



Almaaqal university  
College of Engineering  
Department of Petroleum Engineering



# المناهج الدراسية

لقسم هندسة النفط

كلية الهندسة

جامعة المعقل

البصرة / العراق

١. متطلبات التخرج

المتطلبات	عدد الوحدات	الساعات الكلية/السنة
متطلبات جامعية	4	120
متطلبات هندسية	18	420
متطلبات القسم (النقط)	138	3120
الكلية	160	3600

٢. المتطلبات الجامعية : ٤ وحدة (units)

رمز المادة	المادة الدراسية	الوحدات	الساعات الاسبوعية		
			النظرية	العملية	المناقشة
U111	اللغة الانكليزية English Language	2	2	-	2
U211	Human Rights & Democracy حقوق الانسان ومبادئ الحرية والديمقراطية	2	2	-	2
الكلية			4	8	

٣. المتطلبات الهندسية : ١٦ وحدة (units)

التسلسل	رمز المادة	المادة الدراسية	الوحدات	الساعات الاسبوعية (فصلين دراسيين)		
				النظرية	العملية	المناقشة
1	E112	Mathematics I الرياضيات ١	3	-	3	
2	E122	Mathematics II الرياضيات ٢	3	-	3	
3	E118	Engineering Drawing I الرسم الهندسي ١	2	2	1	
4	E128	Engineering Drawing II الرسم الهندسي ٢	2	2	1	
		الكلية للمرحلة الاولى	10	4	2	
5	E212	Applied Mathematics I الرياضيات التطبيقية ١	2	-	2	
6	E222	Applied Mathematics II الرياضيات التطبيقية ٢	2	-	2	
		الكلية للمرحلة الثانية	4	0	4	
		الكلية للمرحلة الثالثة	0	0	0	
7	E402	Engineering Project المشروع الهندسي ١	2	2	1	
8	E403	Engineering Project المشروع الهندسي ٢	2	2	1	
		الكلية للمرحلة الرابعة	4	4	0	
		الكلية	18	8	6	
				28	14	

٤. متطلبات القسم : ١٤٠ وحدة (units)

رمز المادة	عنوان المادة	الوحدات	الساعات الاسبوعية (فصلين دراسيين)		
			النظرية	العملية	المناقشة
PeE111	General Geology I ١ الجيولوجيا العامة	3	2	3	-
PeE121	General Geology II ٢ الجيولوجيا العامة	3	2	3	-
PeE112	Computer Programming I ١ برمجة الحاسوب	3	2	2	-
PeE122	Computer Programming II ٢ برمجة الحاسوب	3	2	2	-
PeE113	Analytical Chemistry الكيمياء التحليلية	3	2	3	-
PeE123	Organic Chemistry الكيمياء العضوية	3	2	3	-
PeE114	Statics Mechanical Engineering ميكانيك هندسي سكوني	3	2	2	1
PeE124	Dynamics Mechanical Engineering ميكانيك هندسي حركي	3	2	2	1
PeE115	Physics I ١ الفيزياء	2	2	-	-
PeE125	Physics II ٢ الفيزياء	2	2	-	-
	الكلية للمرحلة الاولى	28	20	20	2
PeE211	Static Fluid الموائع السكونية	3	2	2	-
PeE221	Dynamic Fluid الموائع المتحركة	3	2	2	-
PeE212	Advanced Programming I ١ برمجة متقدمة	3	2	2	-
PeE222	Advanced Programming II ٢ برمجة متقدمة	3	2	2	-
PeE213	Structural Geology الجيولوجيا التركيبية	3	2	2	-
PeE223	Petroleum Geology جيولوجيا النفط	3	2	2	-
PeE214	Static Mechanics of Materials ميكانيك المواد السكونية	3	3	-	1
PeE224	Dynamics Mechanics of Materials ميكانيك المواد الحركية	3	3	-	1
PeE215	Electrical Engineering Technology تكنولوجيا الكهرباء	3	3	-	1
PeE225	Oil Properties خواص النفط	3	2	2	-
PeE216	Fundamental Of Petroleum Engineering I اساس هندسة النفط ١	2	2	-	2
PeE226	Fundamental Of Petroleum Engineering II اساس هندسة النفط ٢	2	2	-	2
	الكلية للمرحلة الثانية	34	27	14	7
PeE311	Engineering & Numerical Analysis I التحليل العددي ١ الهندسي	2	2	-	2
PeE321	Engineering & Numerical analysis II التحليل العددي ٢ الهندسي	2	2	-	2
PeE312	Petroleum Reservoir Engineering I ١ هندسة المكامن النفطية	3	3	-	1
PeE322	Petroleum Reservoir Engineering II هندسة المكامن النفطية ٢	3	3	-	1
PeE313	Petroleum Drilling Engineering I ١ هندسة الحفر	3	2	2	2
PeE323	Petroleum Drilling Engineering II ٢ هندسة الحفر	3	2	2	2
PeE314	Petroleum Production Engineering I ١ هندسة الانتاج	3	3	-	1
PeE324	Petroleum Production Engineering II ٢ هندسة الانتاج	3	3	-	1
PeE315	Basic of Thermodynamics اساس الديناميك الحراري	2	2	-	1
PeE325	Thermodynamics ( Cycles ) ديناميك حراري	2	2	-	1
PeE316	Well Logging I ١ جس الابار	3	3	-	1
PeE326	Well Logging II ٢ جس الابار	3	3	-	1
PeE317	Engineering Economics الاقتصاد الهندسي	2	2	-	-
PeE327	Engineering Statistics الاحصاء الهندسي	2	2	-	-
PeE318	Geophysics الجيوفيزياء	2	2	-	1
PeE328	Pollution & Industrial Safety السلامة الصناعية والتلوث	2	2	-	1
	الكلية للمرحلة الثالثة	40	38	4	18
PeE411	Numerical Methods الطرق العددية	2	2	-	2

PeE421	Reservoir simulation محاكاة المكامن	2	2	-	2
PeE412	Petroleum Reservoir Engineering III هندسة المكامن النفطية ٣	3	3	-	1
PeE422	Petroleum Reservoir Engineering V هندسة المكامن النفطية ٤	3	3	-	1
PeE413	Petroleum Drilling Engineering III هندسة الحفر ٣	3	3	-	1
PeE423	Petroleum Drilling Engineering V هندسة الحفر ٤	3	3	-	1
PeE414	Petroleum Production Engineering III هندسة الانتاج ٣	3	3	-	1
PeE424	Petroleum Production Engineering V هندسة الانتاج ٤	3	3	-	1
PeE415	Secondary Oil Recovery I استخلاص النفط الثانوي ١	3	3	-	1
PeE425	Secondary Oil Recovery II استخلاص النفط الثانوي ٢	3	3	-	1
PeE416	Gas Technology I تكنولوجيا الغاز ١	2	2	-	1
PeE426	Gas Technology II تكنولوجيا الغاز ٢	2	2	-	1
PeE417	Reservoir Management ادارة المكامن	2	2	-	2
PeE427	Petroleum Management ادارة النفطية	2	2	-	2
PeE427	Engineering project المشروع	2	1	2	-
الكلية للمرحلة الرابعة		38	37	2	18
الكلية		140	122	40	45
				207	

## 5. PeE Program: Curriculum

Typical degree program is shown in the following Tables for Petroleum Engineering, where recommended PeE course plan by semester is presented

### السنة الدراسية الاولى

الفصل الثاني				الفصل الاول					
الساعات الاسبوعية			الوحدات	المادة	الساعات الاسبوعية			الوحدات	المادة
التطبيقي	العملي	النظري			التطبيقي	العملي	النظري		
1	-	1	1	English Language II	1	-	1	1	English Language I
1	-	3	3	Mathematics-II	1	-	3	3	Mathematics-I
-	2	1	2	Engineering Drawing-II (AutoCAD)	-	2	1	2	Engineering Drawing I (Basic)
-	3	2	3	General Geology II	-	3	2	3	General Geology I
-	2	2	3	Computer Programming II	-	2	2	3	Computer Programming I
-	3	2	3	Organic Chemistry	-	3	2	3	Analytical Chemistry
1	2	2	3	Dynamics Mechanical Engineering	1	2	2	3	Statics Mechanical Engineering
-	-	2	2	Physics II	-	-	2	2	Physics I
3	12	15	20	Total	3	12	15	20	Total
30					30				

### السنة الدراسية الثانية

الفصل الثاني				الفصل الاول					
الساعات الاسبوعية			الوحدات	المادة	الساعات الاسبوعية			الوحدات	المادة
التطبيقي	العملي	النظري			التطبيقي	العملي	النظري		
1	-	1	1	Democracy	1	-	1	1	Human Rights
2	-	2	2	Applied Mathematics- II	2	-	2	2	Applied Mathematics I
-	2	2	3	Dynamic Fluid	-	2	2	3	Static Fluid
-	2	2	3	Advanced Programming II	-	2	2	3	Advanced Programming I
-	2	2	3	Petroleum Geology	-	2	2	3	Structural Geology
-	2	2	3	Oil Properties	1	-	3	3	Electrical Engineering Technology
1	-	3	3	Dynamics Mechanics of Materials	1	-	3	3	Static Mechanics of Materials
2	-	2	2	Fundamental Of Petroleum Engineering II	2	-	2	2	Fundamental Of Petroleum Engineering I
6	8	16	20	Total	7	6	17	20	Total
30					30				

السنة الدراسية الثالثة

الفصل الثاني				الفصل الاول					
الساعات			الوحدات	المادة	الساعات الاسبوعية			الوحدات	المادة
التطبيقي	العملي	النظري			التطبيقي	العملي	النظري		
2	-	2	2	Engineering & Numerical Analysis- II	2	-	2	2	Engineering & Numerical Analysis-I
1	-	3	3	Petroleum Reservoir Engineering II	1	-	3	3	Petroleum Reservoir Engineering I
2	2	2	3	Petroleum Drilling Engineering II	2	2	2	3	Petroleum Drilling Engineering I
1	-	3	3	Petroleum Production Engineering II	1	-	3	3	Petroleum Production Engineering I
1	-	2	2	Thermodynamics ( Cycles )	1	-	2	2	Basic of Thermodynamics
1	-	3	3	Well Logging II	1	-	3	3	Well Logging I
-	-	2	2	Engineering Statistics	-	-	2	2	Engineering Economics
1	-	2	2	Pollution & Industrial Safety	1	-	2	2	Geophysics
9	2	19	20	Total	9	2	19	20	Total
30					30				

السنة الدراسية الرابعة

الفصل الثاني				الفصل الاول					
الساعات الاسبوعية			الوحدات	المادة	Weekly hours			الوحدات	المادة
التطبيقي	العملي	النظري			التطبيقي	العملي	النظري		
-	2	1	2	Engineering Project	-	2	1	2	Engineering Project
2	-	2	2	Reservoir Simulation	2	-	2	2	Numerical Methods
1	-	3	3	Petroleum Reservoir Engineering V	1	-	3	3	Petroleum Reservoir Engineering III
1	-	3	3	Petroleum Drilling Engineering V	1	-	3	3	Petroleum Drilling Engineering III
1	-	3	3	Petroleum Production Engineering V	1	-	3	3	Petroleum Production Engineering III
1	-	3	3	Secondary Oil Recovery II	1	-	3	3	Secondary Oil Recovery I
1	-	2	2	Gas Technology II	1	-	2	2	Gas Technology I
2	-	2	2	Petroleum Management	2	-	2	2	Reservoir Management
9	2	19	20	Total	9	2	19	20	Total
30					30				

### التدريب الصيفي

مناهج قسم هندسة النفط تتطلب من الطالب ان يكمل شهر من التدريب الصيفي في احدى الشركات او الدوائر الحكومية او الاهلية، يعتبر استيفاء الطالب للتدريب الصيفي من متطلبات التخرج ويشرف عليه من قبل لجنة التدريب الصيفي في القسم.

### ٦. مناهج قسم هندسة النفط / الوحدات المطلوبة

- مدة الدراسة ٤ سنوات (تفرغ تام)
- ١٦٠ وحدة ل هندسة النفط موزعه بالشكل التالي :

- العلوم الاساسية والرياضيات : ٥٨ وحدة
- مواد هندسية : ٩٤ وحدة
- تعليم عام : ٨ وحدات



## 1<sup>st</sup> Year/1<sup>st</sup> Semester

**Subject: English Language I**  
**Code: U111 / 1<sup>st</sup> Semester**  
**Class: 1<sup>st</sup> Year**  
**Pre-requisite: None**

**Theoretical: 1hr / week**  
**Practical: ---**  
**Tutorial: 1hr / week**  
**Units: 1**

=====  
This course is designed to enable the students to achieve academic oral and written communication to the standard required at university level. The course integrates all the language skills with emphasis on writing, and it stimulates students' imagination, and promotes personal expression. Students, in this course, are trained to apply critical thinking skills to a wide range of challenging subjects from diverse academic disciplines. Course activities include writing various types of academic essays, acquiring advanced academic vocabulary, and getting involved in group discussions and debates. In addition, the course also includes other skills to consolidate the main skills, such as further readings and use of the Blackboard Suite.

**Subject: Mathematics I**  
**Code: E112 / 1<sup>st</sup> Semester**  
**Class: 1<sup>st</sup> Year**  
**Pre-requisite: None**

**Theoretical: 2hrs / week**  
**Practical: ---**  
**Tutorial: 2hrs / week**  
**Units: 3**

### Brief Review:

Trigonometry, Analytic Geometry, Sets, Relations, Functions (Algebraic and Trigonometric), Differentiation and Integration.

### Transcendental Functions:

Inverse Trigonometric, Natural Logarithmic, Exponential and Power:  
i. Definitions    ii. Properties    iii. Graphs    iv. Derivatives and Integrals.

### Application of the Definite Integral:

i) Areas between curves.    ii) Volumes of revolution.    iii) (Length of the curve.    iv) Surface Area of revolution.

### Hyperbolic Function:

i) Definition,    ii) Properties    iii) Graphs    iv) Inverse hyperbolic.  
v) differentiation and Integration



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**Methods of Integration I:**

Trigonometric Substitutions , Quadratics, Partial Fractions.

**Subject: Engineering Drawing I (Basic)**

**Theoretical: 1hr / week**

**Code: E118 / 1<sup>st</sup> Semester**

**Practical: ---**

**Class: 1<sup>st</sup> Year**

**Tutorial: 2hrs / week**

**Pre-requisite: None**

**Units: 2**

=====  
Introduction

- Graphic Instruments and Their Use
- Lettering
- Graphic Geometry
- Multi View Ortho Graphic Projection in First and Third Angle Projection
- Dimensions
- Third View
- Isometric Drawing and Sketching
- Oblique Drawing
- Section of Isometric Drawing Sectional View

**Subject: General Geology I**

**Theoretical: 2hrs / week**

**Code: PeE111 / 1<sup>st</sup> Semester**

**Practical: 3hrs / week**

**Class: 1<sup>st</sup> Year**

**Tutorial: ---**

**Pre-requisite: None**

**Units: 3**

- =====  
• Introduction (nature of geology, solar system, structure and shape of earth)
- Matter, energy, minerals, atoms, elements, bonding, natural radioactivity, time in geology, rock forming minerals, physical properties of minerals.
  - Igneous activity (magma) formation of igneous rock, mineral composition of igneous rocks, common igneous rocks.
  - Sedimentary rocks (conversation sediments to sedimentary rock, Lithification, origin & classification of sedimentary rocks (common sedimentary rocks).
  - Metamorphic rock (concept of metamorphism, agents & types of metamorphism, identification of common metamorphic rocks.
  - weathering, erosion and soil, environment of weathering, mechanical weathering, chemical weathering, examples of selected rocks & minerals, soil profile.





**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**Subject: Computing Programming I**  
**Code: PeE112 / 1<sup>st</sup> Semester**  
**Class: 1<sup>st</sup> Year**  
**Pre-requisite: None**

**Theoretical: 2hrs / week**  
**Practical: ---**  
**Tutorial: 2hrs / week**  
**Units: 3**

=====

**1. Problem solving algorithms**

Data structures, searching and sorting algorithms

**2. V. Basic Variables**

- 1) Variable types
- 2) Variable Names
- 3) Declarations

**3. Assignment statements and expressions in V. Basic**

Logical expressions and operators  
Mathematical expressions and operators

**4. Conditional Decisions and Loops**

**(a) Conditional Decisions**

- 1) If/Then/End If statement
- 2) If/Then/Else/End If statement
- 3) If/Then/ElseIf/End If statement
- 4) Select Case statement
- 5) Switch statement
- 6) IIf statement
- 7) Choose statement

**(b) Loops**

- 1) For-Next statement
- 2) While-Wend statement
- 3) Do Until-Loop statement
- 4) Do While-Loop statement
- 5) Do-Loop Until statement
- 6) Do-Loop While statement

**5. ARRAYS**

- 1) Declaring Arrays
- 2) Input and Output Arrays
- 3) Generate Specific Array Elements
- 4) Computational (mathematical) processes that take place on the matrices (arrays)



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**Subject: Analytical Chemistry**  
**Code: PeE113 / 1<sup>st</sup> Semester**  
**Class: 1<sup>st</sup> Year**  
**Pre-requisite: None**

**Theoretical: 2hrs / week**  
**Practical: 3hrs / week**  
**Tutorial: ---**  
**Units: 3**

- =====
- Introduction to Stoichiometry
  - Acid-basic titration.
  - Precipitation titration.
  - Redox titration.
  - Various batteries & electronic cells.
  - Principles of corrosion.
  - Water for domestic uses.
  - Industrial water.
  - Atmospheric pollution.

**Subject: Statics Mechanical Engineering**  
**Code: PeE114 / 1<sup>st</sup> Semester**  
**Class: 1<sup>st</sup> Year**  
**Pre-requisite: None**

**Theoretical: 3hrs / week**  
**Practical: 2hrs / week**  
**Tutorial: ---**  
**Units: 3**

=====

Force system, units system, parallelogram law, force+ components, resultant of coplanar forces, components of force in space, moment of a force, moment of coupler, equilibrium, free body diagram, coplanar system, analysis of trusses, friction, nature of friction, theory of friction, coefficient of friction, centroids and center of gravity, centroids of area, centroids determined by integration, moments of inertia, parallel axes theorem, 2<sup>nd</sup> moment of area by integration, radius of gyration, moment of inertia of composite area.

**Workshop Skills**

The workshop training program is designed to satisfy the following:

Objectives Teaching safety rules and regulations on-site in an industrial environment proper use of working tools, instruments, and machines, introducing basic workshop practices, production, labor, and time-requirements of workshop operations. The students are introduced to training programs in six workshops: welding, forging, turning and milling, carpentry, and casting. The student is to spend 2 hours of training in every workshop



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**Subject: Physics I**  
**Code: PeE115 / 1<sup>st</sup> Semester**  
**Class: 1<sup>st</sup> Year**  
**Pre-requisite: None**

**Theoretical: 2hrs / week**  
**Practical: ---**  
**Tutorial: ---**  
**Units: 2**

- 
- Energy and its Conservation:
  - energy, work, power,
  - gravitational potential energy, kinetic energy, conservation of energy.
  - Simple Harmonic Motion: periodic motion, simple harmonic motion,
  - the potential energy of a spring, conservation of energy and the vibrating spring.
  - Wave Motion: mathematical representation of a wave,
  - speed of a transverse wave on a string, reflection of a wave at a boundary,
  - sound waves, the transmission of energy in a wave and the intensity of a wave.
  - Fluids: density, pressure, Pascal principle,
  - Archimedes principle,

## 1<sup>st</sup> Year / 2<sup>nd</sup> Semester

**Subject: English Language II**

**Code: U121 / 2<sup>nd</sup> Semester**

**Class: 1<sup>st</sup> Year**

**Pre-requisite: None**

**Theoretical: 1hr / week**

**Practical: ---**

**Tutorial: 1hr / week**

**Units: 1**

=====

This course is designed to enable the students to achieve academic oral and written communication to the standard required at university level. The course integrates all the language skills with emphasis on writing, and it stimulates students' imagination, and promotes personal expression. Students, in this course, are trained to apply critical thinking skills to a wide range of challenging subjects from diverse academic disciplines. Course activities include writing various types of academic essays, acquiring advanced academic vocabulary, and getting involved in group discussions and debates. In addition, the course also includes other skills to consolidate the main skills, such as further readings and use of the Blackboard Suite.

**Subject: Mathematics II**

**Code: E122 / 2<sup>nd</sup> Semester**

**Class: 1<sup>st</sup> Year**

**Pre-requisite: Mathematics-I**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: 2hrs / week**

**Units: 3**

=====

### 1) Methods of Integration II:

Integration by parts, Further Substitutions.

### 2) Approximation Integral:

i) Trapezoidal    ii) Simpson

### 3) Vector Algebra:

i) Representation of Vectors in space (I,j,k) (unit vectors    ii) Scalar Product

iii) Vector product.

### 4) Complex Numbers:

i) Invented number systems    ii) The Argand diagram.    iii) Addition, Subtraction, product, Quotient, Power and Roots.    iv) Demoivers theorem.

### 5) Polar Coordinates:

i) The polar coordinate system.    ii) Graphs of polar equations.    iii) Plane area in polar coordinates.

### 6) Matrices and Determinants:

i) Definition ii) Properties. iii) Inverse of a matrix. iv) Solution of Equations (Cramer's rule).

**Subject: Engineering Drawing II (AutoCAD)**  
**Code: EE128/2<sup>nd</sup> Semester**  
**Class: 1<sup>st</sup> Year**  
**Pre-requisite: Engineering Drawing-I (Basics)**

**Theoretical: 1hr / week**  
**Practical: 2 hrs/week**  
**Tutorial:**  
**Units: 2**

=====

The use of CAD in engineering drawing. Description of menu Bar and toolbars. Drawing Ellipse, Rectangle, line, Ray, Circle, point, Arc, etc. CAD Electrical, Mechanical/ Special features  
The use of various layers. Drawing electrical symbols on simple architectural plans.  
3-D Drawing, render, orthogonal projections and sectional views.

**Subject: General Geology II**  
**Code: PeE121 / 2<sup>nd</sup> Semester**  
**Class: 1<sup>st</sup> Year**  
**Pre-requisite: None**

**Theoretical: 2hrs / week**  
**Practical: 3hrs / week**  
**Tutorial: ---**  
**Units: 3**

- =====
- Ground water (movement of the origin & storage of ground water, mechanism of ground water flow, aquifers, springs & wells).
  - Shore lines (circulation of the ocean, tides, wave erosion, wave transportation, wave deposition, development of shore lines).
  - Earthquakes & earth's interior (shape & size of earth, Weight of earth, internal structure of earth, causes of earthquakes, prediction & control, internal structural of earth).
  - Contents (topographic features of the earth surface, deformation of rocks (folds & faults), mountains & their origin).
  - Sea-floor spreading (age, magnetic studies, movement of the sea floors, crystal plates, transform faults), continental drift current, energy).
  - Historical geology (evolution & fossilization, Paleozoic cycle, Cenozoic cycle, Pleistocene, life of Cenozoic).



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**Subject: Computer Programming II**

**Code: PeE122 / 2<sup>nd</sup> Semester**

**Class: 1<sup>st</sup> Year**

**Pre-requisite: Computer Programming I**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: 2hrs / week**

**Units: 3**

- =====
1. Review of basic instructions of V. Basic to prepare for advanced V. basic
  2. Built in Functions
  3. User defined functions and subroutines
  4. Sequential files
  5. Random Files
  6. MS chart
  7. MS flex grid
  8. Tree
  9. Data base control
  10. Picture control
- Image Control

**Subject: Organic Chemistry**

**Code: PeE123 / 2<sup>nd</sup> Semester**

**Class: 1<sup>st</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: 3hrs / week**

**Tutorial: ---**

**Units: 3**

- =====
- Organic chemistry.
  - Fuels (introduction).
  - Types of fuel composition.
  - Calorific
  - Chemical reaction.
  - Simple combustion.
  - Lubricants & lubrication
  - Plastic & elastomers.



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**Subject: Dynamics Mechanical Engineering**

**Code: PeE124 / 2<sup>nd</sup> Semester**

**Class: 1<sup>st</sup> Year**

**Pre-requisite:**

**Theoretical: 3hrs / week**

**Practical: ---**

**Tutorial: 2hrs / week**

**Units: 3**

=====

Kinetics of particle, rectilinear motion, curvilinear motion, rectangular components of curvilinear motion, normal and tangential component of acceleration, kinetics, force, mass and acceleration, kinetic of particle Newton's 2<sup>nd</sup> law.

**\*Workshop Skills**

The workshop training program is designed to satisfy the following:

Objectives Teaching safety rules and regulations on-site in an industrial environment proper use of working tools, instruments, and machines, introducing basic workshop practices, production, labor, and time-requirements of workshop operations. The students are introduced to training programs in six workshops: welding, forging, turning and milling, carpentry, and casting. The student is to spend 2 hours of training in every workshop

**Subject: Physics II**

**Code: PeE125 / 2<sup>nd</sup> Semester**

**Class: 1<sup>st</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: --**

**Units: 2**

=====

- equation of continuity,
- Bernoulli theorem,
- viscosity,
- stress and strain.
- Surface tension: interfacial tension, contact angle,
- wetting phenomena, capillary pressure.
- Heat transfer: convection, conduction, and radiation
- Coulomb law and the electric field,
- flux, Gauss law, electric potential.



## 2<sup>nd</sup> Year/1<sup>st</sup> Semester

**Subject: Human Rights**  
**Code: U211 / 1<sup>st</sup> Semester**  
**Class: 2<sup>nd</sup> Year**  
**Pre-requisite: None**

**Theoretical: 1hr / week**  
**Practical: ---**  
**Tutorial: 1hr / week**  
**Units: 1**

Introduces students to the philosophic and political background of the concept of human rights. Discusses important documents as part of the history of the development of human rights theories. Examines important issues in current political and ethical debates about human rights. Reviews core legal documents and the work of the most important governmental and nongovernmental institutions currently involved in human rights protection and promotion. Examines at least one current problem area in human rights protection.

**Subject: Applied Mathematics I**  
**Code: E212 / 1<sup>st</sup> Semester**  
**Class: 2<sup>nd</sup> Year**  
**Pre-requisite: Mathematics I & II**

**Theoretical: 2hrs / week**  
**Practical: ---**  
**Tutorial: 2hrs / week**  
**Units: 2**

i) **Vector**; scalars and vectors, component of a vector, rules of vector arithmetic, norm of a vector, normalizing of vectors, dot product, cross product, product of three or more vectors, equations of lines in space, planes in 3-space.

(ii) **Vector-valued functions**: limits and continuity, derivatives, forms of a curve equation in space, parametric representation, unit tangent and normal vectors, curvature, radius of curvature, motion along a curve, velocity, acceleration and speed, normal and tangential components of acceleration.

(iii) **Partial differentiation**: Function of two or more variables, limits and continuity, partial derivatives, partial derivatives of functions of two variables, partial derivatives of functions with more than two variables, the chain rule, the chain rule for derivatives, the chain rule for partial derivatives, directional derivatives and gradients, directional derivatives, the gradient, tangent plans and normal vectors, maxima and minima of functions of two variables, Lagrange multipliers.



(iv) **Multiple integrals:** Double integral, areas and volumes, double integral in polar coordinates, parametric surfaces, surface area, surface integrals, evaluation of volume and triple integral.

**Subject: Static Fluid**

**Code: PeE211 / 1<sup>st</sup> Semester**

**Class: 2<sup>nd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: 2hrs / week**

**Tutorial: ---**

**Units: 3**

- 
- Dimensions & units, dimensional analysis.
  - Process variables: physical state, overall mass balance, overall energy balance, overall momentum balance.
  - Concept of fluid behavior, Newtonian and non-Newtonian fluids, laminar and turbulent flow in circular tube.
  - Flow measurement.
  - Pitot tube, venturi meter, orifice meter, rota meter.

**Subject: Advanced Programming I**

**Code: PeE212 / 1<sup>st</sup> Semester**

**Class: 2<sup>nd</sup> Year**

**Pre-requisite: Computer Programming I & II**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: 2hrs / week**

**Units: 3**

- 
- Introduction to computer science,
  - digital system .
  - compilers.
  - operating systems, file systems, banking systems .
  - networks .

**Subject: Structural Geology**

**Code: PeE213 / 1<sup>st</sup> Semester**

**Class: 2<sup>nd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: 2hrs / week**

**Units: 3**

- 
- Mechanics of structural deformation: folds, faults, and joints,
  - unconformities, sedimentary environments,
  - origin of oil, generation,
  - migration and accumulation of petroleum.
  - Source rocks, reservoir rocks, cap rock,



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**Subject: Electrical Engineering Technology**  
**Code: PeE215 / 1<sup>st</sup> Semester**  
**Class: 2<sup>nd</sup> Year**  
**Pre-requisite:**

**Theoretical: 2hrs / week**  
**Practical: 2hrs / week**  
**Tutorial: ---**  
**Units: 3**

- 
- D. C. circuits.
  - A. C. circuits.
  - Magnetic circuits.
  - Construction and characteristics of D. C. machines
  - transformers and induction motors.
  - Measuring instruments for voltage, current, power and temperature

**Subject: Static Mechanical of Material**  
**Code: PeE214 / 1<sup>st</sup> Semester**  
**Class: 2<sup>nd</sup> Year**  
**Pre-requisite:**

**Theoretical: 3hrs / week**  
**Practical: 1hr / week**  
**Tutorial: ---**  
**Units: 3**

- 
- Stress: simple stress, shearing stress, bearing stress,
  - thin wall cylinders,
  - strain stress diagram, Hook law, poisson's ratio,
  - thermal stress,
  - torsion formula,
  - flanged bolt,

**Subject: Fundamental of Petroleum Engineering I**  
**Code: PeE216 / 1<sup>st</sup> Semester**  
**Class: 2<sup>nd</sup> Year**  
**Pre-requisite:**

**Theoretical: 2hrs/ week**  
**Practical: 2hrs/ week**  
**Tutorial: ---**  
**Units: 2**

- 
- The oil well “a brief outline”, system of units, Drill string design, Drill string accessories, Drill Bit.

- Three cone bit feature, PDC bit feature, diamond bit.
- Function of drilling mud, functional properties of mud basic mud types.
- Functions of casing, casing types, casing strength properties casing specification. Basic factors for casing design casing accessories.
- Functions of cement., clauses and types of cement.
- Basic component of cement, properties of cement slurry method of cementing. Practical cement calculator.
- Hole problems., pipes sticking, lost circulation shale problems, well kick and blow out.
- Completion equipment,
- types of well. Completion. Types of packer, well completion program,
- perforating of oil and gas wells, perforating techniques, perforating fluid selection of perforated in eternal

### 2<sup>nd</sup> Year/2<sup>nd</sup> Semester

**Subject: Democracy**

**Code: U221 / 2<sup>nd</sup> Semester**

**Class: 2<sup>nd</sup> Year**

**Pre-requisite: None**

**Theoretical: 1hr / week**

**Practical: ---**

**Tutorial: 1hr / week**

**Units: 1**

Introduces students to the philosophic and political background of the concept of human rights. Discusses important documents as part of the history of the development of human rights theories. Examines important issues in current political and ethical debates about human rights. Reviews core legal documents and the work of the most important governmental and nongovernmental institutions currently involved in human rights protection and promotion. Examines at least one current problem area in human rights protection.

**Subject: Applied Mathematics II**

**Code: E222 / 2<sup>nd</sup> Semester**

**Class: 2<sup>nd</sup> Year**

**Pre-requisite: Applied Mathematics I**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: 2hrs / week**

**Units: 2**

#### Differential Equations

(i) First Order: variable separable, exact, linear, Bernoulli.

(ii) second and Higher Order: Linear equation with constant coefficients, linear homogeneous equations with constant coefficients, non-homogenous equations, solving of non-homogenous equations, variation of parameters, higher order linear equations with constant coefficients, D-operator, Cauchy equation.

**Fourier series**

Periodic and non- Periodic Functions, Euler Formulas, Even and Odd functions, Half Range Expansion(Fourier Sine and Fourier Cosine), Complex Fourier Series (Exponential), Applications of Fourier Series in Electric Circuits

**Sequences and series**

Convergence and Divergence Test, Geometric Series and Partial Sum, Integral, Comparison, Ratio and Root Tests, Alternating series, Power Series, Taylor and Maclaurin Series, Applications of Power Series.

**Subject: Dynamic Fluid**

**Code: PeE221 / 2<sup>nd</sup> Semester**

**Class: 2<sup>nd</sup> Year**

**Pre-requisite: Static Fluid**

**Theoretical: 2hrs / week**

**Practical: 2hrs / week**

**Tutorial: ---**

**Units: 3**

- Some design equations for the flow of incompressible fluids.
- Friction losses in pipes and fittings.
- Two-phase flow.
- Fluid machinery.

**Subject: Advanced Programming II**

**Code: PeE222 / 2<sup>nd</sup> Semester**

**Class: 2<sup>nd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: 2hrs / week**

**Units: 3**

- machine language .
- programming with FORTRAN77,
- numerical methods,
- tables, graphics.
- Programming with Matlab

**Subject: Petroleum Geology**

**Code: PeE223 / 2<sup>nd</sup> Semester**

**Class: 2<sup>nd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: 2hrs / week**

**Units: 3**

- traps (types and discovering techniques),



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



- reservoir mechanics (pressure, temperature, reservoir energy),
- subsurface mapping,
- oil field waters,
- Iraq and middle East oilfields.

**Subject: Oil Properties**

**Code: PeE225 / 2<sup>nd</sup> Semester**

**Class: 2<sup>nd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: 2hrs / week**

**Tutorial: ---**

**Units: 3**

- 
- Crude oils (chemical composition, classification, properties),
  - density, specific gravity and coefficient of expansion,
  - viscosity, molecular weight, vapor pressure,
  - specific heat, latent heat, heat of combustion,
  - boiling range, flash point, pour point,
  - sulfur content, aniline point,
  - penetration number, softening point,
  - crude oil evaluation,
  - fractional distillation and TBP curve,
  - analysis of fraction,
  - dehydration of crude oil,
  - natural gas properties and oil field water properties.

**Subject: Dynamics Mechanics of Material**

**Code: PeE224 / 2<sup>nd</sup> Semester**

**Class: 2<sup>nd</sup> Year**

**Pre-requisite:**

**Theoretical: 3hrs / week**

**Practical: 1hr / week**

**Tutorial: ---**

**Units: 3**

- 
- coupling helical springs
  - shear and bending moments, diagrams,
  - analytical and graphical deflection,
  - buckling,
  - special topics.



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**Subject: Fundamental of Petroleum Engineering II Theoretical: 2hrs/ week**  
**Code: PeE226 / 2<sup>nd</sup> Semester** **Practical: 2hrs/ week**  
**Class: 2<sup>nd</sup> Year** **Tutorial: ---**  
**Pre-requisite:** **Units: 2**

=====

- Types of Traps : Lithology of petroleum Reservoirs ,Reservoirs Driving Mechanisms .
- Reservoir Rock Petro physics, porosity, permeability, saturation, Capillary pressure .
- Darcy s law and applications, PVT analysis for oil .
- Well inflow equation for stabilized flow conditions
- Real Gas flow, Gas Well Testing.
- Natural Water Influx.
- Production Engineering, Properties of Hydrocarbon Mixtures, Flow of Fluids,
- Natural flow performance, Sucker Rode Pumping,
- Stimulation and Remedial Operations.

**3<sup>rd</sup> Year/1<sup>st</sup> Semester**

**Subject: Engineering and Numerical Analysis I** **Theoretical: 2hrs / week**  
**Code: PeE311/1<sup>st</sup> Semester** **Practical: ---**  
**Class: 3<sup>rd</sup> Year** **Tutorial: 2hrs / week**  
**Pre-requisite: Applied Mathematics I & II** **Units: 2**

=====

**Fourier Transform**

Properties, convolution theorem, power spectral, density and correlations, signals and linear systems, applications.

**The Z-Transform**

Region of convergence, properties of Z-transforms, Z-transform pairs, the inverse of Z-transform, analysis and discrete-time systems, applications.

**Statistics**

Definitions, frequency distribution (relative & cumulative, mean, standard deviation).



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**Probability Theorem**

Definitions, mutually exclusive and conditional probability, permutations and combinations, probability distribution functions (Binomial, Poisson).

**Complex Variable Theory**

Functions of complex variables, complex differentiation, analytic functions and its properties, integration in the complex plane, Cauchy's theorem, Cauchy's integral formula for simply and multiply connected regions, Taylor's and Laurent series, the residue theorem.

**Subject: Petroleum Reservoir Engineering I**

**Code: PeE312/1<sup>st</sup> Semester**

**Class: 3<sup>rd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: 2hrs / week**

**Units: 3**

- =====
- Types of traps; fluids distribution,
  - types of oil reservoirs, porosity compressibility, permeability,
  - Darcy's Law; linear flow (piston like, leaky piston),
  - Gas flow equation, Radial flow, productivity equation, radial flow of gas,
  - average permeability for stratified reservoirs,
  - klinkenberg effect, flow through channels and fractures,
  - saturation, capillary pressure, wettability,
  - Multiphase flow through porous media,
  - effective and relative permeability; calculation of relative permeability, fractional flow equation, buckley-Leverett equation .

**Subject: Petroleum Drilling Engineering I**

**Code: PeE313/1<sup>st</sup> Semester**

**Class: 3<sup>rd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: 2hrs / week**

**Tutorial: 2hrs / week**

**Units: 3**

- =====
- Introduction to drilling;
  - classification of drilling operations,
  - properties and functions of drilling fluid,
  - types and properties of clay in water,
  - types of drilling fluids, drilling hazards dependent on mud control, drilling mud calculations,
  - drilling methods (cable tool drilling, rotary drilling),



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



- basic component of rotary drilling equipment, drilling string and accessories,
- types of bits,

**Subject: Petroleum Production Engineering I**

**Code: PeE314/1<sup>st</sup> Semester**

**Class: 3<sup>rd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: 2hrs / week**

**Tutorial: ---**

**Units: 3**

- 
- 
- Well completion operations (parameter of design, completion methods, equipment, completion fluids);
  - perforation of oil and gas wells (perforation methods, selection of perforation intervals);
  - water and gas coning; methods for determining oil production rate without coning; completion efficiency,
  - drill stem test (DTS) (test method, equipment, pressure versus time curve, theory of pressure buildup, reservoir properties obtained, depletion);
  - Helical buckling of tubing (forces, homogeneous completion, packers permitting free and limited motions, compound completion of wells);

**Subject: Basic of Thermodynamics**

**Code: PeE315/1<sup>st</sup> Semester**

**Class: 3<sup>rd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: 1hr / week**

**Units: 2**

- 
- 
- Temperature and heat: temperature, heat,
  - specific heat, calorimetry,
  - change of phase,
  - thermal equilibrium. Thermal expansion: linear, a real and volume expansion of solids,
  - volume expansion of liquid and gases;
  - Charles's law.
  - Boyle's law,
  - the ideal gas law,
  - kinetic theory of gases, equations of state. Application of the concept of work to a thermodynamic system, heat added and removed,





**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



- first law of thermodynamics, some special cases of the first law the gasoline engine,

**Subject: Well logging I**

**Code: PeE316/1<sup>st</sup> Semester**

**Class: 3<sup>rd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: 2hrs / week**

**Tutorial: ---**

**Units: 3**

- =====
- Fundamentals of quantitative log interpretations,
  - conventional electric logs,
  - lateral logs,
  - induction logs,
  - micro resistively devices,

**Subject: Engineering Economics**

**Code: PeE317/1<sup>st</sup> Semester**

**Class: 3<sup>rd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: ---**

**Units: 2**

- =====
- Oil and gas reserve, organization of petroleum exporting and importing countries,
  - international supply and demand of petroleum,
  - classification of petroleum, petroleum pricing, alternative energy, international strategy of energy,
  - time value of money, types of interest rates, rate of return,
  - methods of engineering decisions, depreciation, depletion, amortization, taxation, inflation,
  - sensitivity analysis of engineering projects,
  - risk analysis production decline curves,
  - evaluation of future production of oil and gas wells.

**Subject: Geophysics**

**Code: PeE318/1<sup>st</sup> Semester**

**Class: 3<sup>rd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: 1hr / week**

**Tutorial: ---**

**Units: 2**

- Gravity methods (prospecting), principles, instruments,
- field measurements, gravity corrections, interpretations,
- gravity anomalies and geological structures.
- Magnetic methods, principles the earths magnetic field,
- field measurements, magnetic corrections, interpretation.

### 3<sup>rd</sup> Year/2<sup>nd</sup> Semester

**Subject: Engineering and Numerical Analysis II**      **Theoretical: 2hrs / week**  
**Code: PeE321/2<sup>nd</sup> Semester**      **Practical: ---**  
**Class: 3<sup>rd</sup> Year**      **Tutorial: 2hrs / week**  
**Pre-requisite: Engineering and Numerical Analysis-I**      **Units: 2**

=====

#### Solution of Differential Equations using power series

Legendre's equation, Legendre's polynomials, Bessel function of the first and second orders, Bessel function properties.

#### Partial Differential Equations

Wave equation, Laplace equation, solution of boundary condition problems, general solution, solution by separation of variables.

#### Matrix Analysis

Review of matrix theory, linear transformation, Eigen values and Eigen vectors, Laplace transform of matrices, application of electric circuits.

#### Numerical Analysis

Solution of non-linear equations (Iteration, bisection and Newton-Raphson), finite difference, numerical differentiation and integration, numerical solutions of 1<sup>st</sup> order differential equations.

**Subject: Petroleum Reservoir Engineering II**      **Theoretical: 2hrs / week**  
**Code: PeE322/2<sup>nd</sup> Semester**      **Practical: ---**  
**Class: 3<sup>rd</sup> Year**      **Tutorial: 2hrs / week**  
**Pre-requisite: Petroleum Reservoir Engineering I**      **Units: 3**

=====

- Gas properties (Boyle and charle's laws, Avogadro law, Dalton law, equation of state).
- Compressibility factor, liquids properties (PVT), viscosity,
- classification of reservoirs according to P-T diagram, phase behavior,
- calculation of bubble point and dew point,
- behavior of non-ideal liquids, flash and differential degassing,
- determination of reservoir liquids,
- properties of formation water, volumetric calculation of reservoirs,

- material balance equation, material balance for water derive and gas derive reservoirs,
- calculation of reservoir pressures.

**Subject: Petroleum Drilling Engineering II**      **Theoretical: 2hrs / week**  
**Code: PeE323/2<sup>nd</sup> Semester**      **Practical: 2hrs / week**  
**Class: 3<sup>rd</sup> Year**      **Tutorial: 2hrs / week**  
**Pre-requisite: Petroleum Drilling Engineering I**      **Units: 3**

---

- casing of oil wells, functions of casing, types of casing,
- strings, parameters of casing design, selection of casing and bit types,
- design of string, graphical design of casing,
- cementing of oil wells,
- classification of cementing operations,
- cementing equipment, methods and calculations of cementing,
- Hydraulics of primary cementing operations.

**Subject: Petroleum Production Engineering II**      **Theoretical: 2hrs / week**  
**Code: PeE324/2<sup>nd</sup> Semester**      **Practical: 2hrs / week**  
**Class: 3<sup>rd</sup> Year**      **Tutorial: ---**  
**Pre-requisite: Petroleum Production Engineering I**      **Units: 3**

---

- surface gathering systems (types of gathering systems, behavior of fluid flow, flow lines, essential flowing lines, valves);
- separation of oil, gas, & water (types of separators, components of separators and functions);
- oil storage (storage tanks and accessories, calibration, measurement of liquid level);
- Production by pumps (sucker and submersible pumps).

**Subject: Thermodynamics ( Cycles )**      **Theoretical: 2hrs / week**  
**Code: PeE325/2<sup>nd</sup> Semester**      **Practical: ---**  
**Class: 3<sup>rd</sup> Year**      **Tutorial: 1hr / week**  
**Pre-requisite: Basic of Thermodynamics**      **Units: 2**

---

- the ideal heat engine, the carnot cycle.
- The second law of thermodynamics:

- heat engine and the second law, refrigeration and the second law, reversibility,
- entropy, statistical interpretation of entropy.
- Binary system, multi-component system,
- bubble point, dew point, phase envelop,
- critical pressure-critical temperature.

**Subject: Well Logging II**

**Code: PeE326/2<sup>nd</sup> Semester**

**Class: 3<sup>rd</sup> Year**

**Pre-requisite: Well Logging I**

**Theoretical: 2hrs / week**

**Practical: 2hrs / week**

**Tutorial: ---**

**Units: 3**

- sonic log,
- formation density log,
- neutron log, gamma ray log,
- thermal decay time logs,
- electromagnetic waves penetration time (EPT) logs.

**Subject: Engineering Statistics**

**Code: PeE327/2<sup>nd</sup> Semester**

**Class: 3<sup>rd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: ---**

**Units: 2**

- Importance of statistics,
- descriptive and inferential statistics, pictorial description of data, random sample selection,
- data classifications, frequency distributions, cumulative frequency distributions,
- graphical representation of data histograms, frequency polygon, measures of probability variation and the binomial distributions,
- Poisson distribution,
- normal distribution,
- correlation and regression analysis.

**Subject: Pollution & Industrial Safety**

**Code: PeE328/2<sup>nd</sup> Semester**

**Class: 3<sup>rd</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: 1hr / week**

**Tutorial: ---**

**Units: 2**

**Industrial Safety & pollution**



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



- Magnitude of the accident toll.
- Accident costs.
- Evaluation of safety performance.
- Injury sources, cases and distribution.
- Effective safety program.
- Job safety analysis.
- Plant inspection.
- Accident investigation.
- Plant house keeping.
- Maintenance.
- Handling material: hand tools.
- Low voltage electrical hazards.
- Fundamentals of machine guarding.
- The prevention of falls.
- Methods of promoting safe practice.
- Safety organization.
- Safety and health standards and rules.
- First aid.
- Occupational health hazards.
- Personal protective equipment.
- Fire prevention and protection.
- Ionizing radiations protection.

**4<sup>th</sup> Year/1<sup>st</sup> Semester**

**Subject: Engineering Project**

**Code: E402 / 1<sup>st</sup> Semester**

**Class: 4<sup>th</sup> Year**

**Pre-requisite: None**

**Theoretical: 1hr / week**

**Practical: 2hrs / week**

**Tutorial: ---**

**Units: 2**

=====

This is an independent study under the supervision of department members. Each student is expected to do research trying to explore and define a potential study area suitable for a senior design project. A specific engineering problem must then be identified from within the selected study area. Results from this study must be documented and submitted in the form of a design project proposal.



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**\* Engineering Ethics: 1hr/wk**

**Course Objectives:** Prepare students to understand the foundation of classical moral theory and decision making in the context of science and engineering applications. Help students to recognize and evaluate ethical challenges that they will face in their academic and professional careers through knowledge and exercises that deeply challenge their decision-making processes and ethics. Assist students in improving their effective communications and presentation skills.

**1- Introduction:** Background Ideas , Why Study Engineering Ethics?, Engineering Is Managing the Unknown , Personal vs. Professional Ethics , The Origins of Ethical Thought , Ethics and the Law , Ethics Problems Are Like Design Problems , Case Studies ,Summary.

**2- Professionalism and Codes of Ethics:** Introduction, Is Engineering a Profession? Codes of Ethics.

**3- Understanding Ethical Problems:** Introduction , A Brief History of Ethical Thought , Ethical Theories non-Western Ethical Thinking.

**4- Ethical Problem-Solving Techniques:** Introduction, Analysis of Issues in Ethical Problems , Line Drawing , Flow Charting , Conflict Problems, An Application of Problem-Solving Methods: Bribery/Acceptance of Gifts.

**5- Risk, Safety, and Accidents:** Introduction, Safety and Risk, Accidents.

**Subject: Numerical Methods**

**Code: PeE411/1<sup>st</sup> Semester**

**Class: 4<sup>th</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: 2hrs / week**

**Units: 2**

- =====
- Interpolation, ( Linear, Lagrange),
  - Matrices, Review of matrix properties,
  - Determinates, inverse of matrix,
  - solution of system of linear equations (Gaussian elimination, Gauss Jordan method, Jacobi method, Gauss Seidel method),
  - least Square method (linear equations, polynomial equations)
  - Reservoir simulation (Introduction, types of simulators) flow through porous media (derivation of single phase, one-dimensional flow equation, two and three-dimensional flow equation),
  - finite difference method (Taylor series, forward difference, backward difference, central difference, concepts of explicit and method implicit methods),



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**Subject: Petroleum Reservoir Engineering III**      **Theoretical: 2hrs / week**  
**Code: PeE412/1<sup>st</sup> Semester**      **Practical: ---**  
**Class: 4<sup>th</sup> Year**      **Tutorial: 2hrs / week**  
**Pre-requisite: Petroleum Reservoir Engineering I, II**      **Units: 3**

=====

- Fundamental concepts,
- oil reservoirs: depletion drive,
- water drive gravity drainage reservoir,
- combination drive reservoirs,

**Subject: Petroleum Drilling Engineering III**      **Theoretical: 2hrs / week**  
**Code: PeE413/1<sup>st</sup> Semester**      **Practical: 2hrs / week**  
**Class: 4<sup>th</sup> Year**      **Tutorial: 2hrs / week**  
**Pre-requisite: Petroleum Drilling Engineering I, II**      **Units: 3**

=====

- Casing landing (landing as cemented, landing in tension at the freeze point, landing in compression at the freeze point),
- buckling phenomenon,
- wellhead loads, blowout and blowout prevention,
- well kick (methods of control, drillers method, engineers method),
- factors affecting drilling rate (effect of pressure, effect of physical properties of drilling mud, effect of weight on bit and rotary speed economical effect),
- hole problems (pipe sticking, surge and swab pressure, hole deviation),

**Subject: Petroleum Production Engineering III**      **Theoretical: 2hrs / week**  
**Code: PeE414/1<sup>st</sup> Semester**      **Practical: 2hrs / week**  
**Class: 4<sup>th</sup> Year**      **Tutorial: ---**  
**Pre-requisite: Petroleum Production Engineering I, II**      **Units: 3**

=====

- Types of reservoirs and radial flow in the reservoirs,

- productivity index, in flow performance relationship (IPR),
- effect of stratification and water cut on IPR,
- productivity index test, Vogel method, Standing method, Couto method, Fetkovich method, Al-Saadoon method,
- mathematical and physical principles for pressure drop calculations,
- flow pattern and the relation with pressure order,
- Poettmann and Carpenter method, Dukler method, working charts, analysis of choke performance,

**Subject: Secondary Oil Recovery I**

**Code: PeE415/1<sup>st</sup> Semester**

**Class: 4<sup>th</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: 2hrs / week**

**Tutorial: ---**

**Units: 3**

- 
- 
- Principles and definitions,
  - choice of proper methods for enhanced oil recovery,
  - recovery by water displacement,
  - Buckley-Leverett method,
  - welling method, stiles method, original and improved Dyksra-parsons method,
  - pattern of flooding, sweep efficiency,
  - properties of injected water, injected pressures,
  - recovery by immiscible gas,

**Subject: Gas Technology I**

**Code: PeE416/1<sup>st</sup> Semester**

**Class: 4<sup>th</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: 1hr / week**

**Units: 2**

- 
- 
- Properties of gases;
  - gas system analysis;
  - gas flow through P. M.;





**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**Subject: Reservoir Management**  
**Code: PeE417/1<sup>st</sup> Semester**  
**Class: 4<sup>th</sup> Year**  
**Pre-requisite:**

**Theoretical: 2hrs / week**  
**Practical: ---**  
**Tutorial: ---**  
**Units: 2**

- 
- introduction to reservoir management,
  - the base map, isopach map,
  - net pay thickness, cross sections,
  - well correlation using logs, isoporosity map, bubble map, routine map, analysis, special core analysis,
  - screening of core data, using correlations to estimate missing data,
  - calculation of initial fluids in place, material balance,
  - determination of reservoir type,

**4<sup>th</sup> Year/2<sup>nd</sup> Semester**

**Subject: Engineering Project II\***  
**Code: E403 / 2<sup>nd</sup> Semester**  
**Class: 4<sup>th</sup> Year**  
**Pre-requisite: Engineering Project I**

**Theoretical: 1hr / week**  
**Practical: 2hrs / week**  
**Tutorial: ---**  
**Units: 2**

---

This is an independent study under the supervision of department members. Each student is expected to do research trying to explore and define a potential study area suitable for a senior design project. A specific engineering problem must then be identified from within the selected study area. Results from this study must be documented and submitted in the form of a design project proposal.

**\* Engineering Ethics: 1hr/wk**



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



- 1. The Rights and Responsibilities of Engineers:** Introduction, Professional Responsibilities, Professional Rights, Whistle-Blowing.
- 2. Ethical Issues in Engineering Practice:** Introduction, Environmental Ethics, Computer Ethics, Ethics and Research.
- 3. Doing the Right Thing:** See how ethical problems can be avoided; learn how engineers can cooperate with each other and with clients and government agencies to be sure that the ethically correct choice is made. Analysis current ethics problem like what happen in Volkswagen's company.
- 4. Selective Case Study**

**Subject: Reservoir Simulation**  
**Code: PeE421/2<sup>nd</sup> Semester**  
**Class: 4<sup>th</sup> Year**  
**Pre-requisite:**

**Theoretical: 2hrs / week**  
**Practical: ---**  
**Tutorial: 2hrs / week**  
**Units: 2**

- 
- solution of system of difference equations tridiagonal algorithms, use of irregular Gridding, transmissibility,
  - the finite difference form of the flow equation in terms of transmissibility,
  - Averaging of rock and fluid properties, solution of radial from of the flow equation, two dimensional flow,
  - setting up the finite difference form, ordering schemes, standard row ordering, standard column ordering,
  - resulting matrix structure,
  - introduction to multi-phase flow through porous media.

**Subject: Petroleum Reservoir Engineering V**  
**Code: PeE422/2<sup>nd</sup> Semester**  
**Class: 4<sup>th</sup> Year**  
**Pre-requisite: Petroleum Reservoir Engineering III**

**Theoretical: 2hrs / week**  
**Practical: ---**  
**Tutorial: 2hrs / week**  
**Units: 3**

- 
- pressure maintenance, secondary recovery,
  - gas reservoirs,
  - gas-condensate reservoirs,
  - miscellaneous subjects.

**Subject: Petroleum Drilling Engineering V**

**Theoretical: 2hrs / week**



**Almaaqal university**  
**College of Engineering**  
**Department of Petroleum Engineering**



**Code: PeE423/2<sup>nd</sup> Semester**

**Class: 4<sup>th</sup> Year**

**Pre-requisite: Petroleum Drilling Engineering III**

**Practical: 2hrs / week**

**Tutorial: 2hrs / week**

**Units: 3**

- 
- directional drilling, factors affecting hole inclination of directional wells, types of directional wells,
  - geometry of a directional well,
  - methods of calculations of directional wells,
  - horizontal drilling,
  - types of horizontal wells,
  - air drilling, design of air drilling operations.

**Subject: Petroleum Production Engineering V**

**Code: PeE424/2<sup>nd</sup> Semester**

**Class: 4<sup>th</sup> Year**

**Pre-requisite: Petroleum Production Engineering III**

**Theoretical: 2hrs / week**

**Practical: 2hrs / week**

**Tutorial: ---**

**Units: 3**

- 
- prediction of restricted and unrestricted production,
  - effect of other parameters on well performance derivation and solutions of diffusivity equation,
  - application of Horner solution, maturates test, draw-down test,
  - effect of skin factor on well testing,
  - analysis of tests that affected by barrier, bounded reservoirs, gas lift operations,
  - stimulations operations (acidizing and fracturing).

**Subject: Secondary Oil Recovery II**

**Code: PeE425/2<sup>nd</sup> Semester**

**Class: 4<sup>th</sup> Year**

**Pre-requisite: Secondary Oil Recovery I**

**Theoretical: 2hrs / week**

**Practical: 2hrs / week**

**Tutorial: ---**

**Units: 3**

- 
- Tarner method, Muskat method,
  - recovery by miscible gas,
  - dry gas injection,
  - enriched gas injection,
  - CO<sub>2</sub> injection, N<sub>2</sub> injection ,
  - thermal recovery, heat flow through rocks,
  - seam injection, insect combustion tertiary oil recovery,

- surfactant flooding, solvent injection,
- polymer injection.

**Subject: Gas Technology II**

**Code: PeE426/2<sup>nd</sup> Semester**

**Class: 4<sup>th</sup> Year**

**Pre-requisite: Gas Technology I**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: ---**

**Units: 2**

- 
- gas transportation,
  - gas treatment & liquefaction;
  - gas sweetening and dehydration.

**Subject: Petroleum Management**

**Code: PeE427/2<sup>nd</sup> Semester**

**Class: 4<sup>th</sup> Year**

**Pre-requisite:**

**Theoretical: 2hrs / week**

**Practical: ---**

**Tutorial: ---**

**Units: 2**

- 
- building reservoir model, history matching,
  - optimization of surface facilities,
  - suggestions to increase production by plugging, perforation, completion, etc.,
  - development strategies,
  - drilling new wells, completion,
  - suggesting additional necessary surface equipments,
  - economic evaluation of the proposed strategy.

### Summary Table

<i>No</i>	<i>Class</i>	<i>Study Hours</i>			<i>No. of Units</i>		
		<i>First Semester</i>	<i>Second Semester</i>	<i>Total</i>	<i>First Semester</i>	<i>Second Semester</i>	<i>Total</i>
<i>1</i>	<i>First Year</i>	<i>450</i>	<i>450</i>	<i>900</i>	<i>20</i>	<i>20</i>	<i>40</i>
<i>2</i>	<i>Second Year</i>	<i>450</i>	<i>450</i>	<i>900</i>	<i>20</i>	<i>20</i>	<i>40</i>
<i>3</i>	<i>Third Year</i>	<i>450</i>	<i>450</i>	<i>900</i>	<i>20</i>	<i>20</i>	<i>40</i>
<i>4</i>	<i>Fourth Year</i>	<i>450</i>	<i>450</i>	<i>900</i>	<i>20</i>	<i>20</i>	<i>40</i>
<i>Total</i>		<i>1800</i>	<i>1800</i>	<i>3600</i>	<i>80</i>	<i>80</i>	<i>160</i>