

organ systems, using electron and light microscopy; pathogenesis of specific diseases.

7508 Histopathology Slide Conference (1) F,S Prereq.: *D.V.M. degree or equivalent and consent of instructor. May be taken for a max. of 4 hrs. of credit when topics vary.* Histopathological aspects of diseases in various animal species; direct student participation in morphological description and literature review.

7509 Surgical Pathology (1-2) V Prereq.: *D.V.M. degree or equivalent and PBS7516. May be taken for a max. of 6 sem. hrs. credit when topics vary.* Gross and microscopic examination of surgery-derived specimens of diseased tissues from various animals; clinical case interpretation, histopathological description, diagnosis, prognosis, and consultation techniques.

7513 Pathology of Neoplasia (2) V Prereq.: *DVM degree or equivalent and PBS 7501. 1 hr. lecture; 1 hr. lab.* Comparative gross, microscopic, immunochemical, and pathogenetic study of naturally occurring neoplastic disease in animals.

7514 Laboratory Animal Pathology (2) V Prereq.: *D.V.M. degree or equivalent and consent of instructor.* Macroscopic, microscopic, and pathogenetic study of the infectious, nutritional, degenerate, and toxic diseases that affect the commonly used species of laboratory rodents, rabbits, and primates.

7515 Veterinary Dermatopathology (2) V Prereq.: *D.V.M. degree or equivalent and PBS 7516. 1 hr. lecture; 2 hrs. lab.* Histopathological evaluation of integumentary system, tissue response, and diseases of various animal species of veterinary importance.

7516 Advanced Diagnostic Pathology of Animals (1-2) V Prereq.: *D.V.M. degree or equivalent. May be taken for a max. of 6 sem. hrs. of credit when topics vary.* Necropsy of various animals submitted for postmortem examination: gross, light, and electron microscopy; and immunohistochemistry; correlation and synthesis of clinical information, anatomical finding, and other ancillary laboratory results, for an accurate determination of disease diagnosis and pathogenesis.

7525 Advanced Veterinary Clinical Pathology (1-2) V Prereq.: *D.V.M. degree or equivalent. May be taken for a max. of 6 sem. hrs. of credit when topics vary.* Diagnosis and pathogenesis of hematological and clinical chemistry changes in blood from various animal species; understanding the applicable instrumentation, and methodologies of assays and quality assurance; interpretation of cytological specimens (tissue and fluids) and correlation with clinical and histopathological findings.

7530, 7531, 7532 Laboratory Animal Science I, II, III (2, 2, 2) F,S,Su Prereq.: *D.V.M. degree or equivalent and consent of instructor.* Biology, husbandry, diseases, medical care, regulations, and experimental uses of the commonly used laboratory animal species; courses need not be taken in sequence.

PETROLEUM ENGINEERING • PETE

1010 Introduction to Petroleum Engineering (2) F Scientific bases of petroleum geology and chemistry, exploration, drilling, production, reservoir engineering, and refining.

2031 Reservoir Rock Properties (3) F Prereq.: *MATH 1552 and credit or registration in PHYS 2101.* Physical properties of reservoir rock related to the production of oil and gas.

2032 Reservoir Fluid Properties (3) F Prereq.: *Credit or registration in PHYS 2102.* Physical and chemical properties of petroleum reservoir fluids related to production of oil and gas.

2034 Rock and Fluid Properties Laboratory (1) S Prereq.: *credit in PETE 2031 and/or 2032, and registration in the other course. 3 hrs. lab.*

2060 Computational Methods in Petroleum Engineering (2) F Prereq.: *MATH 1552. 1 hr. lecture; 2 hrs. lab.* Computing infrastructure, programming fundamentals, numerical methods, and petroleum engineering commercial software.

3002 Communicating Petroleum Engineering Technology (3) F Prereq.: *ENGL 2000, junior standing in the College of Engineering, and permission of department.* Communication skills including technical writing, public speaking, group management, and computer usage applied to petroleum engineering topics.

3025 Economic Aspects of Petroleum Production (3) F Prereq.: *ECON 2030 and IE 3302.* Mineral ownership and leasing in Louisiana; production decline curve analysis; profitability analysis; risk analysis; evaluation of petroleum properties.

3036 Well Logging (3) F Prereq.: *EE 2950, PETE 2034, and PHYS 2102.* Qualitative and quantitative formation evaluation by means of electric, acoustic, and radioactive well logs.

3037 Petroleum Field Operations (1) F Prereq.: *permission of department; 3 hrs. lab.* Field operations associated with production engineering; field equipment and operation; pneumatic and electronic safety systems; fluid flow measurements.

3053 Petroleum Engineering Aspects of Subsurface Geology (3) S Prereq.: *PETE 3025 and 3036; or senior status in geology.* Engineering aspects of petroleum geology; interpretation of subsurface data; reservoir mapping; determination of reservoir volume.

3990 Independent Research (1-2) F,S,Su *May be taken for a max. of 3 sem. hrs. of credit. Number of hours, outline of proposed work, and name of faculty supervisor must be stated at time of registration.* Individual research or engineering studies with faculty supervision.

4045 Drilling Engineering (3) F Prereq.: *CE 2200 and credit or registration CE 3400.* Drilling process, including equipment and performance; well pressure control and buoyancy; rheology, circulation pressure, and optimum hydraulics of drilling fluids; oil well casing design and cementing techniques.

4046 Well Design-Production (3) S Prereq.: *PETE 4045.* Analysis and design of well production systems; rod pumping, gas lift

4050 Reservoir Dynamics (3) Prereq.: *PETE 2032 and MATH 2065.* Fundamentals of reservoir flow; application to single-well performance; well testing, gas reservoir engineering; waterflooding fundamentals.

4051 Reserve Estimation and Reservoir Management (3) F Prereq.: *PETE 3053.* Quantitative study and behavior prediction of volumetric and water-drive reservoir systems by material balance.

4056 Numerical Simulation of Improved Recovery Processes (3) S Prereq.: *MATH 2065, and PETE 4050 and 4051.* Use of computer simulation to predict oil and gas reservoir performance and to design enhanced recovery processes.

4058 Reservoir Mechanics Laboratory (1) S Prereq.: *PETE 4051. 3 hrs. lab.* Simulation of reservoirs with physical models; fluid flow in porous media.

4059 Drilling Fluids Laboratory (1) F Prereq.: *credit or registration in PETE 4045. 3 hrs. lab. Accompanies PETE 4045.*

4060 Prevention of Oil and Gas Well Blowouts (1) S Prereq.: *credit or registration in PETE 4045. 3 hrs. lab.* Causes and detection of well kicks and the proper handling of these kicks to prevent uncontrolled flow (blowout) from the well; methods and techniques currently used in the oil and gas industry.

4083 Secondary Recovery of Petroleum (3) V Prereq.: *PETE 4050 and 4051.* Reservoir mechanics and application of immiscible fluids displacement methods to secondary recovery of oil.

4085 Surface Handling of Produced Fluids (3) V Prereq.: *PETE 2032 and 2034.* Operating principles and design criteria for equipment used in field processing of oil and gas, e.g., lean oil gasoline plants, gas dehydration units, gas sweetening units, cryogenic gasoline plants, separators, gas transmission and compression facilities.

4086 Well Design-Drilling (3) V Prereq.: *PETE 4045.* Design of drilling operations; bit selection and evaluation; mathematical modeling of bitwear and penetration rate; determination of formation pore pressure and fracture pressure; selection of well casing and casing setting depths; directional drilling; special design considerations for horizontal wells.

4087 Environmental Control in Petroleum Engineering (3) V Prereq.: *PETE 4045, 4051, and 4059.* Environmental impact and pollution mechanisms in petroleum engineering technologies; basic concepts regarding oilfield waste generation, toxicity, and environmental regulatory process; synergy between process productivity and environmental performance.

4088 Formation Evaluation (3) V Prereq.: *PETE 3036.* Use of different formation evaluation techniques to provide a comprehensive description of reservoir content productivity; drilling fluid and cutting analysis; core analysis; formation tester; drillstem test; analysis of openhole logs by overlay, crossplot, and digital evaluation methods.

4089 Natural Gas Engineering (3) V Prereq.: *PETE 4051.* Application of reservoir engineering principles and practices to gas and gas-condensate reservoirs; prediction of gas well performance; management of all types of gas reservoirs; underground gas storage.

4241 Special Topics in Petroleum Engineering Design (3) Prereq.: *senior or graduate standing and permission of instructor. May be taken for a max. of 6 hrs. credit when topics vary.* One or more phases of current petroleum engineering design.

4253 Unitization and Appraisal of Petroleum Properties (3) V Prereq.: *PETE 3025, 3053, and 4051.* Technical aspects of unitization and evaluation of petroleum properties subject to joint management.

4998 Senior Project I (1) Prereq.: *Senior status in the College of Engineering. Written and oral presentation required.* First phase of theoretical and/or experimental investigations of an approved topic in petroleum engineering.

4999 Senior Project II (1) S Prereq.: *PETE 4998 and senior standing in the College of Engineering. Written and oral presentation required.* Theoretical and/or experimental investigation, including a literature review, of an approved topic in petroleum engineering.

7195 Reservoir Characterization (3) See GEOL 7195.

7201 Fluid Flow in Porous Media (3) V Prereq.: *PETE 4052 and 4056, or equivalent.* General hydrodynamic equations for flow of fluids through porous media; two-dimensional flow problems and potential theory methods; gravity flow systems; two-fluid systems; systems of non-uniform permeability; multiple well systems using computerized streamline tracking methods.

7202 Advanced Well Testing Theory and Analysis (3) V Prereq.: *PETE 4051 and 4052 or equivalent.* Unsteady-state flow of reservoir fluids in porous media; application of theory to pressure buildup analysis, well interference testing, pulse testing, pressure draw down analysis, drill stem testing, and water influx prediction.

7211 Production System Analysis (3) V Prereq.: *CE 2200, ME 3333 and PETE 4046 or equivalent.* Use of multiphase flow correlations to determine flow rates and pressure traverses in flowing oil wells, gas-condensate wells, gathering systems, and pipe lines; applications of correlations to the design of gas lift systems.

7212 Well Completion Design (3) V Prereq.: *PETE 4046 or consent of instructor.* Systems analysis for optimum production by designing best combination of tubing, flow lines, choke sizes, perforation density, and separator pressure; inflow performance of reservoirs; well completion techniques; gravel packing; tubing effects.

7221 Drilling Data Acquisition and Processing (3) V Prereq.: *PETE 4059, 4060, and 4086 or equivalent.* Mud and surface drilling data acquisition and processing; downhole data acquisition with drilling stopped and while drilling, data processing; formation evaluation and data analysis.

7222 Downhole Production Fluid Dynamics (3) V Prereq.: *PETE 4057 and 4085.* Wireline sidewall core and fluid recovery; data analysis and completion techniques; thermodynamic properties of fluids; downhole production data acquisition and interpretation; cased hole formation evaluation.

7231 Nonthermal Methods of Enhanced Oil Recovery (3) V Theory and field practice related to miscible displacement processes and chemical and polymer flooding techniques.

7232 Thermal Methods of Oil Recovery (3) V Theory of heat transfer and heat generation applied to the performance prediction of oil recovery by such field processes as forward and reverse *in situ* combustion, continuous and cyclic hot fluid injection, and production well heating.

7241, 7242 Selected Topics in Advanced Petroleum Engineering (3,3) V *May be repeated for credit when topic varies; a total of 12 sem. hrs. of credit may be earned in these two courses.*

7256 Special Problems in Petroleum Engineering (1-6) F,S,Su *May be taken for a max. of 6 sem. hrs. of credit.* Individual study and research.

7280 Mathematical Simulation of Petroleum Reservoir Performance (3) V Prereq.: *PETE 4056 or equivalent; and PETE 4051 and 4052.* Development and application of mathematical models for predicting petroleum reservoir performance, including multiphase fluid flow in three dimensions.

7285 Statistical Reservoir Modeling (3) Prereq.: *permission of instructor.* Theory and practice of modeling uncertainty; spatially variable rock properties for subsurface reservoirs; distributions, transforms, Bayesian updating, variograms/correlograms, estimation and coestimation with various kriging methods, conditional simulation.

7999 Seminar (1) All graduate students are expected to attend this course every semester. Only 1 sem. hr. of credit will be allowed towards the degree. Pass/Fail grading.

8000 Thesis Research (1-12 per sem.) "S"/"U" grading.

9000 Dissertation Research (1-12 per sem.) "S"/"U" grading.

PHILOSOPHY • PHIL

General education courses are marked with stars (★).

★ **1000 Introduction to Philosophy (3)** Major works on such themes as appearance and reality, human nature, nature of knowledge, relation of mind and body, right and good, existence of God, and freedom and determinism.

★ **1001 Honors: Introduction to Philosophy (3)** Prereq.: ENGL 1002 or equivalent. Same as PHIL 1000, with a special honors emphasis for qualified students. Credit will not be given for both this course and PHIL 1000.

★ **1021 Introduction Logic (3)** No special background presupposed. Formal and informal reasoning; introduction to propositional logic; formal and informal fallacies; scientific reasoning.

2000 Contemporary Moral Problems (3) Philosophical study of contemporary moral problems such as capital punishment, preferential treatment, sexual equality, sexual liberation, terrorism, war and nuclear arms, animal rights, world hunger, environmental ethics, and the morality of suicide.

★ **2010 Symbolic Logic I (3)** Classical propositional and first-order predicate logic; syntax and semantics of formal languages; translation between formal languages and English; formal methods of proof.

2018 Professional Ethics (3) Special problems of obligation and valuation related to law, medicine, politics, and education, as well as business, engineering, and architecture; altruism, trust, vocation, codes of honor, professional privilege, and responsibilities for others arising from differential abilities.

★ **2020 Ethics (3)** Classical and recent theories of obligation and value, including works of philosophers such as Plato, Aristotle, Kant, Hume, and Nietzsche; topics including freedom, rights, justification of moral judgments.

★ **2023 Philosophy of Art (3)** Philosophical theories of beauty, art, and art criticism.

★ **2024 Philosophy in Literature (3)** Philosophical themes in world literature: fiction, poetry, drama, and autobiography.

2025 Bioethics (3) Defining health and disease; deciding on rights, duties, and obligations in the patient-physician relationship; abortion and the concept of a person; defining and determining death; euthanasia and the dignity of death; allocation of medical resources, both large-scale and small-scale; experimentation with fetuses, children, prisoners, and animals; genetic testing, screening, and interference.

★ **2028 Philosophy of Religion (3)** Same as REL 2028. Essence and meaning of religion as a pervasive phenomenon in human societies; faith and reason, nature of divinity, arguments for and against God's existence, religious knowledge and experience, morality and cult, the problem of evil.

★ **2033 History of Ancient and Medieval Philosophy (3)** An honors course, PHIL 2034, is also available. Introduction to philosophy through a study of some of the main writings of classical and medieval philosophy.

2034 HONORS: Tutorial in Ancient and Medieval Philosophy (1) To be taken concurrently with PHIL 2033. 1 hr. of tutorial instruction per week for honors students.

★ **2035 History of Modern Philosophy (3)** An honors course, PHIL 2036, is also available. Introduction to philosophy through a study of some of the main writings of modern philosophy.

2036 HONORS: Tutorial in Modern Philosophy (1) To be taken concurrently with PHIL 2035. 1 hr. of tutorial instruction per week for honors students.

2053 HONORS: History of Ancient and Medieval Philosophy (3) Prereq.: one course in philosophy, HNRS 1001/1003 or 2002/2004, or permission of instructor. Same as PHIL 2033 with a special honors emphasis for qualified students. Supervised reading, discussion, research, and writing.

2786 Logic, Science, and Society (3) Prereq.: completed analytical reasoning area of general education or consent of instructor. Logic, evidence, probability, and induction; objectivity and relativism; technology and utopia.

2953 HONORS: Philosophical Colloquium (3) Prereq.: a grade of "B" or higher in at least one other philosophy course; or consent of instructor. Subject drawn from prominent philosophical works.

2963, 2964, 2965 HONORS: Independent Work for Honors Students (1,1,1) Prereq.: sophomore standing, completion of at least 3 hrs. of philosophy with a grade of "B" or higher, and a gpa of at least 3.00 in all work taken. Readings, conferences, and reports under faculty direction.

3001 Existentialism (3) Basic themes of existentialist philosophy; the works of Kierkegaard, Nietzsche, Jaspers, Heidegger, Camus, Marcel, and Sartre.

3002 Philosophy and Film (3) Films as philosophical texts.

3003 French Existentialism (3) Major themes, issues, and theories of the French existentialist; existence, essence, and the question of Being; death, nothingness, and anxiety; freedom, responsibility, and values; the ethical and the other; authors include Jean-Paul Sartre, Simone De Beauvoir, Maurice Merleau-Ponty; Albert Camus, Emmanuel Levinas, Jean Beaufret, Gabriel Marcel, Emmanuel Mounier.

3015 Christian Philosophy (3) Prereq.: one course in either philosophy or religious studies or equivalent. Also offered as REL 3015. Applications of philosophy to such themes in Christianity as knowing God, the nature, and structure of faith, revelation, incarnation, faith and science, Christianity and other faiths.

3020 Special Topics in Philosophy (1-3) May be taken twice for credit when topics vary.

3052 Moral Philosophy (3) May be taken twice when topics vary. Topics in ethics and meta-ethics: egoism, consequentialism, deontology, moral relativism, virtue ethics, values, ethics and religion; naturalistic fallacy, truth and justification, realism and objectivity, motivation and practical reasoning, autonomy, and game theory.

3090 Friedrich Nietzsche (3) See GERM 3090.

3110 The Philosophy of Socrates (3) Early dialogues of Plato; Socrates on pleasure, friendship, justice, courage, temperance, wisdom, and happiness; on knowing the better and following the worse; on reason and inspiration; Socratic irony.

3950 Introduction to Epistemology (3) Survey of central issues in the theory of knowledge; knowledge as justified true belief; the Gettier problem; induction as a source of justification; a priori knowledge; fallibilist vs. infallibilist and internalist vs. externalist conceptions of justification; structure of justification.

4002 Philosophy of Film (3) Theories of film.

4003 Contemporary French Philosophy (3) Major contemporary French philosophers, including Bergson, Sartre, Merleau-Ponty, De Beauvoir, Levinas, Derrida, Foucault, Nancy Ricoeur, Marion, Janicaud; themes such as the rethinking of ethics, the question of humanism, and political thought; intellectual movements such as structuralism and post-structuralism, phenomenology, hermeneutics and deconstruction, feminism and psychoanalysis.

4010 Symbolic Logic II (3) Prereq.: PHIL 2010 or consent of instructor. Syntax and basic model theory of classical first order logic; soundness and completeness.

4011 Topics in Advanced Logic (3) Prereq.: PHIL 4010 or consent of instructor. Also offered as LING 4011. Topics may include advanced metatheory of symbolic languages, intentional logics, and Montague grammar.

4015 Philosophy of Male and Female (3) Philosophical examination of the concepts of human nature that underlie a variety of theories about women and femininity.

4098 Politics and Ethics (3) See POLI 4098.

4786 Selected Topics (3) May be taken for a max. of 6 sem. hrs. when topics vary.

4914 Philosophy of Language (3) Prereq.: one logic course or consent of instructor. Also offered as LING 4914. Various theories of meaning, their implications and presuppositions, and their relevance to issues in such areas as theory of perception, theory of truth, metaphysics, ethics, philosophy of mind and action.

4920 Presocratic Philosophy (3) Prereq.: PHIL 2033 or equivalent. Study of the major Presocratic Philosophers from Thales up to and including the Sophists.

4922 Plato (3) Prereq.: PHIL 2033 or equivalent.

4924 Aristotle (3) Prereq.: PHIL 2033 or equivalent. Topics from Aristotle's *Metaphysics*, *Physics*, *De Anima*, and the logical treatises.

4926 Hellenistic Philosophy (3) Prereq.: PHIL 2033 or equivalent. Study of the major Hellenistic Philosophical Schools: the Epicureans, the Stoics, and the Sceptics.

4928 Medieval Philosophy (3) Also offered as REL 4928. Analysis of key themes, traditions, and figures in medieval philosophy.

4931 Descartes, Spinoza, and Leibniz (3) Prereq.: 6 hrs. of philosophy or consent of instructor. 17th century rationalism, with emphasis on epistemology and metaphysics.

4933 Locke, Berkeley, Hume (3) Language, epistemology, ontology, self, God, causation, realism, and idealism in the writings of these British empiricists.

4935 Kant (3) Prereq.: PHIL 2035 or equivalent. Basic topics and arguments of Kant's *Critique of Pure Reason*.

4936 19th Century Philosophy (3) Prereq.: PHIL 2033 and 2035; or equivalent. 19th century philosophy, with emphasis on German thought; readings in Fichte, Hegel, Marx, Nietzsche, Bergson, and others.

4938 Philosophical Thought in America (3) Late 19th and early 20th centuries; topics from such philosophers as Peirce, James, Royce, Dewey, Santayana, Ward, and Mead.

4939 Kierkegaard (3) Also offered as REL 4939. Study of his works, such as, *Either/Or*, *The Sickness Unto Death*, *Fear and Trembling*, *Concluding Unscientific Postscript*, *Stages on Life's Way*, and *The Present Age*.

4940 Aesthetics (3) Meaning and truth in the arts; artistic intention; critical canons.

4941 Philosophy of Mind (3) Prereq.: PHIL 2033 and 2035; or equivalent. Recent philosophical treatments of human nature; the mind-body problem, identity of the person in time, the person as rational and volitional, and relation of the person to the world.

4942 Topics in Meta-Ethics (3) Prereq.: two courses in philosophy or consent of instructor. May be taken for a max. of 6 sem. hrs. of credit when topics vary. Naturalistic fallacy, truth and meaning, realism an objectivity, motivation and practical reasoning, autonomy, and justification of ethical theory.

4943 Ethics (3) Prereq.: two courses in philosophy or consent of instructor. May be taken for a max. of 6 sem. hrs. of credit when topics vary. Egoism, utilitarianism, deontological systems, intuitionism, moral particularism, virtue ethics, relativism, weakness of will, and value theory.

4944 Philosophical Theology (3) Prereq.: two courses in philosophy and/or religious studies. Also offered as REL 4944. Major themes and works in philosophical theology.

4945 Political Philosophy (3) Prereq.: PHIL 1000 or 2020 or equivalent. Freedom, obligation, authority, justice, law, the state, and revolution.

4946 Philosophy of Law (3) Moral issues in foundations of law and legal authority; nature of law; civil disobedience; principles of punishment; legal liability; morals legislation; *Good Samaritan* laws; moral basis of contract law.

4948 Phenomenology (3) Prereq.: PHIL 2035 or 4936 or equivalent. Contemporary phenomenology; reading in Husserl.

4950 Advanced Epistemology (3) Prereq.: PHIL 3950 or consent of instructor. Topics may include naturalized epistemology, internalism vs. externalism about justification; a priori knowledge; justification and truth; skepticism, Bayesian approaches to justification, contextualist theories of knowledge, and the possibility of non-inferential justification.

4951 Philosophy of Science (3) Prereq.: consent of instructor. Philosophical issues related to concept formation and theory construction in the natural, behavioral, and social sciences.

4952 Topics in Metaphysics (3) May be taken for a max. of 6 sem. hrs. of credit when topics vary. Topics include ontology, modalities, universals, truth, causation, reductionism, identity (physical and personal), realism, and the meaning of life.

4953 Contemporary Analytic Philosophy (3) Prereq.: one logic course and either PHIL 2035 or 4933. Topics from leading philosophers in such contemporary movements as logical empiricism, formalism, and ordinary language analysis, including Moore, Russell, Wittgenstein, Carnap, Goodman, Ryle, Strawson, and Quine.

4954 Recent Speculative Philosophy (3) Prereq.: two other philosophy courses or consent of instructor. Theories of being and knowing in recent absolute idealism, process philosophy, and phenomenological existentialism.

4972 Kant's Moral Philosophy (3) Study of selected Kant's works in moral philosophy such as, *Groundwork of the Metaphysics of Morals*, *Metaphysics of Morals*,