

## 5. Prodi Teknik Perminyakan (S-1)

### **TM2111 Fluida Reservoir**

*Silabus Ringkas/ Short Description:*

On this subject will be given the general explanation about reservoir fluid: oil/gas component, the physics/chemical properties of hydrocarbon, phase behavior, P-T diagram, P-C diagram, ternary diagram, equation of state, ideal gas, real gas, five types of reservoir fluid, formation volume factor, isothermal compressibility, viscosity, compressibility factor, density, surface tension, field data, laboratory data, PVT study, flash liberation, differential liberation, separator test, gas-liquid balance, surface separation, gas-liquid recombination, PVT data simulation, formation water properties, hydrate gas.

### **TM2212 Praktikum fluida Reservoir**

*Silabus Ringkas/Short Description:*

On this subject will be given the practical module: determination of physical gas properties, oil specific gravity, Redwood and Ostwald viscometer, Rolling Ball viscometer, computer simulation of Flash Liberation, computer simulation of Equation of State.

### **TM2113 Petrofisika + Praktikum**

*Silabus Ringkas/Short Description:*

Basic physical properties of reservoir rocks and calculation of physical properties in the laboratory, types of reservoir rocks, types of hydrocarbon traps, stresses concept on rocks, permeability and Darcy equation, fluid saturation, effective and relative permeability, physical-chemical properties of rocks and fluids, capillarity properties, compressibility, average value of rocks physical properties.

### **TM2214 Teknik Reservoir I**

*Silabus Ringkas/Short Description:*

the dimension and conversion on reservoir engineering, description of reservoir pressure, volumetric calculation concept and definition of oil reserves, drive mechanism and picked-up reserve, diffusivity equation, flow equation and productivity concept, decline curve analysis, material balance equation and forecasting reservoir behavior.

### **TM3115 Teknik Reservoir II**

*Silabus Ringkas/Short Description:*

Fluid flow equation in reservoir: diffusivity equation and it's solution; water influx: phenomena, modeling, determining the influx: bottom water drive and water coning; linier water displacement, piston-like displacement model; segregation drive with and without good flow.

### **TM3121 Analisis Well Logs + Praktikum**

#### *Silabus Ringkas/Short Description:*

Studying the rocks petrophysics properties around well bore in determining rock types, water and rocks resistivity value with fluid contained, shale volume, porosity, saturation, and interpretation analysis methods from logging tools which generally used on open hole logging.

### **TM3141 Teknik Produksi**

#### *Silabus Ringkas/Short Description:*

Description about technique on producing oil and gas well based on knowledge about reservoir fluid flow behavior from productive layer into the bottom hole, reservoir fluid flow in the tubing, also the equipment of production well. These four basics knowledge are integrated in planning naturally production well in order to get the optimum production rate either for now or the changing productive layer potential in the future.

### **TM3242 Pengangkatan Buatan**

#### *Silabus Ringkas/Short Description:*

Studying the effort of increasing the production rate as the result of decreasing the ability of productive layer and gas/water production changing. All artificial lift methods will be discussed which are gas lift, sucker rod pump, electric submersible pump, jet pump, hydraulic pump, and Moyno pump. Types of artificial lift will be oriented for artificial lift method which generally used in most fields in Indonesia. Explanation of each types consist of basic concept, which are the application of Nodal System Analysis and artificial lift methods concept. Later on, will be discussed about the equipment which used and their function. So that, when we do the design planning and equipment selection can depend on the good basic concept.

### **TM3251 Manajemen dan Analisis Keekonomian Proyek Migas**

#### *Silabus Ringkas/Short Description:*

Oil and gas business needs big investment, high technology, also need human resource with special skills. Beside in order to fulfill the domestic energy, oil and gas is the source of national income and the main Indonesia's devisa. To operate oil and gas business, it is needed the knowledge about *capita selecta*, management, and oil gas economy. *Capita Selecta* consist of the activity oil and gas sector, the oil and gas role in the country development, challenge and chances oil and gas industry, also the strategy and the mechanism of the affair oil and gas in Indonesia. The management consist of company structure, management tasks, oil and gas business operation, decision making, finance, field development, oil and gas law and contract, also environmental development. The economics side discuss the profit and the factors that affected which are production, price, cost, and tax. Also will be discussed the risk analysis and simulation.

### **TM4116 Peningkatan Perolehan Migas**

#### *Silabus Ringkas/Short Description:*

This subject consist of review about reservoir performance (well data, production data, oil, gas, water, and maps), primary production (natural). The main study of this subject is on the advanced enhance technique with water injection (not miscible) and discuss the performance forecasting analytically and empirically. Also will be given the mikro and

makro factors that affects water injection performance and the other Enhanced Oil Recovery methods. The other methods are not miscible gas injection, fluids miscible injection, thermal injection (steam, hot water, In-Situ combustion), chemical injection (alkaline, polymer, surfactant), and the explanation of microba injection. And also the other techniques which can increase recovery without affects the reservoir either horizontal wells and in-fill-wells.

#### **TM4243 Stimulasi Sumur**

*Silabus Ringkas/Short Description:*

Introduction about stimulation technique, well acidizing, acid-rocks reaction, sandstone rocks acidizing, carbonate rocks acidizing, fracturing with acid, acid additives, well selection, acidizing project design, hydraulic fracturing, rocks and fluids mechanic on hydraulic fracturing, proppant, geometry fracturing model, fracture pressure analysis, and fracture evaluation.

#### **TM4144 Pengolahan dan Transportasi**

*Silabus Ringkas/Short Description:*

Studying and discussing the process and surface facilities design system which generally used in the oil and gas field including water injection field. Beside that will be discussed about the system and design of oil and gas pipe transportation.

#### **TM3246 Kompleksi dan Kerja Ulang**

*Silabus Ringkas/Short Description:*

Open hole completion well and cased hole, completion fluid and design, perforation, packer and forces in the tubing, squeeze cementing, well problem analysis, work over, subsurface equipment, design and sanding control.

#### **TM4152 Ekonomi Migas**

*Silabus Ringkas/Short Description:*

This subject discuss about oil and gas project economy techno, also mikro and makro economy of oil and gas which consist of upstream into downstream. The main discuss are techno-economy, mikro-economy (consumer optimization, producer optimization, price forming theory, market models, monopoly, oligopoly, cartel, tax, subsidiary, price regulation, externality), macro-economy (economy mechanism, banking and money system, inflation, development), non-produceable economy resources, and oil and gas sector economy.

#### **TM4253 OPTimasi Pengembangan**

*Silabus Ringkas/Short Description:*

In this subject will be discussed about optimization methods on decision making in exploration and development of oil and gas fields. Those decisions need information about how big the probabilities of one situation and the economy value of each prospect. Those optimization models will be discussed are linear models which can be used in operation development of oil and gas fields such as decision tree model, linear programming, allocation, scheduling with Critical Path Method and inventory.

### **TM4254 Regulasi Industri Migas**

#### *Silabus Ringkas/Short Description:*

This subject discuss about the chain activity oil and gas business in Indonesia from upstream until downstream from historical aspect, company, also law and regulation. The main discuss are: history of oil and gas industry in Indonesia, basic law and oil gas business regulation, oil and gas role in the country development, and the flow process of oil and gas transportation.

### **TM5261 Teknik Panas Bumi**

#### *Silabus Ringkas/Short Description:*

Discussing about geothermal system, reservoir types, the differences between oil and gas system, rocks and fluids properties of geothermal, reserve estimation methods and well potential. Well test technique, steam production facilities, electricity production facilities, electricity capability and steam consuming for PLTP.

### **TM4262 Pengembangan Lapangan Panas Bumi**

#### *Silabus Ringkas/Short Description:*

Study about exploration status and geothermal field development in Indonesia, future development prospect, challenge and inhibitor, Valuating the proper of geothermal field development, regulation, evaluating the resources, well performance, reservoir performance, steam field planning and PLTP, exploration cost and field development, project scheduling, the economic analysis of the project, simulator for comprehensive analysis, case study.

### **TM1171 Pengantar Teknik Perminyakan**

#### *Silabus Ringkas/Short Description:*

The born of earth science, the earth making theory. Earth as a part of universe. The development of earth science. Earth as solid thing (structure and composition). Earth image form physical aspect. Atmospheric and sea. Earth as mineral resources and energy. Earth disaster. The technology of exploration for mapping earth resources. Mining system and processing the earth material. Exploration technology and oil and gas exploitation.

### **TM4172 Gas Alam**

#### *Silabus Ringkas/Short Description:*

Reviewing gas properties, estimation reserve: initial in place estimation, volumetric, material balance, reservoir performance: gas flow in reservoir, forcheimer equation, inertia-turbulence, skin factor, deliverability: back pressure, isochronal test, modified isochronal, pressure analysis: p-square approach, pseudo pressure function approach, pressure drawdown testing, pressure build up test, the affect of well completion, condensate gas reservoir: IGIP and IOIP determination, gas flow in well bore: BHP and BHFP determination, gas well loading problems, gas flow in pipe, nodal flow for gas flow, calculation of gas rate and compression, gas field performance prediction, gas storage, coalbed methane.

### **TM4273 Operasi Migas Lepas Pantai**

*Silabus Ringkas/Short Description:*

Oceanography, basic offshore construction, offshore platform; offshore construction operation; offshore drilling and equipment; vessel inspection and maintenance.

### **TM501B Pengolahan data Reservoir**

*Silabus Ringkas/Short Description:*

Symbol, constant, conversion, specification, and scale/hierarchy of quantity, data needs and kind of data, method of study/analysis, seismic, laboratory, conventional or special cores, collecting data field. study of geology, uncertainty, consistency, integration. Grouping data by function, sources of scaling, time of collecting data, and scale. Planning, collecting, analysis, choosing, and data synthesis. Source of mistaken, scaling environment, calibrating/validating technique, the sensitivity of models, crossplot method, laboratory data vs field data, averaging the parameters, correlation and statistics, digitations, pressure decline curves, data as abstract function, relative permeability of three phases. Cases study

### **TM501A Perencanaan Pengembangan Lapangan**

*Silabus Ringkas/Short Description:*

After one oil field founded, The planning of field development must be done accurately to make sure that we get the optimum production. The life of the field has started from exploration, then found, delineation, production stage from primary, secondary, and tertiary until we left that field. The key success is planning, management and development controlling. Integrated data aspect (geology, geophysics, engineering, financial), technology (seismic, geologic, geostatistic, engineering, drilling and completions, enhanced oil recovery, environment, computer), tools and man (started from management, engineers, until financial) should be well integrated in order to produce good field development planning.

### **TM5019 Reservoir Karbonat dan Rekah Alam**

*Silabus Ringkas/Short Description:*

More than 50% proven reserves of oil and gas trapped in the carbonate and naturally fracture reservoirs which has complexity and heterogen (note: geothermal reservoir have always almost found in the naturally fracture reservoir). Carbonate reservoir is different from klastic reservoir because it's heterogeneity, surface chemical properties, and multiporosity characteristic (dual or triple porosity)from rocks and fluid flow system(interporosity flow). The rock surface chemical character produce wettability between water-wet and oil-wet which can make water fingering easily happened, lower production and lower recovery factor. These pores geometry heterogeneity on carbonate reservoirs can be representated by dual porosity system which connected by interconnection among fractures (vugs, channels) and rocks matrix. The amount of fluids which stored on matrix and fracture and it's easily path is the most important thing in the strategy for exploiting this kind of reservoirs. The heterogeneity either areal or vertical, wettability degree, and pores geometry multiporosity characteristic is the main contributor which related each other and the uniqueness of the carbonate and naturally fracture reservoir must be known by the Petroleum Engineering, Geology Engineering and Geophysics Engineering student.

### **TM5218 Karakterisasi dan Deskripsi Reservoir**

*Silabus Ringkas/Short Description:*

This subject explains the types of reservoir characteristic including pores and grain distribution, permeability, reservoir rocks porosity, rocks facies distribution, alluvial environment and explanation about basin using all available data. These data are seismic, geological description, well tomograph, VSP data, rocks survey, log data, core, well test, survey tracer and production data which can be described in quality and quantity.

### **TM4217 Pemodelan Reservoir**

*Silabus Ringkas/Short Description:*

History and the purpose of reservoir modeling, reservoir mathematical model, mathematical model of finite difference equation, solution model for numerical method, divergence and convergence, grading reservoir, solution for linear algebra equation directly and iterative, IMPES and SIMULTAN reservoir model solution, reservoir data availability, history matching, and the using of reservoir model for performance forecasting.

### **TM3101 Aplikasi Metode Numerik Perminyakan**

*Silabus Ringkas/Short Description:*

Is the basic engineering science which give the explanation and understanding for the Petroleum Engineering student about the background, techniques and numerical methods to solve the mathematical problems for types of fluid flow phenomena in Petroleum and Geothermal industry with minimum error.

### **TM2102 Matematika Teknik Perminyakan I**

*Silabus Ringkas/Short Description:*

Is the basic engineering science which give the explanation and understanding for the Petroleum Engineering student to develop mathematical models (in this case is ordinary differential equation with any kind of requirements) on Petroleum and Geothermal Engineering and giving the explanation through knowledge to solve the problems using applied engineering mathematics.

### **TM2203 Matematika Teknik Perminyakan II**

*Silabus Ringkas/Short Description:*

Is the basic engineering science which give the explanation and understanding for the Petroleum Engineering student to develop mathematical models (usually partial differential equation with any kind of requirements) on Petroleum and Geothermal Engineering and giving the explanation through knowledge to solve the problems using applied engineering mathematics.

### **TK2105 Termodinamika Dasar**

*Silabus Ringkas/Short Description:*

Thermodynamics concept, work, energy, enthalpy, heat, internal energy, first law, condition function, path function, phase rule, mass balance, energy balance, phase equity, compressibility, heat capacity, volumetric, PVT behavior, thermodynamics diagram, equation of state, ideal gas, real gas, thermochemical, second law, entropy, balance constanta, fugacity, kalor machine, refrigerant.

### **TM2205 Pengenalan Fenomena Perpindahan**

*Silabus Ringkas/Short Description:*

Force, pressure, statics, kinematics, viscosity, control volume analysis, Eulerian, Lagrangian, continuity equation, momentum equation, Bernoulli equation, Reynolds transport theorem, Navier-Stoke equation, dimensional analysis, flow in pipe, fluid flow calculation, basic principal of heat transfer, conduction, radiation, mass transfer basic principal, diffusion basic principal.

### **TM4206 Intelegensia Artifisial Perminyakan**

*Silabus Ringkas/Short Description:*

Is an advanced engineering science subject which can give the explanation and understanding for the Petroleum Engineering student to use the artificial intelligence techniques on any kind of problem dealing with Petroleum and Geothermal Engineering (Reservoir, production, Formation Evaluation, Drilling and even Oil and Gas economy).

### **TM40K1 Kerja Praktek**

*Silabus Ringkas/Short Description:*

Practical Training in the field on an oil company for at least one month. Making report which analyze the task based on the knowledge given in the class. The report should be approved by the Advisor which assigned by Petroleum Engineering Department.

### **TM40Z2 Tugas Akhir**

*Silabus Ringkas/Short Description:*

Solving problem in the petroleum industry using knowledge, technology, and economical principal also with the skill getting during study in Petroleum Engineering Department of ITB under supervised of one or two Advisor. Final Assignment is a report which made based on basic form planned by Petroleum Engineering Department of ITB. The result should be presentation on a Seminar and Sidang.

### **TM4122 Logging Produksi**

*Silabus Ringkas/Short Description:*

Technique and logging calculation when the well is produced either with conventional method or using radioactive to calculate oil, gas, and water rate on a layer and temperature profile behind the casing.

### **TM3223 Pengujian Sumur**

*Silabus Ringkas/Short Description:*

Any type of well testing to know the potential, characteristic and reservoir model. The well test which explained is the standard used in the field such as: deliverability, pressure drawdown and pressure build up especially for one phase flow with semilog method analysis and type curve matching.

### **TM4224 Penilaian Formasi lanjut**

*Silabus Ringkas/Short Description:*

With the explanation about formation Evaluation position in the context of geophysics, geology, and petroleum engineering, this subject include the definition and basic concept, log calculating explanation, and basic background used in log interpretation, log analysis, and interpretation method.

### **TM2231 Teknik Operasi Pemboran**

*Silabus Ringkas/Short Description:*

Drilling equipment, place selection, and drilling location, drilling mud, cementing theory, rocks mechanics, swelling problem, gathering the data, grilling fluids hydraulic, vertical well drill string design, directional drilling, bottom hole assembly.

### **TM3132 Praktikum Lumpur Pemboran dan Semen**

*Silabus Ringkas/Short Description:*

Density and sand content, LPLT rheology, HPHT rheology, chemical mud analysis, lubricity, mud contamination, slurry properties, rock cement properties.

### **TM3233 Perencanaan dan Perancangan Pemboran**

*Silabus Ringkas/Short Description:*

Source of abnormal pressure, formation pressure detection techniques, well kick and pressure control, hole geometry selection, casing setting depth selection, casing design, horizontal drilling principal, build curve design, horizontal well drill string design.

### **TM5034 Sistem Pemboran Horizontal**

*Silabus Ringkas/Short Description:*

The history of horizontal drilling, purpose & horizontal drilling application, horizontal drilling principal, build curve design, bottom hole assembly, drag calculation, torque calculation, buckling force, horizontal well drill string design, special equation for drag and torque, CT-horizontal drilling, HD-completion, HD-problems, URRS, multilateral drilling.

### **TM5135 Kapita Selekt Pemboran**

*Silabus Ringkas/Short Description:*

History and development of CT, the making of CT, CT component, down hole tools, forces on CT, CT limitation, CT drilling, CT cementing, CT fishing, CT completion, CT stimulation, CT sand control, CT under reaming, CT washing, CT logging & perforating, CT multilateral.