This course is fundamental as an introduction to a more complete understanding of the offshore oil and gas production systems. It complements the Marine Pipelines and Subsea Engineering (GW1002) and Offshore Structures Engineering (GW909) courses, where a more in-depth understanding of several aspects are provided.
STAFF	
Lecturer:	**Contact details:**
Name: Ir. Vinay Sewbaran	
Counterpart Lecturer:	**Contact details**
Name: Sheryl Raghoe, MSc.	

<table>
<tr><th colspan="3">ESTIMATED STUDY LOAD</th></tr>
<tr><td>[1]Lecture[hrs]:</td><td>28</td><td rowspan="8">NOTES:
• N/A if not applicable to the course
• Totals should match ECTS load equivalent
• Practical includes contact hours and hours required by student to solve practical.
• 1: Contact Hours
• 2: Self Study Hours</td></tr>
<tr><td>[2]Literature Study-01 [hrs]:</td><td>24</td></tr>
<tr><td>[2]Report & Presentation[hrs]:</td><td>30 (report)
14 (presentation)</td></tr>
<tr><td>[1]Practical- Presentation/ Feedback [hrs]:</td><td>4</td></tr>
<tr><td>[2]Examination- Preparation[hrs]:</td><td>51</td></tr>
<tr><td>[1]Examination- Oral [hrs]:</td><td>N/A</td></tr>
<tr><td>[1]Examination- Written [hrs]:</td><td>3</td></tr>
<tr><td>Total Hours (ECTS x 28hrs):</td><td>154</td></tr>
</table>

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

This course will provide students with an introduction to the structures and facilities required for the development of offshore oil and gas fields. Students are made aware of the diversity and range of building blocks potentially applicable in the offshore field development of these hydrocarbon reservoirs and the facets involved in the (preliminary) design of structures for offshore production. This course will provide general knowledge of this field, allowing you to work with experts in the offshore engineering industry.

Course Contents:

k. The following subjects will be explained through the lecture content:
    - Offshore Engineering, an overview: History, trends and challenges
    - Offshore environment: wind, wave and climate conditions (metocean)
    - Actions on offshore structures: different acting loads and translation to design choices
    - Temporary and permanent offshore installations: overview of installations
    - Platforms: substructures and topsides of fixed and floating offshore structures
    - Offshore drilling, subsea installations, export facilities and unmanned wellhead platforms
    - Stages in a structure's life cycle: from planning and design to decommissioning
    - HSE aspects: focus on Safety
    - Examples of different projects

l. Report & Presentation:
    Students will write a report on choosing an ideal offshore production system for a case study regarding a (fictional) hydrocarbon field off the coast of Suriname. This will be concluded with a presentation and interactive discussion where the students can defend their choices. The students are expected to apply gained knowledge and are challenged to further explore certain aspects in order to provide a more complete picture.

Learning Outcomes:

After completing this course, students are expected to:

- Be familiar with the nomenclature and the several offshore concepts in the offshore oil and gas sector
- Have an overview of the offshore developments and challenges.
- Understand the offshore environment and their actions on the offshore structures.
- Have knowledge of different types of offshore structures; main characteristics, pro's & con's
- Understand the design principles of different offshore platforms, their substructures and topsides.
- Obtain general knowledge of the different aspects of offshore drilling, subsea installations and flow lines
- General knowledge of the different stages of an offshore oil and gas field development
- Obtain general knowledge of different aspects of fabrication, installation and decommissioning
- Obtain general knowledge of different aspects of safety on offshore projects.
- Be able to choose a structure depending on several characteristics of an offshore hydrocarbon field.

Teaching Method:

The lecture content will be explained through lecture presentations. In order to have open and in-depth discussions, students are expected to read the provided lecture notes before attending the lectures. The report and presentation will be done either individually or in groups of students; to be decided based on the amount of attending students. Students will be challenged to provide feedback and deal with received feedback.

Conditions for Examination:

Handing in the report and executing the presentation as per target date

Course Evaluation:

A minimum grade of 5.0 is mandatory for all partial grades. The total grade will be calculated as per the table below and should be ≥ 5.5

Task:	**Knowledge and Abilities Assessed:**	**% of Total Mark:**
Report (individual or group)	Knowledge gained during this course is expected to result in logical choices and conclusions for the provided case study. Academic writing skills are expected for the report	20%
Presentation (individual orgroup)	Presentation skills are assessed, while students are challenged to provide and receive feedback.	10%
Examination- Written Open or Closed Book (individual)	Theoretical assessment of the subjects explained throughout this course	70%

Course Necessities:

Basic Microsoft Office

Course Material:

Lecture notes will be provided two weeks before the start of the course.

GW905 PETROLEUM GEOLOGY OF THE CARIBBEAN REGION

General Course Information

GENERAL		
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**	
Course Code:	GW905	
Course Name:	PETROLEUM GEOLOGY OF THE CARIBBEAN REGION	
Study Load [ECTS]:	7.5	
Assumed Knowledge, Prerequisites or Co-requisites:	BSc knowledge level of Geology, including lithologic description, rock facies, stratigraphy and tectonics. Basic understanding of geodynamics and elementary familiarity with seismic interpretation as well as all prior geology/ Geoscience based courses in the master program..	
Relationship to other courses within the program:	The course allows students to see how the thematic elements of the program come together in explaining the distribution and development of petroleum occurrences in general and in particular in the Caribbean area. It therefore integrates and makes use of earlier course modules, such as GW702, 703, 800 and 801. While the GW1000 course (Basin analysis) will concentrate on the background processes driving basin development, this course will provide a practical guide to the sedimentary and tectonic evolution of sedimentary basins	
STAFF		
Lecturer:	**Contact details**	
Name: Prof. Dr. H. Doust		
Counterpart Lecturer:	**Contact details**	
Name: Clyde Griffith, MSc		
ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	48 (12x4)	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent
[2]Literature Study-01 [hrs]:	22 [12+10]	
[2]Take Home Practical-Hand In Exercises/ Report/ Field Excursion [hrs]:	41 Take home practical 48 Field excursion Trinidad	
[2]Examination- Preparation/ Literature Study-02 [hrs]:	48	

[1]Examination- Written [hrs]:	3	• Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
Total Hours (ECTS x 28hrs):	**210**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

The course will examine the characteristics of sedimentary basins and the occurrence of petroleum resources within them from a global perspective. Following a short review of the status of the petroleum industry and the challenges it faces currently, it will introduce methods for regional study of the elements essential for successful exploration – the source rocks, reservoirs, seals and trapping structures as well as the subsurface processes that lead to generation, migration and retention of hydrocarbons. Emphasis will be placed on methods for management of the multiple risks and uncertainties involved.

Much of the course will be dedicated to reviews of sedimentary basin development, approached from the perspective of the tectono-stratigraphic cycles of which they are composed: Such cycles include faulted rifts, passive margins, carbonate platforms, foreland troughs and active volcanic arc-related basins. Drawing from examples of such cycles from around the globe, their characteristics, development, evolution and significance for petroleum will be presented. In each case, the development of these cycle types in the Caribbean area will then be discussed and, where present, their petroleum systems identified and described. Finally, a selection of prolific Caribbean basins will be analysed to demonstrate the value of using knowledge of cycles in exploration to evaluate basin hydrocarbon prospectivity.

During and following classroom lectures a variety of exercises illustrating the main learnings will be carried out. The classroom section will conclude with a week-long field excursion to Trinidad, where all of the issues discussed can be demonstrated in a classic multi-cycle petroleum province.

Learning Outcomes:

- The course will enable participants to appreciate the practical value of integrating the geological principles of sedimentology/sedimentary processes (GW703) and structural geology/tectonics (GW702) in relation to sedimentary basin evolution and petroleum system development. By exposing Earth Science graduates to the variety of geological basins developed worldwide it will help them to understand how geological components and processes combine in the production of subsurface resources.
- Participants will gain broad perspectives on the composition of sedimentary basins worldwide in a context that will directly support the different aspects and scales of their current activities and facilitate knowledge-building in their careers. They will learn details of the geology and hydrocarbon occurrences in Caribbean basins adjacent to Suriname.
- Group studies involving practical application of the learnings will provide participants with opportunities to exercise their technical evaluation abilities, team working and clear, concise and timely reporting skills.

Teaching Method:

The course will comprise lectures, in-class and take-home exercises and practical demonstration of learnings in the field.

Course Contents:

- Lecture Content: Twelve 2-hour lectures over 2 weeks will cover the following subjects:
    - Introduction to the petroleum industry and the place of exploration in it
    - The essential parameters and processes that combine to produce petroleum systems
    - Risk and uncertainty evaluation in exploration
    - The geology and development of exemplary sedimentary cycle types and basins worldwide
    - The geology and development of exemplary sedimentary cycle types and basins in the Caribbean area, including the Gulf of Mexico and Guianas.
- Practical:
    - Literature Study: Review of lectures and write-up of notes taken during lectures plus selected publications (see list below)
    - Hand in exercises: Several mainly short in-class exercises will be carried out during the 2 hrs following each of the twelve lectures. These will include mapping, basin analysis and risk/uncertainty exercises, as well as methods for predicting sedimentary facies from seismic. CG to supervise.
    - Report: In four sessions of 4hrs each, participants in groups of 2 or 3 will work on two or three interpretation projects from the following:
        - Alucard: integration of 2D seismic and well data from a basin to identify and describe the main stages in basin history and development and prepare a plan to evaluate prospectivity: Objective – recognizing and understanding basin evolution cycles
        - Great South: Workflow methods involved in evaluation of prospectivity in a frontier area, using regional 2D seismic and well data. Objective – how to tackle evaluation with little data and decide on what further work is justified
        - Shangri-La: Use of limited seismic data to compile an exploration licence application to local government based on defined contract terms and simple economics, Objective: Understanding the process of converting predictions into action!
        - Petroleum system analysis: Description of a selected productive basin in the Caribbean area, its geological development and structural-stratigraphic relations, followed by an analysis of its petroleum system(s) and play development
        - Possible additional exercise to be provided by Staatolie.
    - Field excursion: Six-day examination of stratigraphy and structure of the Trinidad fold belt, led by staff from UWI and AAPG Young Professionals. Objective - to provide field observation and description experience, bringing together much of the concepts presented in the lectures and observation of active petroleum system. It essential that this excursion takes place in the field and not digitally: It provides some of the participants with their first opportunity to travel abroad and see the geometry and scale provided by outcrops of the rocks they study in the Suriname subsurface.

Conditions for Examination:

The exam will be written and will comprise questions covering many of the subjects reviewed in the course, from which participants must select 3 – 4 to answer. Participants will have 48 hours to prepare for the exam

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
In-class hand in exercises	Understanding and crystallizing the concepts presented in lectures	20%
Practical Report & PPT Presentation	Technical, co-operative and reporting skills, involving ability to concentrate on important issues and inventively work to produce a quality document	30% (15% report & 15% ppt)
Examination- Written	Understanding of subject concepts and critical analysis/knowledge	50%

Course Necessities:

Basic Microsoft Office, stationary (paper, coloured pencils, transparent A4 paper, ruler, calculator), access to scanner and printer.

Textbooks and/or Reference Books:

Gluyas, J. and Swarbrick, R. (2008). Petroleum Geoscience. Blackwell, 359pp
Allen, P.A. and Allen, J.R. (2005). Basin analysis. Blackwell, 549pp
Tankard, A.J. et al (eds) 1998. Petroleum basins of South America. AAPG Memoir 62
Bartolini, C. et al (2003). The Circum-Gulf of Mexico and the Caribbean. AAPG Memoir79

Bernardo, L. M and Bartolini, C.: 2015. Petroleum Source Rock Analysis in the Western Caribbean Region; an overview. In AAPG Memoir 108, Bartolini, L.M. and Mann, P (eds): Petroleum geology and potential of the western Colombian Caribbean margin, 587 - 614

Geological Society (2009) The origin and evolution of the Caribbean Plate. Geol. Soc. London Special Publication 328

Nemcok, M. et al. 2015: Development history of the southern terminus of the Central Atlantic; Guyana–Suriname case study, in Transform margins: development, controls and petroleum systems. Geol. Soc. Special Publication 431. http://sp.lyellcollection.org

Pindell , J. Kennan, L. , Stanak, K.P. and Maresch, W.J. 2006. Foundations of Gulf of Mexico and Caribbean evolution: Eight controversies resolved, Geologica Acta 4 (1-2): 303-341

Reuber, K., Pindell, J. and Horn, B.W. 2016. : Demerara Rise, offshore Suriname: Magma-rich segment of the Central Atlantic Ocean, and conjugate to the Bahamas hot spot. Interpretation T31-T45

GW907 PETROLEUM RESOURCES

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW907
Course Name:	PETROLEUM RESOURCES
Study Load [ECTS]:	4.5
Assumed Knowledge, Prerequisites or Co-requisites:	Basic knowledge of geology, exploration methods (seismic, drilling, production). Basic computer skills (in particular Excel spreadsheets).
Relationship to other courses within the program:	This course links knowledge of other courses (e.g. seismic, geology, production methods) into an economic model.
STAFF	
Lecturer:	**Contact details:**
Name: Dr. A. A. Dijksman	
Counterpart Lecturer:	**Contact details**
Name: I. Goelaman, MSc.	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	9*4=36	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[2]Literature Study [hrs]:	4	
[2]Take Home Practical-Hand In Report [hrs]:	47	
[2]Examination-Preparation[hrs]:	36	
[1]Examination- Oral [hrs]:	N/A	
[1]Examination- Written [hrs]:	3	
Total Hours (ECTS x 28hrs):	**4.5*28=126**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

The training course will address the key success factors impacting exploration for oil and gas: Oil and gas price, economics (NPV and EMV calculations) hydrocarbon trap formation: the presence of Trap, Charge and Reservoir based on an understanding of the regional setting.

Finally, all aspects will be brought together to assess the risk of the prospect: Building of an economic model, the sources of the various parameters (price, volume, production rates, engineering costs and operating costs).

- Regional setting - understanding the regional geology and its impact on local prospectivity
- Charge - presence and effectiveness of source rock, expulsion and migration
- Reservoir - presence and effectiveness of reservoir based on well and seismic data
- Trap - assessing structural aspects of trap and trap formation, together with the presence and quality of seal

Prospect evaluation and risking - Bringing all geological aspects together and assessing uncertainty and risk of the prospect.

Learning Outcomes:

By the end of the module, the candidate will be able to demonstrate that he/she is able to assess risks, to build an economic model and to arrive at sound commercial decisions.

Teaching Method:

The course will consist of lectures alternating with exercises and each student will have to prepare a written report on a relevant topic. *Note: Please use report template which is placed on Moodle.*

Course Contents:

a. Introduction; Visit to the Ghawar Field
   Traps; Visit to Mushroom
   Porosity/Fault seal; Visit to Bulgaria
   Plate tectonics, EMV; visit to Guinea Bissau, possibly Namibia
   Recovery; visit to Greenland
   Recovery, Resources classification; Visit to Calcutta
   Production, Prices, Process and Conclusion
b. After the lectures the students will be supplied with additional reading (pdf), the written exam will include questions related to these additional papers.
c. Project addressing prospectivity, terms and conditions.

Conditions for Examination:

Need to have handed in the practical as per target date.

Course Evaluation:

Task:	**Knowledge and Abilities Assessed:**	**% of Total Mark:**
Practical- Report	Literature study of a resources related topic.	40%

Examination- Written	Assessment of lectures and supplied reading material	60%

Course Necessities:

Basic Microsoft Office, Prospector Light

Textbooks and/or Reference Books:

At the end of the course students will be supplied with a selection of papers. The written exam will include questions on these papers.

GW908 PRODUCTION SYSTEMS AND ENGINEERING

General Course Information

<table>
<tr><th colspan="3">GENERAL</th></tr>
<tr><td>Name of the Study Program:</td><td colspan="2">☐ BSc. Geowetenschappen (BSc. Gw)
☒ MSc. Petroleum Geoscience & Engineering (MSc. PGsE)
☐ MSc. Mineral Geosciences (MSc. MGs)</td></tr>
<tr><td>Course Code:</td><td colspan="2">GW908</td></tr>
<tr><td>Course Name:</td><td colspan="2">PRODUCTION SYSTEMS AND ENGINEERING</td></tr>
<tr><td>Study Load [ECTS]:</td><td colspan="2">5.5</td></tr>
<tr><td>Assumed Knowledge, Prerequisites or Co-requisites:</td><td colspan="2">• GW803: Familiarity with basic Darcy flow concepts
• Basic single and multiphase flow in pipelines (vertical and horizontal)
• GW802: Properties of Petroleum Fluids
• GW901: Drilling Engineering</td></tr>
<tr><td>Relationship to other courses within the program:</td><td colspan="2">This course follows GW802 Properties of Petroleum Fluids, GW803 Single Phase Flow, GW903 Reservoir Engineering, GW 901 Drilling Engineering and precedes GW1001-Production Optimization</td></tr>
<tr><th colspan="3">STAFF</th></tr>
<tr><td>Lecturer:</td><td colspan="2">Contact details:</td></tr>
<tr><td>Name: A. Mohan, MSc</td><td colspan="2"></td></tr>
<tr><td>Counterpart Lecturer:</td><td colspan="2">Contact details</td></tr>
<tr><td>Name: N/A</td><td colspan="2"></td></tr>
<tr><th colspan="3">ESTIMATED STUDY LOAD</th></tr>
<tr><td>[1]Lecture & Classroom Practical [hrs]:</td><td>60</td><td rowspan="8">NOTES:
• N/A if not applicable to the course
• Totals should match ECTS load equivalent
• Practical includes contact hours and hours required by student to solve practical.
• 1: Contact Hours
• 2: Self Study Hours</td></tr>
<tr><td>[2]Literature Study-01 [hrs]:</td><td>20</td></tr>
<tr><td>[2]Hand In Exercises [hrs]:</td><td>24</td></tr>
<tr><td>[1]Practical- Presentation/ Feedback [hrs]:</td><td>11</td></tr>
<tr><td>[2]Examination- Preparation/ Literature Study-02 [hrs]:</td><td>36</td></tr>
<tr><td>[1]Examination- Oral [hrs]:</td><td>N/A</td></tr>
<tr><td>[1]Examination- Written [hrs]:</td><td>3</td></tr>
<tr><td>Total Hours (ECTS x 28hrs):</td><td>154</td></tr>
</table>

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

This course is programmed to equip the student wilth the basic knowledge on understanding the various components of a production system, applying the physical concepts to diagnose typical issues and optimize the design of wells and production systems. To do so, a multi angle approach is required by the student in order to integrate all necessary information and or assumptions to complete the task.

Learning Outcomes:

After been exposed to this course, students will have built their knowledge and will be able to demonstrate the understanding of the following:

- **Production System:**
  - Definition of Production System
  - Identification and interrelation of various components of the Production System
- **Reservoir and Tubing Performance:**
  - Concept of Nodal Analysis*
  - Describing Inflow and Outflow performance curves*
- **Selection and Design of Artificial Lift:**
  - The need of artificial lift and most common artificial lift types
- **Perforating:**
  - Perforation Technology
  - Perforation Design*
- **Sand Control :**
  - The necessity for Sand Control
  - Types of common Sand Control methods
  - Sand Control Design
- **Multiphase flow in wells and pipelines:**
  - Fundamental aspects of two-phase flow in wells and pipelines
  - Characterization of various flow regimes
  - Slip and hold up definition
  - Multiphase pipeline design*
- **Surface Gathering Systems**:
  - Oil and Gas production gathering systems
  - Basic Analysis of surface gathering systems
  - Intermediate Analysis of surface gathering systems*
- **Environmental** concerns in Petroleum Engineering
  *PIPESIM Exercises

Teaching Method:

- Lectures using PowerPoint format for illustrations
- Exercises (PIPESIM and Excel)
- Student presentations

Course Contents:

d. Lecture Content:
   i. Production System
   ii. Reservoir and Tubing Performance
   iii. Selection and Design of Artificial Lift
   iv. Perforating
   v. Sand Control
   vi. Multiphase flow in wells and pipelines
   vii. Surface Gathering Systems
   viii. Environmental concerns in Petroleum Engineering
   ix. PIPESIM Exercises

e. Practical:
   i. Literature Study
   ii. Classroom exercises
   iii. Hands on exercises (software)

Conditions for Examination:

- All scheduled presentations and slides delivered to Lecturer as per target date

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Classroom Exercises	Understanding of all the individual exercises assigned during the course	5%
Student presentations	• The capacity to conceptualize and solve problems related to production impairment • Demonstrate proficiency use of PIPESIM software	20%
Examination- Written (Closed Book)	Theoretical assessment of subject knowledge	75%

Course Necessities:

Moodle, MS Teams for lectures, Basic Microsoft Office, PIPESIM2017 to be provided by Lecturer.

Textbooks and/or Reference Books:

- "Petroleum Production Systems " – M.Economides et al
- " Petroleum Engineering Handbook for the Practicing Engineer " – M.A. Mian
- "Modelling and Optimisation of Oil and Gas Production Systems – J.D. Jansen and P.K. Currie

GW909 OFFSHORE STRUCTURES ENGINEERING

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW909
Course Name:	OFFSHORE STRUCTURES ENGINEERING
Study Load [ECTS]:	6.5
Assumed Knowledge, Prerequisites or Co-requisites:	It is a prerequisite that students have completed the common foundational courses covering geology, single & multiphase flow and the preceding Introduction to Offshore Production Systems course GW904.
Relationship to other courses within the program:	The course builds on the general knowledge gained in the preceding course GW904 (Introduction To Offshore Production Systems) on structures and facilities required for the development of offshore oil and gas fields. In the present course students will broaden, deepen and apply their knowledge, for fixed structures and deepwater production facilities. The course prepares students for further required building blocks in offshore field development for hydrocarbon extraction and production. Completing this course is a requirement for entering the next OE based track course GW 1002 Marine pipelines and subsea engineering.

STAFF	
Lecturer:	**Contact details:**
Name: Ir. Vinay Sewbaran	
Counterpart Lecturer:	**Contact details**
Name: Rayen Bhajan, MSc.	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	36	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical.
[2]Literature Study-01 [hrs]:	28	
[2]Assignment - [1]Presentation[hrs]:	42 + 4	
[2]Examination- Preparation/ Literature Study-02 [hrs]:	41	
[1]Examination- Written [hrs]:	3	

Total Hours (ECTS x 28hrs):	**154**	• 1: Contact Hours • 2: Self Study Hours

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

This course provides students with an in-depth overview of the engineering requirements for offshore structures and facilities required for the development of offshore oil and gas fields.

Learning Outcomes:

Upon successful completing this course students will be able to:

- Work in a multi-discipline project team and provide engineering inputs and reviews regarding offshore structures requirements
- Evaluate the layout and design of structures for fixed hydrocarbon production facilities
- Evaluate the layout and design of structures for deepwater hydrocarbon production facilities (floating structures)
- Provide inputs and assist with technical evaluations of mobile offshore units for hydrocarbon exploration and production drilling
- Determine selection criteria and design drivers for floating, fixed and hybrid offshore structures
- Prepare a Basis for Design for an offshore structure for an offshore oil and gas field development
- Participate in safety engineering studies for offshore production facilities
- Liaise at professional level with offshore structures design consultants and contractors, with specific focus on design, fabrication, transport, installation and safe operations of structures
- Assist offshore asset managers in the decision-making process for offshore oil and gas developments

Teaching Method:

- Academic lectures presented in classroom. A structured and thematic program is followed for knowledge transfer and cultivation of understanding. Students are stimulated to further explore and research the subjects taught.
- Two assignments where knowledge of this course is applied on fixed structures and floating structures

Course Contents:

f. **Contents:**
  - Fixed structures: Design, Fabrication, Transport, Installation and Commissioning
  - Floating Structures: Design, Fabrication, Transport, Installation and Commissioning
  - Topsides and processing options
  - Safety and economical considerations

g. **Assignments:** Students perform two assignments for learning how to obtain their understanding (through design) of the basics of FPSO production structure and of Bottom Founded Structures.

Conditions for Examination:

Handing in the practical as per target date.

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Assignment 1	Preliminary design of an offshore fixed structure	15%
Assignment 2	Aspects of FPSO design	15%
Written exam	Theoretical assessment of course knowledge, demonstrating understanding and application of subjects taught	70%

Both the two assignments and the exam scores will be normalized on a scale 1-10 and weighted to arrive at the final grade for the course. For each of these three grade components, the minimum passing score required to pass the complete course is 5.0, however the final grade should be 5.5 at minimum.

The assignments are individual assignments. After handing in their individual assignment, two groups will be formed for assignment 1 and 2. Both groups will present the outcome of the assignment. The idea is that students reach consensus on the outcomes by discussing their individual assignments. The grade for the presentation will be incorporated in the assignment grade.

Course Necessities:

Basic Microsoft Office (For calculations, Excel or Matlab can be used)

Textbooks and/or Reference Books:

Sukumar Laik, Offshore Petroleum Drilling and Production

S. Chakrabarti, Handbook of Offshore Engineering

GW1000 BASIN ANALYSIS

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW1000
Course Name:	BASIN ANALYSIS
Study Load [ECTS]:	3.5
Assumed Knowledge, Prerequisites or Co-requisites:	Pre-requisites for MSc admission, Sedimentology and Sedimentary processes (GW703), Structural geology and Tectonics (GW702), and Petroleum Geology Of The Caribbean Region (GW905)
Relationship to other courses within the program:	The course allows students to see how the thematic elements of the program come together in explaining the evolution of basin formation in various settings around the world with a focus on the Suriname Basin It therefore integrates and makes use of earlier course modules, such as GW702, 703, 800 and 801. The GW1000 course (Basin analysis) will concentrate on the background processes driving basin development, this course will provide a practical guide to the sedimentary and tectonic evolution of sedimentary basins

STAFF	
Lecturer:	**Contact details**
Name: Kyle Reuber, PhD	
Counterpart Lecturer:	**Contact details**
Name: Ilaisha Goelaman, MSc	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	48 (12x4)	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent
[2]Literature Study-01 [hrs]:	22 [12+10]	
[2]Take Home Practical-Hand In Exercises/ [hrs]:	10	
[1]Short Oral Presentation/ Feedback [hrs]:	2	

[2]Examination- Preparation/ Literature Study-02 [hrs]:	14	• Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[1]Examination- Oral [hrs]:	2	
[1]Examination- Written [hrs]:	0	
Total Hours (ECTS x 28hrs):	**98**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

This course will familiarize students with the major mechanisms involved in formation, subsidence, and filling of sedimentary basins. We will examine the details of basin evolution in tectonically active settings, including convergent, divergent, and strike-slip plate margins and interiors. The material will focus on major structural, tectonic, and geophysical processes that produce sedimentary basins, and develop some skills in basin analysis that allow us to interpret those processes from the stratigraphic record. The application of basin analysis to petroleum exploration will be introduced. When applicable, all of these aspects of Basin Analysis will be correlated with the geologic framework of the Guyana/Suriname Basin.

Learning Outcomes:

- Understand the major mechanisms involved in subsidence and filling of sedimentary basins.
- Become familiar with several important examples of sedimentary basins (volcanic and non-volcanic) worldwide.
- A solid understanding of basin filling models that govern stratigraphic architecture of most basins.
- Acquire detailed insight into tectonic controls on the Guyana-Suriname Basin, through an analysis of global analogs
- Improve and hone public presentation skills via question & answer sessions and classroom presentation at the end of term.

Teaching Method:

Lectures presented in the duration of this course will provide the background information on the interpretation of basin formation from the Guyana/Suriname Basin and basins from around the world. The practical hours of this course will consist of preparation of student oral presentations, short assignments (i.e. - essays and isostatic modeling) and questions and answers.

Course Contents:

Lecture Content

- Plate Tectonics and Basin Classification
  - Plate Tectonics Overview
  - What is a Basin?
  - Mechanics of Basin Formation
  - Sequence Stratigraphy in a new basin
    - Stratigraphic Cycles (Suriname specific)
    - Definitions and recognition
    - Depositional Systems

            - Depositional Style according to basin setting
- Application to Petroleum Systems
    - Onshore migration/trapping Suriname (with permission)
    - Basin Modeling (Suriname) overview (with permissions)

- Practical:
    - Literature Study: Review of lectures and selected publications (as provided during class)
    - Hand in short assignments: Several mainly short in-class exercises will be carried following the lectures. These will based on the topics lectured. Submission of these assignments will be due the **Saturday** of the week they were assigned.
    - Oral presentations: Mid-term and Final (Comprehensive)

Conditions for Examination:

The final exam for this course consists of an individual oral-presentation followed by a question-and-answer period.

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Mid Term Oral evaluation	Understanding of topics covered in the first half of the course	30%
Short assignments and Class participation (class/ email)	Technical ability to review papers and extract specific knowledge and present these in a quality document covering the main objectives Ability to acquire knowledge and open to ask question for clarification, actively participate in technical conversations (assignments)	30%
Final comprehensive oral presentation	Understanding of subject concepts and critical analysis/knowledge	40%

Course Necessities:

Basic Microsoft Office, email, MS Teams, Zoom

Textbooks and/or Reference Books:

- Allen, P. A. and J.R. Allen, 2013, Basin Analysis: Principles and Application to Petroleum Play Assessment. John Wile & Sons, 619 pp.
- Reprints of scientific papers related to the course content handed out during the lectures.

GW1001 PRODUCTION OPTIMIZATION

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW1001
Course Name:	PRODUCTION OPTIMIZATION
Study Load [ECTS]:	5.5
Assumed Knowledge, Prerequisites or Co-requisites:	• Basics of petroleum geology • Basics of petrophysics • Reservoir engineering • Drilling and completion engineering • Production systems & engineering
Relationship to other courses within the program:	This course integrates the content of other courses to optimize the production of oil and gas wells. Main proceeding courses that would be preferred to follow first are listed above. During the course these topics will be briefly discussed during specific topics.
STAFF	
Lecturer:	**Contact details:**
Name: Ir. W. Botermans	
Counterpart Lecturer:	**Contact details**
Name: X. Sewberath Misser, MSc	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	6 x 2 = 12	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[2]Literature Study-01 [hrs]:	20	
[2]Project 1:	40	
[2]Project 2:	40	
[1]Practical- Presentation/ Feedback [hrs]:	N/A	
[2]Examination- Preparation/ Literature Study-02 [hrs]:	40	
[1]Examination- Oral [hrs]:	N/A	

[1]Examination- Written [hrs]:	3	
Total Hours (ECTS x 28hrs):	**154**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

The actual split of the hours can vary per student based on their efforts, learning efficiency and planning efficiency.

Course Description:

This course describes the work of the oil and gas producing company. It starts after the wells have been drilled and are taken into production. We will follow the process of Monitoring, Identification, Solution selection, Implementation and Data Management. The course will first start with the monitoring plan of the entire production system, although the focus is on inflow and outflow monitoring, surface facilities performance observations are important too. Second, the course will talk about opportunity or problem identification. When the monitoring is carried out correctly, possibilities for further recovery and production improvement can be identified. Once understood, these opportunities can be matured or problems can be solved by selecting the right technologies or production best practices as a third step. The fourth step is to make sure that the solutions are implemented in the field as designed and that the results are reported in a data management system. This step of post job reporting and data storage will close the loop of production optimization and form the new start of monitoring against new performance parameters.

Learning Outcomes:

After the course the student is able to identify opportunities and/or problems for production and recovery optimization of oil and gas reservoirs.

- Identify under-performing well
- Identify the problem
- Select the solution
- Describe the operational tools and process
-

Teaching Method:

The course material will be presented via online meetings of 2 hrs. Slides with information and sketches will be presented. The style is active participation.
Exercises will be done to apply the theory. The students will also carry out a project in which a well will be analyzed and proposals for improvement of the production will have to be presented.

Course Contents:

II. Lecture Content [Summary of lecture subjects]
  - Monitoring reservoir and well performance
  - Water Production
  - Well testing design and implementation
  - Cased hole logging
  - Opportunity and problem identification
  - Formation Damage

- Acidizing (basics)
- Hydraulic fracturing (basics)
- Solution selection & implementation
- Well service
- Data management

III. Practical
   a. Literature Study
   b. Hands on exercises between classes
      i. During course exercises will be made. A summary of the results will have to be made and shown to the instructor. This can be in free format, as long as it is readable and possible to store electronically. Example; Word, Power Point, Excel, scan of written results, picture of written results.
   c. Project 1
      i. A report will have to be prepared in Microsoft Word.
   d. Project 2
      i. A presentation will have to be given in Microsoft Power Point

Conditions for Examination:

- Project 1 and 2 finished and handed in before target date
- Follow at least 5 of the courses, unless clear justification to be absent is communicated

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Hands on exercises between classes	Understanding of presented material	10%
Project	Ability to integrate presented theory	30%
Examination- Written	Content of the course and testing of applying the theory to answer practical questions	60%

Course Necessities:

Standard Computer with basic MS Office with MS Teams installed

Textbooks and/or Reference Books:

There are various good petroleum engineering text books. These are the preferred ones:

- Fundamentals of Reservoir Engineering – L.P. Dake
- Petroleum Production Systems

If required, references and study material will be provided during the course

GW1003 PETROLEUM ECONOMICS & MANAGEMENT

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW1003
Course Name:	PETROLEUM ECONOMICS & MANAGEMENT
Study Load [ECTS]:	5
Assumed Knowledge, Prerequisites or Co-requisites:	• BSc Petroleum Engineering, fundamentals of exploration geology, reservoir engineering, reservoir geology, petrophysics, production technology, drilling engineering, facility & offshore engineering • Mathematics and statistics at BSc level • Skills in using XL spreadsheets • Basic understanding of complex systems subject to uncertainty
Relationship to other courses within the program:	• Economics and decision making are "integrating languages". All technical disciplines come together in supporting decisions that add value to a company's or the government's bottom line.
STAFF	
Lecturer:	**Contact details:**
Name: Drs. Lucia van Geuns (Dr. Jilles van den Beukel)	
Counterpart Lecturer:	**Contact details**
Name: R. Mangnoesing MSc	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	28	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[2]Literature Study-01 [hrs]:	24	
[2]Take Home Practical-Model Exercise [hrs]:	36	
[1]Practical- Presentation/ Feedback [hrs]:	8	
[2]Examination- Preparation [hrs]:	40	
[1]Examination- Oral [hrs]:	N/A	
[1]Examination- Written [hrs]:	4	

Total Hours (5ECTS x 28hrs):	140	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

The course will start by introducing some basic concepts in micro-economics and in (investment) decision-making under uncertainty. Topics include exploration economics, project economics, asset life-cycle economics, portfolio economics, corporate economics. Sub-topics include discounted cashflow (DCF) analysis, Capital Asset Pricing Model (CAPM) and Weighted Average Cost of Capital (WACC), time-value of money, corporate finance, hydrocarbon asset technical-to-business integrated modelling (Integrated Asset Modelling – IAM using XL), Monte Carlo uncertainty analysis, technical vs systemic uncertainties, decision tree analysis (DTA), combining discrete and continuous and time-series uncertainties, sensitivity analysis, risk analysis, options theory, automatic decision triggers in time-series, asset valuation, Key Performance Indicators (KPI), (hierarchical) optimization under uncertainty.

All topics are related to the corporate or government's process of decision-making under uncertainty, given the applicable constraints. The purpose of well-articulated objective functions will be explained and may include short-term, medium-term, long-term objectives and constraints, and pertain to the operational level, project level, asset life-cycle level, portfolio level, corporate level, and/or national level.

Integrated Asset Models (IAM) follow the decision analysis (DA) process, and include concepts such as scenario development and modelling, uncertainty quantification of KPIs and time-series, risk definition, risk analysis, risk tolerance, multi-criteria decision-making, robustness of a decision.

Special attention will be given to the various forms of Government Take (concession regime, tax regime, production sharing contracts – PSC). Also, non-quantitative aspects such as bias, psychology, group think, black swans, etc. will be reviewed. Finally, questions such as "what is a good decision?" and "what is a good forecast?" will also be addressed.

Learning Outcomes:

The main goal of this course is to understand the concepts underlying the (investment) decision-making process, and their relationship to the Government's decision -making / policy-making process, applicable to the petroleum E&P industry. At the end of this course students should be able to:

- Apply methods to compute an investment's Key Performance Indicators, which act as decision criteria.
- Do this including model input parameter uncertainty (technical, economic, planning uncertainties).
- Do this including discrete uncertainties and decisions in a decision tree (Decision Tree Analysis).
- Apply sensitivity analysis to identify which manageable uncertainties can be tested for Value of Information analysis or Value of Flexibility analysis.
- Understand how to manage the downside and the upside by including dynamic options.
- Understand how to relate the different hierarchical decision levels (operational, project, asset, portfolio, corporate): optimizing value at one level is not necessarily optimal at the next higher level.
- Understand and articulate concepts such as (added) value, risk and opportunity.
- Understand the fundamental relationship between risk and minimum required expected return.

- Understand the quantitative and non-quantitative aspects in Decision Analysis.
- Understand the (economic) relationship between an (international) oil company and the Government.

Teaching Method:

Teaching methods will consist of:

- Lectures
- Practical exercises using XL and Crystal Ball (Monte Carlo XL plug-in)
- Class discussions, including discussions on academic attitudes
- Student presentations on economic topics, including reactions / questions by students in audience
- Self-study using the course syllabus, power-point presentations, literature and earlier exams
- On-line Q&A
- A written closed-book exam

Course Contents:

e. Lecture Content:
    i. Company projects, cashflows, cost of capital, tax, KPIs
    ii. Uncertainty modelling
    iii. Sensitivity analysis
    iv. Decision analysis process
    v. Project maturation/ Decision Gate Process
    vi. Portfolio management, corporate KPIs
    vii. Bias

f. Practical:
    i. Setting up economic cashflow model using XL
    ii. Computing KPIs, including short-term vs long-term KPIs
    iii. Computing the uncertainty around KPIs, including stochastically /uncorrelated input variables
    iv. Computing risk
    v. Computing Value of Information, Value of Flexibility,
    vi. Computing the value of an exploration license
    vii. Computing time-series uncertainty
    viii. Computing triggers (automatic decisions) that react on the value of state variables

Conditions for Examination:

Handing in all required exercises & practical (per target date).

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Individual presentations + questions asked by audience to presenter	• Robustness of knowledge presented • Critical attitude (method validity, potential improvements, creativity etc.) • Presentation skills	25
Written Examination*	• Assessment of the complete course content	75

*Closed book

Course Necessities:

- MS Teams
- MS Word / PowerPoint / Excel
- Crystal Ball (Oracle Crystal Ball Downloads)

Textbooks and/or Reference Books:

Book (course syllabus): SUPPLEMENTARY NOTES TO Petroleum Economics and Management course (Code GW1003), MSc. Petroleum Geoscience & Engineering (MSc. PGsE), Anton de Kom University Suriname, 4 – 16 July 2022, by Ir. C.F.M. Bos (76 pages)

GW1002 Marine Pipelines and Subsea Engineering

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW1002
Course Name:	Marine Pipelines and Subsea Engineering
Study Load [ECTS]:	5.5
Assumed Knowledge, Prerequisites or Co-requisites:	It is assumed that students have successfully completed the foundational courses covering geology, reservoir engineering and preceding offshore engineering courses.
Relationship to other courses within the program:	The course builds on the general knowledge gained in the preceding offshore engineering courses on structures and facilities required for the development of offshore oil and gas fields.
STAFF	
Lecturer:	**Contact details:**
Name: Ir. Victor Krolis	
Counterpart Lecturer:	**Contact details**
Name: Cheryl Djamin, MSc.	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	60 (3 classes per week of each 4 hours for 5 weeks)	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Self Study Hours
[2]Literature Study [hrs]:	30	
[2]Take Home Practical-Hand In Exercises [hrs]:	31	
[2]Examination- Preparation [hrs]:	30	
[1]Examination- Written [hrs]:	3	
Total Hours (ECTS x 28hrs):	**154**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

This course will provide students with an understanding of the required processes in place to install subsea pipelines and structures as part of oil and gas field developments.

Learning Outcomes:

Upon successful completion of this course students will be able to:

- work in a multi-disciplinary project team and provide input regarding pipeline and subsea installations requirements;
- prepare concept design of pipeline and subsea installations for an oil and gas field development;
- liaise at professional level with offshore structures design consultants and contractors, with specific focus on design, fabrication, installation and operation of pipelines and subsea installations.
- assist field asset managers in decision making process concerning offshore oil and gas developments.

Teaching Method:

- Academic and industry expert lectures presented. A structured and thematic program is followed for knowledge transfer and cultivation of understanding. Students are stimulated to further explore and research the subjects taught.
- Interactive offshore engineering assignments with direct feedback from staff are integrated in the program. This reinforces the topics learned from lectures.
- Small group exercises with hands-on presentation and participation in discussion of results empower student learning.

Course Contents:

g. **Contents:**

- Typical layouts of an offshore (green) field development
- Factors that determine the type of field layout
- Typical assets that are part of a SURF infrastructure – Assignment 1
- Flow lines:
  - Types of Pipelines – Assignment 2
  - Flow assurance – Assignment 3
  - Design of Pipelines – Assignment 4
  - Pipeline installation methods: S-lay, Reel Lay and J-Lay – Assignment 5
  - Pipeline support (including buckling) and burial – Assignment 6
  - Pre-commissioning – Assignment 7a
  - Corrosion and Maintenance – Assignment 7b
- Subsea systems:
  - Type of subsea systems and their functions – Assignment 8
  - Installation methods of subsea systems – Assignment 9
- Typical CAPEX and OPEX – Assignment 10
- Diving operations – Assignment 11
- Remotely Operated Vehicles (ROV) – Assignment 12

h. **Assignments:** Students will be asked to provide input for the development of the SURF infrastructure of an ongoing field development in deep and or shallow water. Emphasis will lie on knowing which basic components are required, the basic design philosophies of each component, basic installation principles and the external factors that need to be considered in order to make the right technical decisions for SURF infrastructure development.

Conditions for Examination:

During the exam a field development case will be described in which the student needs to present a full SURF development which will include all the components as described above in the assignments section.

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Practical	A total of 12 assignments are expected from the students. Each assignment is related to the contents which have been discussed during the classes. The assignments are part of the take-home practical exercises and should be combined with literature study. Next to solving the actual assignment task, the student will be asked to give their own input on potential improvements, recommendations, and their own insights of the actual subject.	40
Written exam	The written exam will be an assessment of all the previously conducted assignments into one SURF case study in combination with a few theoretical questions. During the exam it is expected from the student to deliver a full SURF field development plan with a generic overview of the costs involved. The aim is to condense this case within the allowable 3 hours available.	60

The minimum passing score required to pass the complete course is 5.0, however the final grade should be 5.5 at minimum.

Course Necessities:

Basic Microsoft Office, MS Teams

Textbooks and/or Reference Books:

S. Laik, Offshore Petroleum Drilling and Production, CRC Press, 2018
A. Palmer and R. King, Subsea Pipeline Engineering 2nd Edition, 2008
L. Maria de Araujo Lima Gaudencio, R. de Oliveira, W. Curi, Construction of Sustainability Indicators System for Offshore Oil and Gas Production Units, 2021
B. Gerwick Jr., Construction of Marine and Offshore Structures 3rd Edition, 2007
S. Chandrasekaran, Dynamic Analysis and Design of Offshore Structures 2nd Edition, 2015
A. Bahadori, Oil and Gas Pipelines and Piping Systems Design, Construction, Management, and Inspection, 2017
Y. Bai and Q. Bai, Subsea Engineering Handbook, 2010

GW1004 The Global Energy Transition

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW1004
Course Name:	The Global Energy Transition
Study Load [ECTS]:	4
Assumed Knowledge, Prerequisites or Co-requisites:	Knowledge of exploration and production of georesources and subsurface activities. Interest in the current transition from fossil fuels to more sustainable energy is a prerequisite. Basic knowledge of the interlinkages and drivers of the international energy markets at the political, policy and corporate level.
Relationship to other courses within the program:	This course integrates the disciplinary insights from Earth Sciences, Economics, Environmental Policy and Governance to arrive at interdisciplinary solutions to the complex sustainability problems of tomorrow.
STAFF	
Lecturer:	**Contact details:**
Name: Drs. Lucia van Geuns (Dr. Jilles van den Beukel)	
Counterpart Lecturer:	**Contact details**
Name: Robbin Mangnoesing MSc	

ESTIMATED STUDY LOAD		
[1]Lecture & Classroom Practical [hrs]:	30	NOTES: • N/A if not applicable to the course • Totals should match ECTS load equivalent • Practical includes contact hours and hours required by student to solve practical. • 1: Contact Hours • 2: Team work
[2]Literature Study-01 [hrs]:	0	
[2]Take Home Practical-Hand In Exercises/ Paper/ Essay/Report [hrs]:	0	
[1]Practical- Presentation/ Feedback [hrs]:	29	
[2]Preparation/ Literature Study/paper[hrs]:	53	
[1]Examination- Oral [hrs]:	0	
[1]Examination- Written [hrs]:	0	
Total Hours (ECTS x 28hrs):	**112**	

*For more information on study load calculation please refer to https://msingermany.co.in/european-credit-system-ects/

Course Description:

Subjects covered include

- The tension field between energy policy objectives of secure energy supplies, a clean environment and an affordable energy price;
- The dominance of fossil fuels in the primary energy mix and changing patterns of energy consumption in OECD-countries, Russia and China;
- The overall oil- and gas balance and its relationship with the large consuming regions in a geopolitical context;

Students in this course will

- Be offered a framework to analyse energy policy
- Gain insight in how countries deal with the tension between the policy objectives of secure energy supplies, a clean environment and affordable energy prices
- Learn about today's geopolitics of and between consuming and producing states
- Develop a greater awareness of how several institutions influence low-carbon policies
- Examine the possible impacts of technological developments on geopolitics

Learning Outcomes:

After completing this course, students will be able to:

- Understand the main concepts and theories in energy transition and be able to put them in a wider context of global sustainable development
- Be offered a framework to analyse energy policy;
- Learn about the impact of climate policies, consequences for fossil fuels and subsidies;
- Learn about trends and developments in global energy demand and supply;
- Learn about the competition between major consuming countries and between major consuming and producing countries;
- Be offered a historical view on energy geopolitics of the past 25 years;
- Learn about today's geopolitics of and between consuming and producing countries;
- Learn about possible and plausible energy futures;
- Discuss the geopolitical and economic dimensions of energy security throughout the course.

Teaching Method:

- The course will be given in a blended form, i.e. partly face-to-face (e.g. interactive lecturing, workshops) and partly online (e.g. web lectures, online documents)
- Self-study
- Write a policy document
- Participate in debates/workshops
- Group research project

Course Contents:

Subjects covered include

- The long-term geopolitical and geo-economic aspects of energy transition
- Different scenarios on the future global energy mix including the role of renewables

- Trends and developments in the oil and gas market
- Technological and institutional changes affecting energy transition
- The challenges facing policy-makers in consuming and producing countries in transition

*Lectures/Workshops will cover:

- The global energy transition landscapes
- The gas markets and gas industry overview
- The EU energy policy story
- Groningen gas: the loss of a social license to operate *(Workshop)*
- The world of the energy scenario's; the geopolitics of (renewable) energy *(Workshop)*
- Oil markets and oil industry overview
- Challenges for the international oil industry
- The discovery of a major hydrocarbon occurrence in the Guiana Basin, offshore Suriname: a blessing or a curse? *(Workshop)*

Conditions for Examination:

Student attendance and commitment is absolutely vital to the attainment of the best possible learning outcomes of this course. The project requires a full-time commitment of the student as per course planning. Since this course is practical based, attendance is mandatory.

Course Evaluation:

Assignments

The workload is designed to reflect 4 ECTS points, including three assessments:

• A short, written essay (policy note) of 1000 words;

• A oral presentation and written paper at the end of the course based on the Group research work;

• Active participation in the course (incl. workshops).

Grading

− Written policy note: 20 %

− Group Research Presentation and written (team) paper: 10 & 40 %

− Workshop presentations (3x): 30 %

Policy note and Group research project:

- Reporting technique (structure, lay-out, language usage)
- Research objectives and context
- Theoretical profundity
- State-of-the-art description and literature study
- Scientific argumentation
- Scientific reflection and judgment, analysis
- Integration of results and analysis (for group grade only)
- Amount of work

- Use of resources
- Logbook (planning, minutes of meetings, etcetera)

Presentations and discussion:
- Speaker quality
- Clarity and structure of presentation
- Quality of presentation material/contents
- Answering of questions

Team skills:
- Communication
- Commitment/attitude
- Initiative
- Project management

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Written policy note	Individual reporting technique	20 %
Written team research paper	Scientific argumentation, scientific reflection and judgment, analysis, use of resources, team skills	40 %
Group research presentation	Communication, quality, quality of presentation material, content	10 %
Workshop presentations	Communication, quality, answering questions	30 %

Course Necessities:
Basic Microsoft Office & MS Teams

Textbooks and/or Reference Books:
https://en.wikipedia.org/wiki/The_Prize:_The_Epic_Quest_for_Oil,_Money,_and_Power

https://www.iea.org/reports/world-energy-outlook-2021

https://www.chathamhouse.org/publication/transparency-in-transition-eiti-bradley

https://www.chathamhouse.org/publication/carbon-risk-resilience-how-energy-transition-changing-prospects-countries-fossil

https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf

https://www.eia.gov/todayinenergy/

http://www.adekusjournal.com/ojs/index.php/acjoursu/article/view/6

https://www.sciencedirect.com/science/article/pii/S2211467X19300677?via%3Dihub

https://www.irena.org/publications/2019/Jan/A-New-World-The-Geopolitics-of-the-Energy-Transformation

https://hcss.nl/report/groningen-gas-loss-social-license-operate

https://hcss.nl/report/gas-supply-security-in-the-netherlands-geopolitical-and-environmental-dilemmas/

https://hcss.nl/report/european-tank-storage-sector/

https://hcss.nl/report/securing-critical-materials-for-critical-sectors-policy-options-for-the-netherlands-and-the-european-union/

https://hcss.nl/news/new-report-deteriorating-outlook-dutch-small-natural-gas-fields

https://hcss.nl/report/russias-unsustainable-business-model/

https://hcss.nl/expert/lucia-van-geuns

GW1101: FIELD DEVELOPMENT PROJECT

General Course Information

GENERAL	
Name of the Study Program:	☐ **BSc. Geowetenschappen (BSc. Gw)** ☒ **MSc. Petroleum Geoscience & Engineering (MSc. PGsE)** ☐ **MSc. Mineral Geosciences (MSc. MGs)**
Course Code:	GW1101
Course Name:	FIELD DEVELOPMENT PROJECT
Study Load [ECTS]:	7
Assumed Knowledge, Prerequisites or Co-requisites:	All preceding courses of the MSc. Program.
Relationship to other courses within the program:	This course integrates all knowledge from previous courses with the main objective to generate an optimal field development plan for a hydrocarbon field.
STAFF	
Lecturer & Counterpart:	**Contact details:**
Geology & Geophysics: Lect.: Dr. Albert Dijksman CP: Ilaisha Goelaman, MSc. **Petrophysics:** Lect.: Drs. Jan Lutgert CP: Sharon Kuhn, MSc. **Production Geology:** Lect.: drs. Kees Geel CP: Rakesh Ramdajal, MSc. **Reservoir Engineering:** To be determined **Offshore Engineering:** Lect.: Ir. Vinay Sewbaran CP: Rayen Bhajan, MSc. **Economics, HSE & PSC:** Lect.: Dr. Albert Dijksman CP: Sharon Kuhn, MSc.	

Course Description:

On the basis of provided subsurface and surface data students need to formulate a field development plan for this course. Specific knowledge acquired in earlier courses (geophysics, petrophysics, production geology, reservoir engineering, offshore engineering and economics) will be needed to set up and execute a development plan using seismic, petrophysical and reservoir data. The development plan will be documented and presented to the lecturers & counterparts.

Learning Outcomes:

General learnings:
At the end of this course students will have demonstrated that they are able to:

- Apply acquired knowledge of the MSc course on defining and documenting a field development study (FDP)
- Explain the interaction between the specialist disciplines in Geology-Reservoir and Offshore Engineering
- Be able to quantify the implications of subsurface activities and deal with inaccuracy and uncertainty.
- Integrate contributions from different disciplines as a team.
- Integrate specific knowledge from geophysics, petrophysics, geology, reservoir engineering, production technology and offshore engineering for setting up a field development plan using seismic, petrophysical and reservoir data
- Evaluate the economic merits of the proposed FDPs
- Evaluate the societal impact and risks of the FDPs
- Present a field development plan to a management panel.

Learnings per discipline:

<u>G&G:</u>

- Setting up of an interpretation project
- Definition of project coordinate system
- Checking of internal consistency, data QC
- Interpretation of seismic and well data
- Generation of maps (structure, attribute, thickness)
- Literature study on the reservoir environment of deposition
- Build a geological model

<u>Petrophysics:</u>

- Multi-well formation evaluation to calculate all the reservoir properties required to perform a volumetric evaluation. Properties calculated include:
    - Clay content
    - Porosity and

- Water saturation
- Permeability

Production Geologist:

- Two main learnings:
  - 1) How to build a static model
  - 2) how to determine volumes
- Sub task learnings:
  - To gather, QC and analyze critical input data at building of a static model
  - Build a 3D pillar grid from faults derived from seismic interpretation
  - Create a stratigraphic subdivision that is optimal for volumetrics and fluid flow
  - Build and QC a 3D geocellular reservoir model
  - Populate the reservoir model with properties in such a way that it honors both reservoir simulation purposes and geology
  - Volumetric calculations

Reservoir Engineering:

- To gather, QC and analyze critical input data at building of a dynamic model
- To understand the uncertainty quantification by varying the relevant parameters
- To master production forecasts and scenario testing by forward reservoir simulations

Offshore Engineering:

- To understand the different concepts of oil and gas offshore platforms
- To understand the different options in subsea engineering
- To understand the effect of existing infrastructure and the environment on the choice of offshore production systems
- To evaluate the offshore processing options based on reservoir fluids, export options, existing infrastructure

Economics, HSE & PSC:

- Setting of an economic model, incorporating local fiscal terms (Surinamese), production profiles, cost estimates and phasing.
- Additional activities required to arrive at an FDP proposal (appraisal drilling, testing)
- Calculation of economic parameters: NPV or EMV
- Assessment of HSE Suriname procedures: ESIA and Oil spill response

Teaching Method:

The students (groups of 5 students) will be given a data set to perform analysis to define a field development plan. Acquired knowledge, course contents and literature of previous courses need to be used for this course. For each discipline, an introduction will be given on the tasks, deliverables, and instructions by the Lecturers. During working on the practical, the lecturers and counterparts will be available for guidance. After each discipline, the deliverables will be presented to the lecturers and counterparts. When the practical work is finalized, the students will present the results and hand in an executive summary.

Course Contents:

Tasks and Deliverables:

- G&G:
  - Tasks:
    - Gathering of data, seismic, well data (log data, T/Z data , deviation data) cultural data (from NLog data base), acquisition/processing reports
    - Verification of project coordinate system, checking of internal consistency, definition of units system
    - Loading of all data into a project data base.
    - Re-checking internal consistency
    - Report on data loading, mention any anomalies, polarity/phase of seismic
    - Interpretation of seismic data, incorporation of well data, well to seismic ties
    - Literature study on reservoir environment of deposition
    - Two Way Time model
    - Depth conversion
  - Deliverables:
    - Depth converted structure, thickness, attribute maps
    - Fault interpretation
    - Depositional model/concept

- Petrophysics:
  - Tasks:
    - Calculation of clay content (GR methods only), porosity, permeability and water saturation. Since this is a multi-well study and students are working under time constraints, it is suggested that (X) groups are formed with each group interpreting one/two wells.
    - Several group sessions will be held with (1) group discussing:
      - Use the best/optimal method to calculate the desired properties
      - Agree on the type and values of the required input parameters (water salinity, matrix density, clay parameters etc.
      - Establish guidelines to estimate petrophysical uncertainties and related uncertainty ranges
  - Deliverables:
    - For each well a set of continuous curves of VClay, porosity, permeability and water saturation over the indicated reservoir zones.

        - A preliminary assessment of cutoff criteria for Net/Gross, porosity and water saturation to determine the Net Reservoir and net pay intervals.

- Production Geology:
    - Tasks:
        - Gather, QC and analyze critical input data at building of a static model: well logs (raw and evaluation), depth and isochore maps, RFT, production logs, well test permeabilities and flow boundaries
        - Build a 3D pillar grid from faults derived from seismic interpretation
        - Create a stratigraphic subdivision that is optimal for fluid flow and volumetrics
        - Build and QC a 3D geocellular reservoir model
        - Populate the reservoir model with properties in such a way that it honours both reservoir simulation purposes and geology
        - Calculate volumes in place

    - Deliverables:
        - Petrel static model
        - ECLIPSE/CMG export grid
        - Volumetrics

Reservoir Engineering:

- Tasks:
    - Collect, QC and QA the following input data required for building the dynamic model: PVT and SCAL
    - Validate the permeabilities in the model with DST data
    - Set-up, initialize and validate a dynamic reservoir model based on the static model developed in the previous sessions and PVT, RCA and SCAL data
    - Quantify the uncertainties for several key parameters by running reservoir simulations by running various scenarios, where parameters are varied one by one
    - Run development concepts on a base case reservoir model and determine optimum development scenario's including a production forecast (EUR)
- Deliverables:
    - PVT and SCAL data in table and graphical form to be used as input
    - Reservoir dynamic model with quantified uncertainties
    - Development scenarios with production forecast (number of wells, production strategy etc..)

Offshore Engineering:

- Tasks:
    - Evaluate the provided field from an offshore production systems point of view and choose an offshore structure for production.
    - Evaluate field and environmental properties to combine with the previous task and provide a concept for the subsea equipment.

* First task includes export options, drilling options etc. Second task includes a field layout based on the number of wells (and possibly gas/water re-injection etc.)

- Deliverables:
    - An offshore structure and a field layout for all subsea equipment

Economics, HSE & PSC:

- Tasks:

  Economics
    - Setting of an economic model, incorporating local fiscal terms (Surinamese), production profiles, cost estimates and phasing.
    - Oil and gas price predictions
    - Additional activities required to arrive at an FDP proposal (appraisal drilling, testing)
    - Calculation of economic parameters, NPV or EMV
    - Sensitivity analysis

  HSE:
    - Perform an HSE Assessment
    - ESIA planning

- Deliverables:
    - Net Present value of the project and proposals for further activity.
    - HSE plan

Conditions for Examination:

One Pager executive summary should be handed in on the day of the final presentation.

Course Evaluation:

Task:	Knowledge and Abilities Assessed:	% of Total Mark:
Milestone Review Status Presentation per Discipline (7)	See learnings/deliverables above	35%
Final Presentation	See learnings/deliverables above	35%
Executive Summary	See learnings/deliverables above	30%

Course Necessities:

- Basic Microsoft office
- Matlab
- Petrel
- CMG (if Petrel RE is unavailable)
- Questor

Textbooks and/or Reference Books:

All references of the previous courses can be used.