REDLINES FOR CHANGES TO FROM PREVIOUS SYLLABUS

Petroleum engineering examinations

Group A - Compulsory examinations (seven required)

24-Pet-A1 Principles of Stratigraphy and Sedimentation

Sedimentary processes, environments and facies; properties and classification of sedimentary rocks; stratigraphic code, nomenclature and the stratigraphic column; stratigraphic relationship and interpretations.

Textbooks (most recent edition is recommended):

Primary Text:

- Boggs, S. Principles of Sedimentology and Stratigraphy, 3rd edition, Pearson.

Secondary Text:

- Krumbein, W.C. and Sloss, L.L. Stratigraphy and Sedimentation. W.H. Freeman & Co.
- Walker, R.G. (Editor), Facies Models. Geoscience Canada Reprint Series 1, Geological Association of Canada.
- Prothero, D.R., Interpreting the Stratigraphic Record. W.H. Freeman & Co.

24-Pet-A2 Petroleum Reservoir Fluids

TEXT REWRITTEN (NO SCOPE CHANGE)

Qualitative and quantitative phase behaviour of hydrocarbon reservoir fluids, including natural gases and oil, PVT data and equations of state of ideal and non-ideal gases and liquids. Properties of gases, oil, and oilfield water. Reservoir fluid studies and the application of fluid properties for compositional analyses. Phase separation and gas-liquid equilibria.

Textbooks (most recent edition is recommended):

Primary Text:

- McCain Jr., W.D. The Properties of Petroleum Fluids, 3rd edition. The Petroleum Publishing Co., Tulsa, Oklahoma.

Secondary Text:

- Amyx, J.W. Bass, D.M. and Whiting, R.L. Petroleum Reservoir Engineering. McGraw Hill, Toronto.

24-Pet-A3 Fundamental Reservoir Engineering

TEXT REWRITTEN (NO SCOPE CHANGE)

Rock porosity and absolute permeability: definition, measurement, and models. Rock-fluid interactions: interfacial tension, wettability, relative permeability, capillary pressure. Single and multiphase flow through porous media. Steady and unsteady Darcy flow of single fluid. Immiscible and miscible flows. An introduction to oil and gas material balance equations, and drive indices.

Textbooks (most recent edition is recommended):

Primary Text:

- Dake, L., Fundamentals of Reservoir Engineering, Elsevier, Amsterdam.
- Terry, R.E., Brandon, R., Craft, B.C., and Hawkins, M.S. Applied Petroleum Reservoir Engineering. Prentice-Hall, Englewood Cliffs, N.J.

Secondary Text:

- Amyx, J.W., Bass, D.M., and Whiting, R.L. Petroleum Reservoir Engineering. McGraw-Hill, Toronto.

24-Pet-A4 Oil and Gas Well Drilling and Completion

Drilling rig types, components and selection. Rotary drilling, drilling fluids, drilling hydraulics, penetration rates, and drilling operations. Coring and core analyses, drillstem testing, casing design and seat selections. Formation damage. Cementing procedures, and well completion. Special topics including directional drilling, blowout control, hole stability, planning and cost control, underbalanced drilling, coiled tubing drilling, offshore drilling operations, and environmental aspects.

Textbooks (most recent edition is recommended):

Primary Text:

- Bourgoyne, A.T., Millheim, K.K., Chenevert, M.E., and Young, F.S. Applied Drilling Engineering. Society of Petroleum Engineers, Richardson, TX.

Secondary Text:

- Gatlin, C., Petroleum Engineering, Drilling and Well Completion. Prentice-Hall, Englewood Cliffs, N.J.

24-Pet-A5 Petroleum Production Operations

Principles of oil and gas production mechanics. Reservoir Inflow performance. Wellbore hydraulics and multiphase flow. Nodal analysis for production optimization. Acidizing and hydraulic fracturing. Artificial lift including sucker-rod pumping, electrical submersible pumps, progressive cavity pumps, and gas lift. Wellbore damage, workover operations and stimulation methods. Surface facilities: storage, separators, flow measurement, and produced water treatment and disposal.

ADD

Textbooks (most recent edition is recommended):

Primary Text:

- Economides, M., A.D. Hill, C. Ehlig-Economides, and D. Zhu. Petroleum Production Systems. Prentice Hall, Inc., Upper Saddle River, NJ.
- Allen, T.O. and A.P. Roberts, Production Operations, Vols. 1 & 2. Oil & Gas Consultant International (OGCI), Inc., Tulsa, OK.
- H.D.Beggs. Production Optimization Using NODAL* Analysis. Oil & Gas Consultant International (OGCI), Tulsa, OK.

Secondary Text:

- Kumar, S, Gas Production Engineering. Gulf Publishing Co., N.B.
- Nind, T.E.W., Principles of Oil Well Production, McGraw-Hill Book Co., New York.

- Dake, L., Fundamentals of Reservoir Engineering, Elsevier, Amsterdam.

24-Pet-A6 Well Logging and Formation Evaluation

WAS 17-PET-B1

Theory, engineering, and applications of measurements of physical properties of the near-wellbore formation. Types of well logging devices. Conventional logging interpretation and its applications in oil and gas reservoirs. Introduction to geophysical interpretation.

Textbooks (most recent edition is recommended):

Primary Text:

- Bassiouni, Z. Theory, Measurement, and Interpretation of Well Logs. Society of Petroleum Engineers (SPE), Richardson, TX.

Secondary Text:

- Helander, D.P., Fundamentals of Formation Evaluation. Oil and Gas Consultants International Inc., Harvard, Tulsa, OK.
- Serra, O., Fundamentals of Well-Log Interpretation, Volume 1: The Acquisition of Logging Data. Elsevier, New York, N.Y.
- Ellis, D.V., Well Logging for Earth Scientists. Elsevier, Amsterdam.
- Dewan, J.T., Essentials of Modern Open-Hole Log Interpretation. Penn Well Books, Tulsa, OK.
- Log Interpretation Principles/Applications. Schlumberger, Canada.
- Log Interpretation Charts. Schlumberger, Canada.
- Lines, L.R. and R.T. Newrick, Fundamentals of Geophysical Interpretation, Number 13 (2004). Geophysical Monograph Series. Society of Exploration Geophysicists (SEG); Houston, TX.

24-Pet-A7 Secondary and Enhanced Oil Recovery

REWRITTEN (NO SCOPE CHANGE)

Classification of EOR methods. Areal, vertical, and volumetric sweep efficiencies; Trapping and mobilization of residual oil. Predictive models for immiscible displacement. Frontal advance theory and Buckley-Leverett-Weldge approach. Chemical (alkaline, polymer, surfactant, micellar injection) flooding. Miscible-immiscible gas (hydrocarbon and CO2) injection. Thermal recovery techniques.

Textbooks (most recent edition is recommended):

Primary Text:

- Green, D.W. and Willhite, G.P. Enhanced Oil Recovery, SPE Text Series Vol. 6, Society of Petroleum Engineers, Richardson, TX.
- Craig, F.F. The Reservoir Engineering Aspects of Water Flooding. Monograph No. 3, Society of Petroleum Engineers of AIME.
- Stalkup, Fred. Miscible Displacement. Monograph No.8, Henry Doherty Series, Society of Petroleum Engineers of AIME.
- Prats, Michael. Thermal Recovery. Monograph No. 7, Henry Doherty Series, Society of Petroleum Engineers of AIME.

Secondary Text:

- Craft, B. C. and Hawkins, M.S. (revised by Terry, R.E.). Applied Petroleum Reservoir Engineering, Englewood Cliffs, N.J.

Group B - Optional examinations (two required)

24-Pet-B1 Natural Gas Engineering

WAS 17-PET-B2
REWRITTEN (NO SCOPE CHANGE)

Reserves estimation. Steady, transient, Darcy and non-Darcy gas flow through porous media; well testing, buildup and drawdown tests. Gas well deliverability and well interference. Decline curve analysis. Development and production of unconventional gas reservoirs (coal beds, hydrates, tight sand, and shale gas). Gas flow measurements, flow through conduits, and surface facilities.

Textbooks (most recent edition is recommended):

Primary Text:

- Lee, John and Robert A. Wattenbarger. Gas Reservoir Engineering. Society of Petroleum Engineers, Richardson, Texas.
- Katz, Donald L. and Robert L. Lee. Natural Reservoir Engineering: Production and Storage. Society of Petroleum Engineers, Richardson, Texas.

Secondary Text:

- Ikoku, C.U. Natural Gas Reservoir Engineering. John Wiley & Sons. Krieger P.

24-Pet-B2 Oil and Gas Evaluation and Economics

WAS 17-PET-B3; REWRITTEN (NO SCOPE CHANGE)

Principles of property evaluation as a function of resource type, economics, technology, risk, and policies. Investment decision-making tools. Cost estimation for petroleum exploration, drilling, production, and development. Proration, value of money, evaluation nomenclature, payout time, profit ratio, rate of return, capital cost allowance, taxation, and oil and gas unitization theory. Canadian and international oil and gas regulations. Global and regional factors impacting oil and gas prices.

Textbooks (most recent edition is recommended):

Primary Text:

- Campbell Petroleum Series. Analysis and Management of Petroleum Investments: Risk, Taxes and Time. Pennwell Publishers, OK.

Secondary Text:

- Mineral Property Economics, Vol. 2 and 3 - The Campbells. Campbell Petroleum Series.

24-Pet-B3 Petroleum Geology

WAS 17-PET-B4
REWRITTEN (NO SCOPE CHANGE)

Description of clastic (sandstone) and carbonate (limestone) reservoir rocks. Hydrocarbon origin and migration. Geologic mapping: creating contour maps and cross sections to visualize subsurface structures. Geography of petroleum and natural gas in Canada, North America, and the world.

Textbooks (most recent edition is recommended):

- North, F.K. Petroleum Geology. Allen and Muir, Winchester, MA.

24-Pet-B4 Well Testing

WAS 17-PET-B5

Basics of well test interpretation: diffusivity equation, skin, wellbore storage, radius of investigation; different flow regimes: transient, pseudo-steady state, steady state. Interpretation of drawdown and buildup data for estimating formation permeability, skin, reservoir pore volume, and average reservoir pressure. Superposition; fault and dual porosity systems; derivative analysis; gas well testing.

Textbooks (most recent edition is recommended):

Primary Text:

- Lee, J., Rollins, J.B., and Spivey, J.P. Pressure Transient Testing, SPE Textbook Series Vol. 9, Society of Petroleum Engineers, Richardson, TX.
- Horne, R. N. Modern Well Test Analysis. Petroway Inc.

Secondary Text:

- Earlougher, R. C. Advances in Well Test Analysis. SPE Monograph No. 5.
- Lee, John. Well Testing. SPE Textbook Series Vol. 1.

24-Pet-B5 Reservoir Mechanics WAS 17-PET-A6

Advanced reservoir engineering principles including estimation of reserves; analysis and prediction of reservoir performance using material balance and decline curve analysis; combined drive mechanisms including unsteady state water influx; Naturally fractured reservoirs. Statistical analysis of unknowns from production history.

Textbooks (most recent edition is recommended):

Primary Text:

- Craft, B.C. and Hawkins, M.S. (revised by Terry, R.E.). Applied Petroleum Reservoir Engineering. Prentice-Hall, Englewood Cliffs, N.J..

24-Pet-B6 Petroleum Reservoir Simulation NEW

Basics of numerical reservoir simulation and numerical solution of partial differential equations. Simulation methods as applied to specific problems in petroleum reservoir behavior. Applications on primary, secondary and tertiary recovery phases of petroleum production using reservoir simulation tools.

24-Pet-B7 Advanced Drilling Technology NEW

Recent advances in drilling technologies. Drilling equipment and tools. Drilling optimization and troubleshooting, directional drilling and deviation control, design aspects of horizontal and multilateral well drilling. Measurement while drilling, drill string mechanics, bottomhole assembly design, tubular stability, drag and torque problems. Wellbore stability and mechanics. Drilling in high-pressure high-temperature (HPHT) environments.

24-Pet-B8 Petroleum Field Safety and Environmental Impact

NEW

Review of safety issues, including blowouts, fires, and other hazards; hydrate formation and decomposition; H2S and other toxic gases. Coverage of safety standards, the impact of petroleum operations on the environment, and the handling, safe transportation, and disposal of petroleum wastes.

TOTAL EXAMINATION PROGRAM

PEO Syllabus of Examinations, 2017 Edition

PETROLEUM ENGINEERING

PROFESSIONAL EXAMS – SPECIFIC TO PETROLEUM ENGINEERING

GROUP A

17-Pet-A1 Principles of Stratigraphy and Sedimentation

Sedimentary processes, environments and facies; properties and classification of sedimentary rocks; stratigraphic code, nomenclature and the stratigraphic column; stratigraphic relationship and interpretations.

17-Pet-A2 Petroleum Reservoir Fluids

MINOR ADDITIONS

Phase behaviour of hydrocarbon fluid ideal and non-ideal gases, and liquids; qualitative and quantitative phase behaviour- PVT data and equations of state; properties of gases, oil, and water; reservoir fluid studies; application of fluid properties for compositional analyses; phase separation and reservoir behaviour; gas-liquid equilibria.

17-Pet-A3 Fundamental Reservoir Engineering (Physical Properties and Flow of Fluid through Porous Media)

ADDED DETAIL

Porosity and pore structure, fluid saturations, absolute permeability, interfacial tension, wettability, capillary pressure. Multiphase flow and relative permeability. Steady and unsteady Darcy flow of single fluid. Immiscible and miscible flows. An introduction to oil and gas material balance equations, drive indices. An introduction to performance prediction techniques and decline curve analysis.

17-Pet-A4 Oil and Gas Well Drilling and Completion

ADDED DETAIL

Drilling rig types, components and selection. Rotary drilling, drilling fluids, drilling hydraulics, penetration rates, drilling operations, core and core analyses, drillstem testing, casing design and seat selections; formation damage; cementing procedures, and well completion. Special topics including: directional drilling; blowout control; logging and coring; hole stability; planning and cost control; underbalanced drilling; coiled tubing drilling; offshore drilling operations, and environmental aspects.

17-Pet-A5 Petroleum Production Operations

REWRITTEN

Principles of oil and gas production mechanic. Reservoir Inflow performance . Wellbore hydraulics and multiphase flow. Decline curve analysis. Nodal analysis for production optimization. Acidizing and hydraulic fracturing. Artificial lift; Sucker-rod pumping; electrical submersible pumps; progressing cavity pumps; and gas lift. Oil and gas separation, wellbore damage, fluid movements patterns. Workover operations and stimulation methods, oil well cementing and through tubing logging. Surface facilities: storage, separators, emulsions, flow measurement.

17-Pet-A6 Reservoir Mechanics

Advanced reservoir engineering principles including estimation of reserves; material and volumetric balance; combined driving mechanisms including unsteady state water influx; mechanics in hydraulically fractured wells. Performance prediction techniques. Linear material balance and statistical analysis of unknowns from production history.

17-Pet-A7 Secondary and Enhanced Oil Recovery ADDED DETAIL

The fluid displacement process. Trapping and mobilization of residual oil; displacement theory; linear waterflood calculations; viscous fingering; flood patterns and sweep efficiency. Buckley/Leverett theory. Analytical waterflood prediction models; black-oil reservoir simulation models; design engineering aspects of waterflooding. Miscible displacement methods and thermal recovery techniques.

GROUP B

17-Pet-B1 Well Logging and Formation Evaluation MINOR WORDING CHANGES

Theory and engineering and applications of measurements of physical properties of the formation near the wellbore; types of well logging devices; conventional logging interpretation and its applications in oil, and gas reservoirs.

17-Pet-B2 Natural Gas Engineering MINOR WORDING CHANGE

Estimation of reserves; flow measurements; flow through conduits; steady, transient, Darcy and non-Darcy flow through porous media; well testing, buildup and drawdown tests; deliverability; well interference. Decline curve analysis; and development of shale gas.

17-Pet-B3 Oil and Gas Evaluation and Economics

Oil and gas reserves, conservation, proration, value of money, evaluation nomenclature, payout time, profit ratio, rate of return, capital cost allowance, taxation, oil and gas unitization theory.

17-Pet-B4 Petroleum Geology

Physical and chemical characteristics of formation waters, natural gas, and crude oil. Origin and modes of occurrence of each of these in the earth. Geography of petroleum and natural gas in Canada, North America, and the world.

17-Pet-B5 Well Testing

Basics of Well Test Interpretation: diffusivity equation, skin, wellbore storage, radius of investigation; different flow regimes: transient, pseudo-steady state, steady state; interpretation of drawdown and buildup data for estimating formation permeability, skin, reservoir pore volume, average reservoir pressure; superposition; effect of fault and double porosity systems; derivative analysis; gas well testing.

NOTE: Please feel free to use the most recent edition of textbooks referenced in this lis

17-Pet-A1- Principles of Stratigraphy and Sedimentation

Prime Text:

Boggs, S., Principles of Sedimentology and Stratigraphy, 5th edition. Merrill Publishing Co., Toronto, 2011. ISBN 0023117923.

Supplementary Texts:

Krumbein, W.C. and Sloss, L.L., Stratigraphy and Sedimentation, 2nd edition. W.H. Freeman and Co., 1963. ISBN 0716702193.

Walker, R.G. (Editor), Facies Models, 3rd edition. Geoscience Canada Reprint Series 1, Geological Association of Canada, 1992. ISBN 0919216498.

Prothero, D.R., Interpreting the Stratigraphic Record. W.H. Freeman & Co., 1990. ISBN 0716718545.

17-Pet-A2- Petroleum Reservoir Fluids

Prime Text:

McCain Jr., W.D., The Properties of Petroleum Fluids, 2nd edition. The Petroleum Publishing Company, Tulsa, Oklahoma, 1990. ISBN 0878143351.

Supplementary Text:

Amyx, J.W. Bass, D.M. and Whiting, R.L., Petroleum Reservoir Engineering. McGraw Hill, Toronto, 1960. (pp. 211 470). ISBN 0070016003.

17-Pet-A3- Fundamental Reservoir Engineering (Physical Properties and Flow of Fluid through Porous Media)

Prime Texts:

Dake, L., Elsevier, Fundamentals of Reservoir Engineering, 1980.

Terry, R.E., Brandon, R., Craft, B.C. and Hawkins, M.S. , Applied Petroleum Reservoir Engineering, 3rd edition, 2015. Prentice-Hall, Englewood Cliffs, N.J., ISBN 978-0-13-3155587.

Supplementary Texts:

Dake, L.P., Fundamentals of Reservoir Engineering, Elsevier, Amsterdam, 1978. ISBN-13: 978-0-444-41830-2

Amyx, J.W., Bass, D.M. and Whiting, R.L., Petroleum Reservoir Engineering. McGraw-Hill, Toronto, 1960. (pp. 36-210). ISBN 0070016003.

17-Pet-A4 - Oil and Gas Well Drilling and Completion

Prime Text:

Bourgoyne, A.T., Millheim, K.K., Chenevert, M.E. and Young, F.S. Applied Drilling Engineering. Society of Petroleum Engineers, Richardson, TX (1986, 2nd printing 1991). ISBN 9991135979.

Supplementary Text:

Gatlin, C., Petroleum Engineering, Drilling and Well Completion. Prentice-Hall, Inc., Englewood Cliffs, N.J., 1960. ISBN 0136621554.

17-Pet-A5 - Petroleum Production Operations

Prime Texts:

M. Economides, A.D. Hill, C. Ehlig-Economides, and D. Zhu. Petroleum Production Systems(2nd Ed.). Prentice Hall, Inc., Upper Saddle River, NJ, 2012. Tel 1-201-236-3290.
T.O. Allen and A.P. Roberts, Production Operations, Vol. 1, 4th edition. Oil & Gas Consultant International (OGCI), Inc., Tulsa, OK, 1997.
T.O. Allen and A.P. Roberts, Production Operations, Vol. 2, 4th edition. Oil & Gas Consultant International (OGCI), Inc., Tulsa, OK, 1997.
H.D.Beggs, Production Optimization Using NODAL* Analysis. Oil & Gas Consultant International (OGCI), Inc., Tulsa, OK, 2003.

Supplementary Texts:

Kumar, S, Gas Production Engineering. Gulf Publishing Co., 1987. N.B.
The following is out of print but is an excellent reference:
Nind, T.E.W., Principles of Oil Well Production, 2nd edition. McGraw-Hill Book Co. Ltd., New York, 1981. ISBN 0070465762.

17-Pet-A6 - Reservoir Mechanics

Prime Text:

Craft, B.C. and Hawkins, M.S. (revised by Terry, R.E.), Applied Petroleum Reservoir Engineering, 2nd edition. Prentice-Hall, Inc., Englewood Cliffs, N.J., 1991. (pp. 146-334, 360375, 391-424). ISBN 0130398845.

Supplementary Text:

Dake, L., Elsevier, Fundamentals of Reservoir Engineering, 1980.

17-Pet-A7 - Secondary and Enhanced Oil Recovery

Prime Texts:

Green, D.W. and Willhite, G.P, Enhanced Oil Recovery, SPE Text Series Vol. 6, Society of Petroleum Engineers, Richardsco,, TX, 1998. ISBN 978-1-55563-077-5
Craig, F.F., The Reservoir Engineering Aspects of Water flooding. Monograph No. 3, Society of Petroleum Engineers of AIME, 1976. ISBN 0895202026.
Stalkup, Fred, Miscible Displacement. Monograph No.8, Henry Doherty Series, Society of Petroleum Engineers of AIME, 1983. ISBN 0895203197.
Prats, Michael, Thermal Recovery. Monograph No. 7, Henry Doherty Series, Society of Petroleum Engineers of AIME, 1982. ISBN 0895203146.

Supplementary Text:

Craft, B. C. and Hawkins, M.S. (revised by Terry, R.E.), Applied Petroleum Reservoir Engineering, 2nd edition. Englewood Cliffs, N.J., 1991, (pp. 335-386) ISBN 0130398845

17-Pet-B1 - Well Logging and Formation Evaluation

Prime Text:

Bassiouni, Z. Theory, Measurement, and Interpretation of Well Logs. Society of Petroleum Engineers (SPE), Richardson, TX, 1994.

Supplementary Texts:
Helander, D.P., Fundamentals of Formation Evaluation. Oil and Gas Consultants International Inc., 1983. 4554 S. Harvard, Tulsa, OK., 74135. ISBN 0930972023.
Serra, O., Fundamentals of Well-Log Interpretation, Volume 1 - The Acquisition of Logging Data. Elsevier Science Publishers, New York, N.Y., 1984. ISBN 0444421327.
Ellis, D.V., Well Logging for Earch Scientists. Elsevier Science Publishing Co., 1987. ISBN 0135005620.
Dewan, J.T., Essentials of Modern Open-Hole Log Interpretation. Penn Well Books, Tulsa, OK., 1983. ISBN 0878142339.
Log Interpretation Principles/Applications. Available through local offices of Schlumberger of Canada, Current Issue.
Log Interpretation Charts. Available through local offices of Schlumberger of Canada, Current Issue.

17-Pet-B2 - Natural Gas Engineering

Prime Texts:
John Lee and Robert A. Wattenbarger, Gas Reservoir Engineering. Order No. RESV TEXT005. Society of Petroleum Engineers in Richardson, Texas, Tel: 1-800-456-6863.
Donald L. Katz and Robert L. Lee, Natural Reservoir Engineering: Production and Storage. Order No. PROD COM023, Society of Petroleum Engineers in Richardson, Texas, Tel: 1-800456-6863.

Supplementary Text:
Ikoku, C.U., Natural Gas Reservoir Engineering. John Wiley & Sons, 1991. Krieger Pr. ISBN 0894646400.

17-Pet-B3 - Oil and Gas Evaluation and Economics

Prime Text:
Campbell Petroleum Series, Analysis and Management of Petroleum Investments: Risk, Taxes and Time, 2nd edition. Pennwell Publishers, 1991, OK 73072. ISBN 0685547779.

Supplementary Text:
Mineral Property Economics, Vol. 2 and 3 - The Campbells. Campbell Petroleum Series, 1980. ISBN 990667675.

17-Pet-B4 - Petroleum Geology

North, F.K., Petroleum Geology. Allen and Muir Inc., Winchester, MA, 1985. ISBN 041253830X.

17-Pet-B5 - Well Testing

Prime Texts:
Lee, J., Rollins, J.B. and Spivey, J.P., Pressure Transient Testing, SPE Textbook Series Vol. 9, Society of Petroleum Engineers, Richardson, TX, 2003. ISBN 1-55563-099-5
R. N. Horne, Modern Well Test Analysis, 2nd edition. Petroway Inc., 1995 (p.1-118). (FE COM 056 SPE Catalog).

Supplementary Texts:
R. C. Earlougher, Advances in Well Test Analysis. SPE Monograph No. 5, 1977. John Lee, Well Testing. SPE Textbook Series Vol. 1, 1982.

4.18 INTRODUCTION

Seventeen engineering disciplines are included in the Examination Syllabus issued by the Canadian Engineering Qualifications Board of the Canadian Council of Professional Engineers.

Each discipline examination syllabus is divided into two examination categories: compulsory and elective. A full set of Petroleum Engineering examinations consists of nine, three-hour examination papers. Candidates will be assigned examinations based on an assessment of their academic background. Examinations from discipline syllabi other than those specific to the candidates' discipline may be assigned at the discretion of the constituent Association/Ordre.

Before writing the discipline examinations, candidates must have passed, or have been exempted from, the Basic Studies Examinations.

Information on examination scheduling, textbooks, materials provided or required, and whether the examinations are open or closed book, will be supplied by the constituent Association/Ordre.

4.18.1 PETROLEUM ENGINEERING EXAMINATIONS

GROUP A

COMPULSORY EXAMINATIONS (SEVEN REQUIRED)

98-Pet-A1 Principles of Stratigraphy and Sedimentation

Sedimentary processes, environments and facies; properties and classification of sedimentary rocks; code of stratigraphic nomenclature and the stratigraphic column; stratigraphic nomenclature and the stratigraphic column; stratigraphic relationship and interpretations.

98-Pet-A2 Petroleum Reservoir Fluids

Phase behaviour of hydrocarbon systems ideal and non-ideal gases and liquid systems; qualitative and quantitative phase behaviour; fundamental properties of gas, oils, and waters; application of basic fluid properties to compositional analyses; separation and reservoir behaviour.

98-Pet-A3 Fundamental Reservoir Engineering

(Physical Properties and Flow of Fluid through Porous Media)

Porosity, fluid saturations, permeability, interfacial tension, wettability, capillary pressure, effective and relative permeability, steady and unsteady state fluid flow. An introduction to oil and gas material balance equations, drive indices. An introduction to performance prediction techniques.

98-Pet-A4 Oil and Gas Well Drilling and Completion

Rotary drilling, drilling fluids, drilling hydraulics, penetration rates, drilling techniques, core and core analyses, drillstem testing, casing and cementing procedures, well completion and stimulation.

98-Pet-A5 Petroleum Production Operations

Overall view of important steps involved in Petroleum Production Engineering. Inflow performance relationships. Two-phase vertical flow. Decline curve analysis. Other steps include importance of reservoir description, role of effective communication between the reservoir and the well bore, oil and gas separation, well bore damage, fluid movements and vigor of excluding undesirable fluids, workover and stimulation methods, oil well cementing and through tubing logging. Surface facility: storage, separators, emulsions, flow measurement gas hydrates.

98-Pet-A6 Reservoir Mechanics

Advanced reservoir engineering principles including estimation of reserves, material and volumetric balance, combined driving mechanisms including unsteady state water influx. Performance prediction techniques. Linear material balance and Statistical analysis of unknowns from production history.

98-Pet-A7 Secondary and Enhanced Recovery

The fluid displacement process. Buckley/Leverett theory. Engineering fundamentals in the principles of secondary recovery; water flooding, miscible displacement methods and thermal recovery techniques.

GROUP B

ELECTIVE EXAMINATIONS (TWO REQUIRED)

98-Pet-B1 Well Logging and Formation Evaluation

Theory and engineering and applications of measurements of physical properties of the formation near the well bore, types of well logging devices, interpretation and use of information in petroleum, and natural gas engineering.

98-Pet-B2 Natural Gas Engineering

Estimation of reserves; flow measurements; flow through conduits; steady, transient, Darcy and non-Darcy flow through porous media; well testing, back pressure and drawdown tests; deliverability; well interference; phase behaviour in gas and condensate reservoirs. Decline curve analysis.

98-Pet-B3 Oil and Gas Evaluation and Economics

Oil and gas reserves, conservation, proration, value of money, evaluation nomenclature, payout time, profit ratio, rate of return, capital cost allowance, taxation, oil and gas unitization theory.

98-Pet-B4 Petroleum Geology

Physical and chemical characteristics of formation waters, natural gas, and crude oil. Origin and modes of occurrence of each of these in the earth. Geography of petroleum and natural gas in Canada, North America, and the world.

98-Pet-B5 Well Testing

Basics of Well Test Interpretation: diffusivity equation, skin, wellbore storage, radius of investigation; different flow regimes: transient, pseudo-steady state, steady state; interpretation of drawdown and build up data for estimating formation permeability, skin, reservoir pore volume, average reservoir pressure; superposition; effect of fault and double porosity systems; derivative analysis; gas well testing.

98-Pet-A1 - Principles of Stratigraphy and Sedimentation

Prime Text:

Boggs, S., Principles of Sedimentology and Stratigraphy, 2nd edition. Merrill Publishing Co., Toronto, 1995. ISBN 0023117923.

Supplementary Texts:

Krumbein, W.C. and Sloss, L.L., Stratigraphy and Sedimentation, 2nd edition. W.H. Freeman and Co., 1963. ISBN 0716702193.

Walker, R.G. (Editor), Facies Models, 3rd edition. Geoscience Canada Reprint Series 1, Geological Association of Canada, 1992. ISBN 0919216498.

Prothero, D.R., Interpreting the Stratigraphic Record. W.H. Freeman & Co., 1990. ISBN 0716718545.

98-Pet-A2 - Petroleum Reservoir Fluids

Prime Texts:

Amyx, J.W. Bass, D.M. and Whiting, R.L., Petroleum Reservoir Engineering. McGraw-Hill, Toronto, 1960. (pp. 211-470). ISBN 0070016003.

Supplementary Text:

McCain Jr., W.D., The Properties of Petroleum Fluids, 2nd edition. The Petroleum Publishing Company, Tulsa, Oklahoma, 1990. ISBN 0878143351.

98-Pet-A3 - Fundamental Reservoir Engineering

Prime Text

Craft, B.C. and Hawkins, M.S. (revised by Terry, R.E.), Applied Petroleum Reservoir Engineering, 2nd edition. Prentice-Hall, Englewood Cliffs, N.J., 1991. (pp. 1-53, 56-68, 210-272). ISBN 0130398845.

Supplementary Text:

Amyx, J.W., Bass, D.M. and Whiting, R.L., Petroleum Reservoir Engineering. McGraw-Hill, Toronto, 1960. (pp. 36-210). ISBN 0070016003.

98-Pet-A4 - Oil and Gas Well Drilling and Completion

Prime Text

Bourgoyne, A.T., Millheim, K.K., Chenevert, M.E. and Young, F.S. Applied Drilling Engineering. Society of Petroleum Engineers, Richardson, TX (1986, 2nd printing 1991). ISBN 9991135979.

Supplementary Text:

Gatlin, C., Petroleum Engineering, Drilling and Well Completion. Prentice-Hall, Inc., Englewood Cliffs, N.J., 1960. ISBN 0136621554.

98-Pet-A5 Petroleum Production Operations

Prime Texts:

M. Economides, A.D. Hill, and C. Ehlig-Economides, Petroleum Production Systems. Order No. PROD COM047. Society of Petroleum Engineers, Richardson, Texas Tel 1-800-456-6863.

T.O. Allen and A.P. Roberts, Production Operations, Vol. 1, 4th edition. Order No. PROD COM021. Society of Petroleum Engineers, Richardson, Texas Tel 1-800-456-6863.

T.O. Allen and A.P. Roberts, Production Operations, Vol. 2, 4th edition. Order No. PROD COM022, Society of Petroleum Engineers, Richardson, Texas Tel 1-800-456-6863.

H.D.Beggs, Production Optimization Using NODAL* Analysis. Order No. PROD COM029, Society of Petroleum Engineers, Richardson, Texas Tel 1-800-456-6863.

Supplementary Texts:

Kumar, S, Gas Production Engineering. Gulf Publishing Co., 1987.

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