August 28, 2015
9:30-11:30am
ADM 204

I. Roll Call

( ) Arlene Schmuland (LIB, Chair)
( ) Anthony Paris(FS)
( ) Jervette Ward (CAS)
( ) Sam Thiru (CAS)
( ) Peter Olsson (CTC)
( ) Hsing-Wen Hu (COE)
( ) Cindy Knall (COH)
( ) Bogdan Hoanca (CBPP)
( ) Clayton Trotter (CBPP)

Ex-Officio Members
( ) Susan Kalina (OAA)
( ) Lora Volden (Registrar)
( ) Gianna Niva (Scheduling and Publications)

II. Approval of Agenda (pg. 1)

III. Approval of Meeting Summary (pg. 2)

IV. Administrative Reports

A. Vice Provost, Susan Kalina

B. University Registrar, Lora Volden

C. GAB Chair, Arlene Schmuland

V. Program/Course Action Request - Second Readings

VI. Program/Course Action Request – First Readings

Chg	BA A634	Organizational Design and Development (3 cr)(3+0)(pg. 3-6)
Add	GEOL A636	Petroleum Geology (Stacked with GEOL A436)(3 cr)(3+0)(pg. 7-16)
Add	GEOL A637	Adv Dep Systems and Stratigraphy (Stacked with GEOL A437) (3 cr)(3+0)(pg. 17-28)
Add	GEOL A638	Adv Sed Petrology and Diagenesis (Stacked with GEOL A438) (3 cr)(3+0)(pg. 29-38)
Add	GEOL A640	Advanced Hydrogeology (Stacked with GEOL A440)(3 cr)(3+0)(pg. 39-49)
Add	GEOL A645	Advanced Geothermal Energy (Stacked with GEOL A445)(3 cr)(3+0)(pg. 50-61)
Add	GEOL A657	Advanced Geology of Alaska (Stacked with GEOL A457)(3 cr)(3+0)(pg. 62-69)
ADD	GEOL A699	Graduate Thesis (1-6 cr)(0+3-18)(pg. 70-72)

VII. Old Business
VIII. New Business
IX. Informational Items and Adjournment

April 24, 2015
9:30-11:30am
ADM 204

I. Roll Call

			Ex-Officio Members
(x) Arlene Schmuland	(x) Anthony Paris	(x) Hsing-Wen Hu	(x) David Yesner
(x) Cindy Knall	(x) Dennis Drinka	(x) Clayton Trotter	(x) Lora Volden
(x) Jervette Ward	(x) Parker McWilliams	(x) Sam Thiru	(x) Scheduling/Publications
(x) Peter Olsson			

II. Approval of Agenda (pg. 1)

Approved

III. Approval of Meeting Summary (pg. 2)

Approved

IV. Administrative Reports

A. Associate Dean of the Graduate School David Yesner

B. University Registrar Lora Volden

C. GAB Chair Arlene Schmuland

V. Program/Course Action Request - Second Readings

VI. Program/Course Action Request – First Readings

Chg BA A634 Organizational Design and Development (3 cr)(3+0)(pg. 3-6)
Postponed

Chg Master of Science, Civil Engineering (pg. 7-14)
Waive for first reading, approve for second

Chg Master of Civil Engineering (pg. 15-21)
Waive for first reading, approve for second

VII. Old Business

VIII. New Business

A. 2015-2016 Election of New Chair
Arlene Schmuland was elected to continue as chair for 2015-2016

IX. Informational Items and Adjournment

A. Graduate Academic Board Report to Faculty Senate (pg. 22)

Course Action Request
University of Alaska Anchorage
Proposal to Initiate, Add, Change, or Delete a Course

1a. School or College	1b. Division	1c. Department
CB CBPP	ADBP Division of Business Programs	BA

2. Course Prefix	3. Course Number	4. Previous Course Prefix & Number	5a. Credits/CEUs	5b. Contact Hours (Lecture + Lab)
BA	A634	N/A	3	(3+0)

6. Complete Course Title
Organizational Design and Development
Org. Design and Development
Abbreviated Title for Transcript (30 character)

7. Type of Course ☒ Academic ☐ Preparatory/Development ☐ Non-credit ☐ CEU ☐ Professional Development

8. Type of Action: ☐ Add *or* ☒ Change *or* ☐ Delete

If a change, mark appropriate boxes:

☐ Prefix ☐ Course Number
☐ Credits ☐ Contact Hours
☐ Title ☐ Repeat Status
☐ Grading Basis ☐ Cross-Listed/Stacked
☐ Course Description ☐ Course Prerequisites
☐ Test Score Prerequisites ☐ Co-requisites
☐ Automatic Restrictions ☐ Registration Restrictions
☐ Class ☐ Level ☐ General Education Requirement
☐ College ☐ Major
☒ Other Update CCG (please specify)

9. Repeat Status No # of Repeats Max Credits

10. Grading Basis ☒ A-F ☐ P/NP ☐ NG

11. Implementation Date semester/year
From: Fall/2015 To: /9999

12. ☐ Cross Listed with

☐ Stacked with

Cross-Listed Coordination Signature

13a. Impacted Courses or Programs: List any programs or college requirements that require this course.
Please type into fields provided in table. If more than three entries, submit a separate table. A template is available at www.uaa.alaska.edu/governance.

Impacted Program/Course	*Date of Coordination*	*Chair/Coordinator Contacted*
1. MBA, General Management	03/20/2015	Ed Forrest & Bogdan Hoanca
2.		
3.		

Initiator Name (typed): Terry Nelson Initiator Signed Initials: _________ Date:_______________

13b. Coordination Email Date: 04/03/2015
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison Date: 04/03/2015

14. General Education Requirement
Mark *appropriate box:*
☐ Oral Communication ☐ Written Communication ☐ Quantitative Skills ☐ Humanities
☐ Fine Arts ☐ Social Sciences ☐ Natural Sciences ☐ Integrative Capstone

15. Course Description *(suggested length 20 to 50 words)*
Explores factors, conditions, and practices that lead to creating and maintaining organizational success. Examines alternative methods of determining organizational effectiveness. Presents organizational design based on contingency theory perspective and examines major organizational dilemmas and dysfunctions. Surveys and applies critical tools available for organizational development.

16a. Course Prerequisite(s) *(list prefix and number or test code and score)*
BA A632

16b. Co-requisite(s) *(concurrent enrollment required)*
N/A

16c. Automatic Restriction(s)
☐ College ☐ Major ☐ Class ☐ Level

16d. Registration Restriction(s) *(non-codable)*
Graduate standing

17. ☒ Mark if course has fees Standard CBPP computer lab fee

18. ☐ Mark if course is a selected topic course

19. Justification for Action
To update course resources and textbook as part of the CBPP Five-Year Review Program.

Initiator (faculty only) Date
Terry Nelson
Initiator (TYPE NAME)

☐ Approved
☐ Disapproved Department Chair Date

☐ Approved
☐ Disapproved College/School Curriculum Committee Chair Date

☐ Approved
☐ Disapproved Dean/Director of School/College Date

☐ Approved
☐ Disapproved Undergraduate/Graduate Academic Board Chair Date

☐ Approved
☐ Disapproved Provost or Designee Date

COURSE CONTENT GUIDE
UNIVERSITY OF ALASKA ANCHORAGE
COLLEGE OF BUSINESS AND PUBLIC POLICY

I. Date Initiated August 24, 2015

II. Course Information

College/School: College of Business and Public Policy
Department: Business Administration
Program: Master of Business Administration, General Management
Course Title: Organizational Design and Development
Course Number: A634
Credits: 3
Contact Hours: 3 per week x 15 weeks = 45 hours
0 lab hours
6 hours outside of class per week x 15 weeks = 90 hours
Grading Basis: A-F
Course Description: Explores factors, conditions, and practices that lead to creating and maintaining organizational success. Examines alternative methods of determining organizational effectiveness. Presents organizational design based on contingency theory perspective and examines major organizational dilemmas and dysfunctions. Surveys and applies critical tools available for organizational development.
Course Prerequisites: BA A632
Registration Restrictions: Graduate Standing
Fees: Standard CBPP computer lab fee

III. Course Activities

A. Lecture
B. Discussion
C. Group work

IV. Course Level Justification

Students rely on knowledge gained at the undergraduate level and the activities required in the course necessitate self-direction. The course is one of four options required for the Executive Focus of the Master of Business Administration.

V. Outline

A. Overview of Complex Organizations

B. Organizational Strategy, Structure, and Variety

C. Governance: Boards, Committee, and the “Principle-Agent” Problem

D. Organizational Design and Globalization

E. Organizational Design and Technology

F. Management of Growth

G. Inter-Organizational Relations

H. Innovation and Change Management

I. Decision Making Processes

J. Decision Making: Mistake, Misconduct, and Error

VI. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. **The instructor will:**
1. Review and interpret the academic and practitioners’ understanding of organizations, their structures, and processes.
2. Identify the tools and practices available to successfully intervene in the development and change of organizations.
3. Demonstrate how to apply the concepts and methods learned by performing an “Organizational Diagnosis” on an organization.

B. Student Learning Outcomes. **Students will be able to:**	**Assessment Method**
1. Apply central concepts and findings in organizational theory and design.	Exams and group presentations
2. Apply organizational development research tools and prepare an organizational diagnosis.	Group research papers
3. Evaluate case studies and present the case analyses to the class.	Group research papers and group presentations

VII. Suggested Text

Cummings, T.G. & Worley, C.G. (2014). *Organization development and change*, 10th ed. Stamford, CT: Cengage Learning.

VII. Bibliography

Bartlett, C. & Ghoshal, S. (2003). What is a global manager? *Harvard Business Review*, 81, 101-108.

Cascio, W. (2005). Strategies for responsible restructuring. *Academy of Management Executive*, 19, 39-50.

Downe, M. & Russ, G. (2005). Antecedents and consequences of failed governance: The Enron example. *Corporate Governance*, 5, 84-98.

Fleming, P. & Spicer, A. (2014). Power in management and organization science. *The Academy of Management Annals*, 8(1), 237-298.

Gioia, D. A., Patvardhan, S. D., Hamilton, A. L., & Corley, K. C. (2013). Organizational identity formation and change. *Academy of Management Annals, 7*, 123-192.

Greenwood, R., Raynard, M., Kodeih, F., Micellota, E., & Lounsbury, M. (2011). Institutional complexity and organizational responses. *Annals of the Academy of Management*, 5(1): 1 -55.

Greve, H. R., Palmer. D., & Pozner, J. (2011). Organizations gone wild: The causes, processes, and consequences of organizational misconduct. *The Academy of Management Annals***,** 4(1): 53-107.

Hatch, M.J., Schultz, M., & Skov, A. (2015). Organizational identity and culture in the context of managed change: Transformation in the Carlsberg Group, 2009–2013 *Academy Management Discovery*, 1, 56-87.

Hofstede, G. (1993). Cultural constraints in management theories. *Academy of Management Executive*, 7, 81-94.

Kodeih, F. & Greenwood, R. (2014). Responding to institutional complexity: The role of identity. *Organization Studies*, 35, 7-39.

Nadler, D. & Tushman, M. (1999). The organization of the future: Strategic imperatives and core competencies for the 21st century. *Organizational Dynamics*, 28, 45-60.

Pfeffer, J. & Veiga, J. (1999). Putting people first for organizational success. *Academy of Management Executive*, 13, 37-48.

Prahalad, C. & Lieberthal, K. (1998). The end of corporate imperialism. *Harvard Business Review***,** 76, 68-79.

Rousseau, D. (1995). *Psychological contracts in organizations*, Thousand Oaks, CA: Sage.

Course Action Request
University of Alaska Anchorage
Proposal to Initiate, Add, Change, or Delete a Course

1a. School or College	1b. Division	1c. Department
AS CAS	AMSC Division of Math Science	Geological Sciences

2. Course Prefix	3. Course Number	4. Previous Course Prefix & Number	5a. Credits/CEUs	5b. Contact Hours (Lecture + Lab)
GEOL	A636	n/a	3	(3+0)

6. Complete Course Title
Petroleum Geology

Abbreviated Title for Transcript (30 character)

7. Type of Course ☒ Academic ☐ Preparatory/Development ☐ Non-credit ☐ CEU ☐ Professional Development

8. Type of Action: ☒ Add *or* ☐ Change *or* ☐ Delete

If a change, mark appropriate boxes:

- ☐ Prefix
- ☐ Credits
- ☐ Title
- ☐ Grading Basis
- ☐ Course Description
- ☐ Test Score Prerequisites
- ☐ Automatic Restrictions
  - ☐ Class ☐ Level
  - ☐ College ☐ Major
- ☐ Other CCG (please specify)
- ☐ Course Number
- ☐ Contact Hours
- ☐ Repeat Status
- ☐ Cross-Listed/Stacked
- ☐ Course Prerequisites
- ☐ Co-requisites
- ☐ Registration Restrictions
- ☐ General Education Requirement

9. Repeat Status No # of Repeats Max Credits

10. Grading Basis ☒ A-F ☐ P/NP ☐ NG

11. Implementation Date semester/year
From: Spring/2016 To: /9999

12. ☐ Cross Listed with

☒ Stacked with A436

Cross-Listed Coordination Signature

13a. Impacted Courses or Programs: List any programs or college requirements that require this course.
Please type into fields provided in table. If more than three entries, submit a separate table. A template is available at www.uaa.alaska.edu/governance.

Impacted Program/Course	*Date of Coordination*	*Chair/Coordinator Contacted*
1. Geological Sciences	3/1/2015	K. Crossen
2.		
3.		

Initiator Name (typed): Jennifer Aschoff Initiator Signed Initials: _________ Date:_______________

13b. Coordination Email Date: _____
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison Date: _____

14. General Education Requirement
Mark appropriate box:
☐ Oral Communication ☐ Written Communication ☐ Quantitative Skills ☐ Humanities
☐ Fine Arts ☐ Social Sciences ☐ Natural Sciences ☐ Integrative Capstone

15. Course Description *(suggested length 20 to 50 words)*
Introduction to the formation of hydrocarbons, their migration/accumulation in the context of the petroleum system, and their exploration/exploitation. Includes an introduction to subsurface datasets used in the petroleum industry and how to integrate them. Conventional and unconventional petroleum systems are discussed in the class using examples from Alaska and around the world.

16a. Course Prerequisite(s) *(list prefix and number or test code and score)*

16b. Co-requisite(s) *(concurrent enrollment required)*

16c. Automatic Restriction(s)
☐ College ☐ Major ☐ Class ☒ Level

16d. Registration Restriction(s) *(non-codable)*
Graduate Standing

17. ☒ Mark if course has fees

18. ☐ Mark if course is a selected topic course

19. Justification for Action
Adding introductory course in Petroleum Geology based on student demand

Initiator (faculty only) Date
Jennifer Aschoff
Initiator (TYPE NAME)

☐ Approved
☐ Disapproved Department Chair Date

☐ Approved
☐ Disapproved College/School Curriculum Committee Chair Date

☐ Approved
☐ Disapproved Dean/Director of School/College Date

☐ Approved
☐ Disapproved Undergraduate/Graduate Academic Board Chair Date

☐ Approved
☐ Disapproved Provost or Designee Date

Course Content Guide
University of Alaska Anchorage

GEOL A636
Petroleum Geology

I. Date of Initiation: Spring 2015

II. Course Information

A. College: CAS
B. Course Subject: Geological Sciences
C. Course Number: GEOL A636
D. Number of Credits: 3.0 (3+0)
E. Course Title: Petroleum Geology
F. Grading Basis: A-F
G. Course Description: Introduction to the formation of hydrocarbons, their migration/accumulation in the context of the petroleum system, and their exploration/exploitation. Includes an introduction to subsurface datasets used in the petroleum industry and how to integrate them. Conventional and unconventional petroleum systems are discussed in the class using examples from Alaska and around the world.
H. Registration Restriction: Graduate Standing
I. Fee: Yes

III. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will:
1. Deliver interactive, multi-media lectures, collaborative in-class exercises and laboratory exercises on the topics listed in the course description and course outline.
2. Incorporate real-world datasets in hands-on exercises that reflect typical tasks a geoscience professional would complete as part of their job in Petroleum Geology.

B. Student Learning Outcomes and Evaluation. The students will:

Student Learning Outcomes	Evaluations
Demonstrate understanding of the basic process of hydrocarbon accumulation formation, exploration, exploitation and valuation.	In-class exercises and exams
Interpret subsurface data- seismic, well-log and core with a focus on key information needed to determine the presence, effectiveness and/or timing of various petroleum systems elements.	In-class exercises and exams
Associates and articulates the elements of the petroleum system as they pertain to their core discipline in the form of an integrative research project.	Final Research Project

Synthesize and articulate the mechanics of the petroleum system and its constituent elements: source, reservoir, seal, trap and migration pathway.	Exams

IV. Course Evaluations

Based on grades received on exercises, exams, and in-class participation.

V. Course Level Justification

This course provides students with fundamental skills in petroleum geology. It is typically taught as an upper-level undergraduate (400) or graduate course (600) at other institutions. The class is stacked with a 400-level (Geol 436) for undergraduate students. The 600-level course requires a rigorous, individual research project where students generate and interpret a dataset that applies two or more course concepts.

VI. Topical Course Outline

A. Reserves vs Resources
1. World Energy Reserves
2. Reserves Concept
3. Reserves Calculation (OOIP and OGIP)
4. Recovery, Recovery Factor, Estimated Ultimate Recovery (EUR) Calculation
5. Geologic and Engineering Controls on Recovery Factors
6. Petroleum System Overview
7. Petroleum Terminology: System, Play Fairway, Play, Lead, Prospect
7. Unconventional vs Conventional Systems

B. Hydrocarbon Generation and Source Rocks
1. Kerogen and Kerogen Types
2. Measuring Source Rock Quality: Pyrolysis, TOC, HI, S1, S2, S3
3. Controls on Source Rock Quality
4. Burial and Thermal Maturation
5. Geothermal Gradients and Basin Type

C. Hydrocarbon Migration
1. Carrier Beds and Migration Pathways
2. Using Structure Maps to Understand Migration ("Spider Maps")
3. Review Contouring Structure Maps
4. Fill-Spill, Fill-Leak
5. Primary vs Secondary Migration
6. Gas, Oil, Water Contacts

D. Subsurface Data Interpretation
1. Seismic Data Acquisition
2. Distinguishing Noise in Seismic

3. Seismic Interpretation
4. Well-log Acquisition
5. Well-log Interpretation

E. Reservoirs
   1. Review Porosity and Permeability
   2. Primary vs. Secondary Porosity
   3. Depositional Environment Controls on Porosity and Permeability
   4. Diagenetic Controls on Porosity and Permeability
   5. Interpreting Reservoir Quality from Well-log Data
   6. Review Isopach Maps
   7. Flow Unit Concept and Defining Flow Units
   8. Concept of Reservoir Connectivity
   9. Using Decline Curves and Other Engineering Data to Interpret Reservoir Connectivity

F. Basic Well Drilling and Completion
   1. Modern Drilling and Completion Techniques
   2. Drilling/Completing Shale

VIII. Required Texts

Selly and Sonnenberg, 2014, Elements of Petroleum Geology (third edition), Elsevier, 526 p. ISBN: 978-0-12-386031-6

VIII. Bibliography (*Indicates Classic Text)

*Asquith, G.B., 1982, Basic Well Log Analysis for Geologists, AAPG Methods in Exploration Series, No. 3, 216 pp.

Evenick, J., 2008, Introduction to well logs and subsurface maps, Penwell Publishing, 236 pp.

Magoon, L. B, W. G. Dow, 1994, The petroleum system—from source to trap: AAPG Memoir 60, 64 pp.

Magoon, L. B, W. G. Dow, 1999, Leslie B. Magoon and Edward A. Beaumont, in Exploring for Oil and Gas Traps, Edward A. Beaumont and Norman H. Foster, eds., Treatise of Petroleum Geology, Handbook of Petroleum Geology 12 p.

McCarthy, K., Niemann, M., Palmowski, D., Peters, K., and Stankiewicz, A., 2011, Basic Petroleum Geochemistry for Source Rock Evaluation: Oilfield Review, v. 23, no. 2.

Posamentier, H.W., Allen, G.P., 1999, Siliciclastic sequence stratigraphy-concepts and applications, SEPM Special Publications 7, 210 pp.

Prosser, D.J., Maskall, R., 1993, Permeability Variation within Aeolian Sandstones: A Case Study Using Core Cut Sub-parallel to Slipface Bedding, The Auk Field, central North Sea, In: C.P. North, D.J. Prosser eds., Characterization of Fluvial and Aeolian Reservoirs, Geological Society of London Special Publication 73, p. 377-398.

*Sarg, J.F., 1988, Carbonate Sequence Stratigraphy. SEPM Special Publication No. 42, p. 155-181.

Slatt, R., 2008. Stratigraphic Reservoir Characterization for Petroleum Geologists, Geophysicists and Engineers, Cubitt, J. eds, Elsevier, San Francisco, CA, 478 pp.

White, D.A., 1993, Geologic Risking Guide for Prospects and Plays: AAPG Bulletin no 77, p. 2048-2061.

Course Action Request
University of Alaska Anchorage
Proposal to Initiate, Add, Change, or Delete a Course

1a. School or College: AS CAS

1b. Division: AMSC Division of Math Science

1c. Department: Geological Sciences

2. Course Prefix: GEOL

3. Course Number: A436

4. Previous Course Prefix & Number: n/a

5a. Credits/CEUs: 3

5b. Contact Hours (Lecture + Lab): (3+0)

6. Complete Course Title: Survey of Petroleum Geology

Abbreviated Title for Transcript (30 character)

7. Type of Course: ☒ Academic ☐ Preparatory/Development ☐ Non-credit ☐ CEU ☐ Professional Development

8. Type of Action: ☒ Add *or* ☐ Change *or* ☐ Delete

If a change, mark appropriate boxes:

- ☐ Prefix
- ☐ Credits
- ☐ Title
- ☐ Grading Basis
- ☐ Course Description
- ☐ Test Score Prerequisites
- ☐ Automatic Restrictions
  - ☐ Class ☐ Level
  - ☐ College ☐ Major
- ☐ Other CCG (please specify)
- ☐ Course Number
- ☐ Contact Hours
- ☐ Repeat Status
- ☐ Cross-Listed/Stacked
- ☐ Course Prerequisites
- ☐ Co-requisites
- ☐ Registration Restrictions
- ☐ General Education Requirement

9. Repeat Status No # of Repeats Max Credits

10. Grading Basis ☒ A-F ☐ P/NP ☐ NG

11. Implementation Date semester/year
From: Spring/2016 To: /9999

12. ☐ Cross Listed with

☒ Stacked with A636

Cross-Listed Coordination Signature

13a. Impacted Courses or Programs: List any programs or college requirements that require this course.
Please type into fields provided in table. If more than three entries, submit a separate table. A template is available at www.uaa.alaska.edu/governance.

Impacted Program/Course	*Date of Coordination*	*Chair/Coordinator Contacted*
1. Geological Sciences	3/1/2015	K. Crossen
2.		
3.		

Initiator Name (typed): Jennifer Aschoff Initiator Signed Initials: _________ Date:_______________

13b. Coordination Email Date: _____
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison Date: _____

14. General Education Requirement
Mark *appropriate box:*
☐ Oral Communication ☐ Written Communication ☐ Quantitative Skills ☐ Humanities
☐ Fine Arts ☐ Social Sciences ☐ Natural Sciences ☐ Integrative Capstone

15. Course Description *(suggested length 20 to 50 words)*

Formation of hydrocarbons, their migration/accumulation in the context of the petroleum system, and their exploration/exploitation. Includes an introduction to subsurface datasets used in the petroleum industry and how to integrate them. Conventional and unconventional petroleum systems are discussed in the class using examples from Alaska and around the world.

16a. Course Prerequisite(s) *(list prefix and number or test code and score)*
GEOL A221 with score of C or higher

16b. Co-requisite(s) *(concurrent enrollment required)*

16c. Automatic Restriction(s)
☐ College ☐ Major ☐ Class ☐ Level

16d. Registration Restriction(s) *(non-codable)*

17. ☒ Mark if course has fees

18. ☐ Mark if course is a selected topic course

19. Justification for Action
Adding new course in Petroleum Geology based on demand from students and local industry.

_______________________________ Date
Initiator (faculty only)
Jennifer Aschoff
Initiator (TYPE NAME)

☐ Approved
☐ Disapproved _______________________________ Date
Department Chair

☐ Approved
☐ Disapproved _______________________________ Date
College/School Curriculum Committee Chair

☐ Approved
☐ Disapproved _______________________________ Date
Dean/Director of School/College

☐ Approved
☐ Disapproved _______________________________ Date
Undergraduate/Graduate Academic Board Chair

☐ Approved
☐ Disapproved _______________________________ Date
Provost or Designee

Course Content Guide
University of Alaska Anchorage

GEOL A436
Survey of Petroleum Geology

I. Date of Initiation: Spring 2015

II. Course Information

A. College: CAS
B. Course Subject: Geological Sciences
C. Course Number: GEOL A436
D. Number of Credits: 3.0 (3+0)
E. Course Title: Survey of Petroleum Geology
F. Grading Basis: A-F
G. Course Description: Formation of hydrocarbons, their migration/accumulation in the context of the petroleum system, and their exploration/exploitation. Includes an introduction to subsurface datasets used in the petroleum industry and how to integrate them. Conventional and unconventional petroleum systems are discussed in the class using examples from Alaska and around the world.
H. Course Prerequisites: GEOL A221
I. Fee: Yes

III. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will:
1. Deliver interactive, multi-media lectures, collaborative in-class exercises and laboratory exercises on the topics listed in the course description and course outline.
2. Incorporate real-world datasets in hands-on exercises that reflect typical tasks a geoscience professional would complete as part of their job in Petroleum Geology.

B. Student Learning Outcomes and Evaluation. The students will:

Student Learning Outcomes	Evaluations
Demonstrate basic knowledge of the process of hydrocarbon accumulation formation, exploration, exploitation and valuation.	In-class exercises and exams
Interpret basic subsurface data- seismic, well-log and core with a focus on key information needed to determine the presence, effectiveness and/or timing of various petroleum systems elements.	In-class exercises and exams
Synthesize and articulate the mechanics of the petroleum system and its constituent elements: source, reservoir, seal, trap and migration pathway.	Exams

IV. Course Evaluations

Based on grades received on exercises, exams, and in-class participation.

V. Course Level Justification

The course will to satisfy student interest and local oil/gas industry needs in the discipline of petroleum geology.

VI. Topical Course Outline

A. Reserves vs Resources
   1. World Energy Reserves
   2. Reserves Concept
   3. Reserves Calculation (OOIP and OGIP)
   4. Recovery, Recovery Factor, Estimated Ultimate Recovery (EUR) Calculation
   5. Geologic and Engineering Controls on Recovery Factors
   6. Petroleum System Overview
   7. Petroleum Terminology: System, Play Fairway, Play, Lead, Prospect
   8. Unconventional vs Conventional Systems

B. Hydrocarbon Generation and Source Rocks
   1. Kerogen and Kerogen Types
   2. Measuring Source Rock Quality: Pyrolysis, TOC, HI, S1, S2, S3
   3. Controls on Source Rock Quality
   4. Burial and Thermal Maturation
   5. Geothermal Gradients and Basin Type

C. Hydrocarbon Migration
   1. Carrier Beds and Migration Pathways
   2. Using Structure Maps to Understand Migration (“Spider Maps”)
   3. Review Contouring Structure Maps
   4. Fill-Spill, Fill-Leak
   5. Primary vs Secondary Migration
   6. Gas, Oil, Water Contacts

D. Subsurface Data Interpretation
   1. Seismic Data Acquisition
   2. Distinguishing Noise in Seismic
   3. Seismic Interpretation
   4. Well-log Acquisition
   5. Well-log Interpretation

E. Reservoirs
   1. Review Porosity and Permeability
   2. Primary vs. Secondary Porosity
   3. Depositional Environment Controls on Porosity and Permeability

4. Diagenetic Controls on Porosity and Permeability
5. Interpreting Reservoir Quality from Well-log Data
6. Review Isopach Maps
7. Flow Unit Concept and Defining Flow Units
8. Concept of Reservoir Connectivity
9. Using Decline Curves and Other Engineering Data to Interpret Reservoir Connectivity

F. Basic Well Drilling and Completion
   1. Modern Drilling and Completion Techniques
   2. Drilling/Completing Shale

VIII. Required Texts

Selly and Sonnenberg, 2014, Elements of Petroleum Geology (third edition), Elsevier, 526 p. ISBN: 978-0-12-386031-6

VIII. Bibliography (*Indicates Classic Text)

*Asquith, G.B., 1982, Basic Well Log Analysis for Geologists, AAPG Methods in Exploration Series, No. 3, 216 pp.

Evenick, J., 2008, Introduction to well logs and subsurface maps, Penwell Publishing, 236 pp.

Magoon, L. B, W. G. Dow, 1994, The petroleum system—from source to trap: AAPG Memoir 60, 64 pp.

Magoon, L. B, W. G. Dow, 1999, Leslie B. Magoon and Edward A. Beaumont, in Exploring for Oil and Gas Traps, Edward A. Beaumont and Norman H. Foster, eds., Treatise of Petroleum Geology, Handbook of Petroleum Geology 12 p.

McCarthy, K., Niemann, M., Palmowski, D., Peters, K., and Stankiewicz, A., 2011, Basic Petroleum Geochemistry for Source Rock Evaluation: Oilfield Review, v. 23, no. 2.

Posamentier, H.W., Allen, G.P., 1999, Siliciclastic sequence stratigraphy-concepts and applications, SEPM Special Publications 7, 210 pp.

Prosser, D.J., Maskall, R., 1993, Permeability Variation within Aeolian Sandstones: A Case Study Using Core Cut Sub-parallel to Slipface Bedding, The Auk Field, central North Sea, In: C.P. North, D.J. Prosser eds., Characterization of Fluvial and Aeolian Reservoirs, Geological Society of London Special Publication 73, p. 377-398.

*Sarg, J.F., 1988, Carbonate Sequence Stratigraphy. SEPM Special Publication No. 42, p. 155-181.

Slatt, R., 2008. Stratigraphic Reservoir Characterization for Petroleum Geologists, Geophysicists and Engineers, Cubitt, J. eds, Elsevier, San Francisco, CA, 478 pp.

White, D.A., 1993, Geologic Risking Guide for Prospects and Plays: AAPG Bulletin no 77, p. 2048-2061.

Course Action Request
University of Alaska Anchorage
Proposal to Initiate, Add, Change, or Delete a Course

1a. School or College: AS CAS

1b. Division: AMSC Division of Math Science

1c. Department: Geological Sciences

2. Course Prefix: GEOL

3. Course Number: A637

4. Previous Course Prefix & Number:

5a. Credits/CEUs: 3

5b. Contact Hours (Lecture + Lab): (3+0)

6. Complete Course Title: Adv Dep Systems and Stratigraphy

Abbreviated Title for Transcript (30 character)

7. Type of Course: ☒ Academic ☐ Preparatory/Development ☐ Non-credit ☐ CEU ☐ Professional Development

8. Type of Action: ☒ Add *or* ☐ Change *or* ☐ Delete

If a change, mark appropriate boxes:

- ☐ Prefix
- ☐ Credits
- ☐ Title
- ☐ Grading Basis
- ☐ Course Description
- ☐ Test Score Prerequisites
- ☐ Automatic Restrictions
  - ☐ Class ☐ Level
  - ☐ College ☐ Major
- ☐ Other CCG (please specify)
- ☐ Course Number
- ☐ Contact Hours
- ☐ Repeat Status
- ☐ Cross-Listed/Stacked
- ☐ Course Prerequisites
- ☐ Co-requisites
- ☐ Registration Restrictions
- ☐ General Education Requirement

9. Repeat Status No # of Repeats Max Credits

10. Grading Basis ☒ A-F ☐ P/NP ☐ NG

11. Implementation Date semester/year
From: Fall/2016 To: /9999

12. ☐ Cross Listed with

☒ Stacked with A437

Cross-Listed Coordination Signature

13a. Impacted Courses or Programs: List any programs or college requirements that require this course.

Please type into fields provided in table. If more than three entries, submit a separate table. A template is available at www.uaa.alaska.edu/governance.

Impacted Program/Course	*Date of Coordination*	*Chair/Coordinator Contacted*
1. Geological Sciences	3/1/2015	K. Crossen
2.		
3.		

Initiator Name (typed): Jennifer Aschoff Initiator Signed Initials: _________ Date:_______________

13b. Coordination Email Date: _____
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison Date: _____

14. General Education Requirement
Mark *appropriate box:*
☐ Oral Communication ☐ Written Communication ☐ Quantitative Skills ☐ Humanities
☐ Fine Arts ☐ Social Sciences ☐ Natural Sciences ☐ Integrative Capstone

15. Course Description *(suggested length 20 to 50 words)*

Advanced skills in sedimentary geology that can be applied in oil/gas, hydrology, and mining. Includes greater detail in depositional environments, characteristics of resultant sedimentary deposits, and sequence stratigraphy using various geologic datasets. Emphasis on hands-on application of course concepts in outcrop, core and well-log data.

16a. Course Prerequisite(s) *(list prefix and number or test code and score)*

16b. Co-requisite(s) *(concurrent enrollment required)*

16c. Automatic Restriction(s)
☐ College ☐ Major ☐ Class ☒ Level

16d. Registration Restriction(s) *(non-codable)*
Graduate Standing

17. ☒ Mark if course has fees

18. ☐ Mark if course is a selected topic course

19. Justification for Action

Adding new, hands-on course in depositional environments and stratigraphy that emphasises data interpretation and application.

Initiator (faculty only) Date

Jennifer Aschoff
Initiator (TYPE NAME)

☐ Approved
☐ Disapproved Department Chair Date

☐ Approved
☐ Disapproved College/School Curriculum Committee Chair Date

☐ Approved
☐ Disapproved Dean/Director of School/College Date

☐ Approved
☐ Disapproved Undergraduate/Graduate Academic Board Chair Date

☐ Approved
☐ Disapproved Provost or Designee Date

Course Content Guide
University of Alaska Anchorage

GEOL A637
Adv Dep Systems and Stratigraphy

I. Date of Initiation: Spring 2015

II. Course Information

A. College: CAS
B. Course Subject: Geological Sciences
C. Course Number: GEOL A637
D. Number of Credits: 3.0 (2+1)
E. Course Title: Adv Dep Systems and Stratigraphy
F. Grading Basis: A-F
G. Course Description: Advanced skills in sedimentary geology that can be applied in oil/gas, hydrology, and mining, and expose students to subsurface datasets. Includes the many environments in which sediment is deposited, characteristics of resultant sedimentary deposits, and the range of methods to interpret and correlate sedimentary deposits using various geologic datasets. Emphasis on hands-on core and well-log interpretation.
H. Registration Restrictions: Graduate Standing
I. Fee: Yes

III. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will:
1. Deliver interactive, multi-media lectures, collaborative in-class exercises and laboratory exercises on the topics listed in the course description and course outline.
2. Incorporate real-world datasets in hands-on exercises that reflect typical tasks a geoscience professional would complete as part of their job.

B. Student Learning Outcomes and Evaluation. The students will:

Student Learning Outcomes	Evaluations
Describe and interpret paleohydraulic conditions from complex sedimentary structures and fabrics using outcrop and rock core.	Exercises
Interpret depositional environments from stratigraphic architectures, sedimentary structures/fabrics in outcrop and rock core.	Exercises and Exam(s)
Correlate well-logs and outcrop sections using sequence-stratigraphic methods.	Collaborative In-class Exercises
Synthesize course concepts and integrate a range of subsurface data to deduce the depositional history	Exercises and Final Project
Articulate scientific interpretations to specialists.	Final Presentation

IV. Course Evaluations

Based on grades received on in-class exercises, laboratory exercises, exam(s) and presentations.

V. Course Level Justification

This course provides students with advanced skills in stratigraphy to make interpretations of complex sedimentary successions and application of sequence stratigraphy. It is typically taught as an upper-level undergraduate (400) or graduate course (600) at other institutions. The class is stacked with a 400-level (Geol A437) for undergraduate students. The 600-level course requires a rigorous, individual research project where students generate and interpret a dataset that applies two or more course concepts.

VI. Topical Course Outline

A. Depositional System Concept
1. Sedimentary Process and Product
2. Facies Definition
3. Facies Paleohydraulic Interpretation- Flow Regime Concept
4. Depositional Environment vs. Depositional System
5. Overview of Depositional Environments
6. Modern Depositional Systems

B. Outcrop Interpretation
1. Architectural Analysis in Fluvial-Lacustrine Outcrop
2. Facies Definition and Interpretation in Outcrop

C. Depositional Environments in a Clastic Shelf to Slope System
1. Shelfal: Regressive Marginal Marine
2. Shelfal: Transgressive Marginal Marine
3. Slope
4. Basin floor and Offshore Mudstone
8. Source-to-Sink Connection of Depositional Environments within a System

D. Depositional Environments in a Carbonate Platform System
1. Platform Carbonates
2. Reef Depositional Models

E. Sequence Stratigraphy
1. Comparison of Sequence Stratigraphy to Lithostratigraphy
2. Terminology
3. Walther's Law
4. History and Development from Seismic Stratigraphy
5. Overview of Seismic and Well-log Data
6. Application of Sequence Stratigraphy in Seismic Data
7. Application of Sequence Stratigraphy in Outcrop Data

8. Application of Sequence Stratigraphy in Well-log Data

F. Core Description
   1. Drilling Wells and Taking Core
   2. Defining Intervals to be Cored
   3. Types of Core
   4. Proper Handling and Care of Core
   5. Core Description and Presentation of Core Data

G. Presenting Core Data
   1. Creating a Poster to Display Scientific Data
   2. Articulating Scientific Interpretations to Broad Audiences

VIII. Required Text

Catuneanu, O., 2006, Principles of Sequence Stratigraphy, Elsevier Science. ISBN 0444515682

VIII. Bibliography (*Indicates Classic Text)

Boyd, R., Suter, J., and Penland, S., 1989, Relation of sequence stratigraphy to modern sedimentary environments: Geology, v. 17, p.926-929.

Catuneanu, O., Willis, A., and Miall, A. D., 1998, Temporal significance of sequence boundaries: Sedimentary Geology, v. 121, p. 157-178.

Catuneanu, O., 2006, Principles of sequence stratigraphy, Elsevier New York, 375 p.

*Campbell C., 1967, Lamina, Laminaset, Bed and Bedset; Sedimentology, v. 8, p.7-26.

Embry, A. and Myers, J., 1996, Sequence Stratigraphy, Blackwell Science Ltd, Oxford, 297 p.

Embry, A., 2002, Transgressive-Regressive (T-R) Sequence Stratigraphy, Gulf Coast Association of Geological Societies Transactions, v. 52, p. 151 – 172.

*Fisher, W. L., and J. H. McGowan, 1967, Depositional systems in the Wilcox Group of Texas and their relationship to occurrence of oil and gas: Gulf Coast Assoc. of Geological Soc., Trans., v. 17, p.213-248.

Galloway, W.E., 1989, Genetic stratigraphic sequences in basin analysis: Architecture and genesis of flooding-surface bounded depositional units. AAPG Bulletin v. 73, p. 125–142.

Hunt, D. and M. E. Tucker, 1993, The Middle Cretaceous Urgonian platform of southeastern France, in J. A. Simo, R. W. Scott, and J. Masse, eds., Cretaceous Carbonate Platforms: AAPG Memoir 56, p.409-454.

Jacquin, T., A. Arnaud-Vanneau, H. Arnaud, C. Ravenne, and P. R. Vail, 1991, Systems tracts and depositional sequences in a carbonate setting: a study of continuous outcrops from platform to basin at the scale of seismic lines: Marine and Petroleum Geology, v. 8, p.122-139.

*Jervey, M. T., 1988, Quantitative geological modeling of siliciclastic rock sequences and their seismic expression, in C. K. Wilgus, B. S. Hastings, C. G. St. C. Kendall, H. W. Posamentier, C. A. Ross, and J. C. Van Wagoner, eds., Sea-Level Changes: An Integrated Approach: SEPM Special Publication No. 42, p.47-69.

Keighley D., Flint S., Howell J. and Moscariello A., 2003, Sequence stratigraphy in lacustrine basins: a model for part of the Green River Formation (Eocene), southwest Uinta Basin, Utah, Journal of Sedimentary Research. v. 73, no. 6, p. 987-1006.

*Kidwell, S.M., 1988, Reciprocal sedimentation &-correlative hiatuses in marine-paralic siliciclastis: Miocene outcrop evidence: Geology, v. 16, p. 609-612.

Leckie, D.A., Singh, C., Goodarzi, F., and Wall, J.H., 1990, Organic-rich, radioactive marine shale: a case study of a shallow-water condensed section, Cretaceous Shaftesbury Formation, Alberta, Canada: Journal of Sedimentary Petrology, v. 60, p. 101-117.

Miall, A. D., 1991, Stratigraphic Sequences and their Chronostratigraphic Correlation, Journal of Sedimentary Petrology, v. 61, no. 4, p. 497-505.

Miall, A.D., 1997, The geology of stratigraphic sequences. Springer-Verlag, Berlin Heidelberg New York, 433 p.

Miall, A.D., 1999, In Defense of Facies Classifications and Models, Journal of Sedimentary Research: v. 69, no. 1, p. 2-5.

*Mitchum, R. M., 1977, Seismic Stratigraphy and Global Changes of Sea Level, Part 11 : Glossary of terms used in seismic stratigraphy; in C. E. Payton, ed., Seismic Stratigraphy - Applications to Hydrocarbon Exploration: AAPG Memoir 26, p.205-212.

*Mitchum, R. M., 1977, Seismic Stratigraphy and Global Changes of Sea Level, Part 2: The Depositional sequence as a basic unit for stratigraphic analysis; in C. E. Payton, ed., Seismic Stratigraphy - Applications to Hydrocarbon Exploration: AAPG Memoir 26, p.53-62.

*Sarg, J. F., 1988, Carbonate sequence stratigraphy, in C. K. Wilgus, B. S. Hastings, C. G. St. C. Kendall, H. W. Posamentier, C. A. Ross, and J. C. Van Wagoner, eds., Sea-Level Changes: An Integrated Approach: SEPM Special Publication No. 42, p.155-181.

Schlager, W., 2005, Carbonate Sedimentology and Sequence Stratigraphy; SEPM Concepts in Sedimentology and Paleontology #8, 200 p.

*Sloss, L.L., 1963, Sequences in the cratonic interior of North America: GSA Bulletin, v. 74, p. 93-113.

Schumm, S. A.., 1993, River Response to Baselevel Change: Implications for Sequence Stratigraphy. Journal of Geology, v. 101, p. 279-294.

Vail, P. R., 1987, Seismic stratigraphy interpretation procedure, in A. W. Bally, ed. Atlas of seismic stratigraphy: AAPG Studies in Geol., no.27, p.1-10.

Vail, P. R., Audemard, S. A. Bowman, P. N. Eisner, and C. Perez-Cruz, 1991, The stratigraphic signatures of tectonics, eustasy, and sedimentology - an overview; in G. Einsele et al., eds., Cycles and Events in Stratigraphy, Springer-Verlag, Berlin Heidelberg, p.617-659.

Van Wagoner, J.C., 1990. Siliclastic sequence stratigraphy in well logs, cores and outcrops: AAPG Methods in Exploration Series no. 7, 55 p.

Walker, R.G. and James, N.P., 1992, Facies Models: Response to Sea Level Change 454 p.

*Wheeler, H.E., 1958, Time Stratigraphy: AAPG Bulletin, v. 42, no. 5, p. 1047-1063.

Course Action Request
University of Alaska Anchorage
Proposal to Initiate, Add, Change, or Delete a Course

1a. School or College AS CAS	1b. Division AMSC Division of Math Science			1c. Department Geological Sciences
2. Course Prefix GEOL	3. Course Number A437	4. Previous Course Prefix & Number	5a. Credits/CEUs 3	5b. Contact Hours (Lecture + Lab) (3+0)

6. Complete Course Title
Dep Systems and Dynamic Strat

Abbreviated Title for Transcript (30 character)

7. Type of Course ☒ Academic ☐ Preparatory/Development ☐ Non-credit ☐ CEU ☐ Professional Development

8. Type of Action: ☒ Add *or* ☐ Change *or* ☐ Delete

If a change, mark appropriate boxes:

- ☐ Prefix
- ☐ Credits
- ☐ Title
- ☐ Grading Basis
- ☐ Course Description
- ☐ Test Score Prerequisites
- ☐ Automatic Restrictions
  - ☐ Class ☐ Level
  - ☐ College ☐ Major
- ☐ Other CCG (please specify)
- ☐ Course Number
- ☐ Contact Hours
- ☐ Repeat Status
- ☐ Cross-Listed/Stacked
- ☐ Course Prerequisites
- ☐ Co-requisites
- ☐ Registration Restrictions
- ☐ General Education Requirement

9. Repeat Status No # of Repeats Max Credits

10. Grading Basis ☒ A-F ☐ P/NP ☐ NG

11. Implementation Date semester/year
From: Fall/2016 To: /9999

12. ☐ Cross Listed with

☒ Stacked with A637

Cross-Listed Coordination Signature

13a. Impacted Courses or Programs: List any programs or college requirements that require this course.
Please type into fields provided in table. If more than three entries, submit a separate table. A template is available at www.uaa.alaska.edu/governance.

Impacted Program/Course	*Date of Coordination*	*Chair/Coordinator Contacted*
1. Geological Sciences	3/1/2015	K. Crossen
2.		
3.		

Initiator Name (typed): Jennifer Aschoff Initiator Signed Initials: _________ Date:_______________

13b. Coordination Email Date: _____
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison Date: _____

14. General Education Requirement
Mark *appropriate box:*
☐ Oral Communication ☐ Written Communication ☐ Quantitative Skills ☐ Humanities
☐ Fine Arts ☐ Social Sciences ☐ Natural Sciences ☐ Integrative Capstone

15. Course Description *(suggested length 20 to 50 words)*
Advanced skills in sedimentary geology that can be applied in oil/gas, hydrology, and mining. Includes greater detail in depositional environments, characteristics of resultant sedimentary deposits, and sequence stratigraphy using various geologic datasets. Emphasis on hands-on application of course concepts in outcrop, core and well-log data.

16a. Course Prerequisite(s) *(list prefix and number or test code and score)*
GEOL A221 with score of "C" or higher

16b. Co-requisite(s) *(concurrent enrollment required)*

16c. Automatic Restriction(s)
☐ College ☐ Major ☐ Class ☐ Level

16d. Registration Restriction(s) *(non-codable)*

17. ☒ Mark if course has fees

18. ☐ Mark if course is a selected topic course

19. Justification for Action
Adding new, hands-on course in depositional environments and stratigraphy that emphasises data interpretation and application.

Initiator (faculty only) Date
Jennifer Aschoff
Initiator (TYPE NAME)

☐ Approved
☐ Disapproved Department Chair Date

☐ Approved
☐ Disapproved College/School Curriculum Committee Chair Date

☐ Approved
☐ Disapproved Dean/Director of School/College Date

☐ Approved
☐ Disapproved Undergraduate/Graduate Academic Board Chair Date

☐ Approved
☐ Disapproved Provost or Designee Date

Course Content Guide
University of Alaska Anchorage

GEOL A437
Dep Systems and Dynamic Strat

I. Date of Initiation: Spring 2015

II. Course Information

A. College: CAS
B. Course Subject: Geological Sciences
C. Course Number: GEOL A437
D. Number of Credits: 3.0 (2+1)
E. Course Title: Dep Systems and Dynamic Strat
F. Grading Basis: A-F
G. Course Description: Advanced skills in sedimentary geology that can be applied in oil/gas, hydrology, and mining, and expose students to subsurface datasets. Includes the many environments in which sediment is deposited, characteristics of resultant sedimentary deposits, and the range of methods to interpret and correlate sedimentary deposits using various geologic datasets. Emphasis on hands-on core and well-log interpretation.
H. Course Prerequisites: GEOL A221 with grade of "C" or higher
A. Fee: Yes

III. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will:
   1. Deliver interactive, multi-media lectures, collaborative in-class exercises and laboratory exercises on the topics listed in the course description and course outline.
   2. Incorporate real-world datasets in hands-on exercises that reflect typical tasks a geoscience professional would complete as part of their job.

B. Student Learning Outcomes and Evaluation. The students will:

Student Learning Outcomes	Evaluations
describe and interpret paleohydraulic conditions from complex sedimentary structures and fabrics using outcrop and rock core	Exercises
interpret depositional environments from stratigraphic architectures, sedimentary structures/fabrics in outcrop and rock core	Exercises and Exam(s)
correlate well-logs and outcrop sections using sequence-stratigraphic methods	Collaborative In-class Exercises
articulate scientific interpretations to specialists	Presentations

IV. Course Evaluations

Based on grades received on in-class exercises, laboratory exercises, exam(s) and presentations.

V. Course Level Justification

This course builds on Historical Geology (Geol 221) by providing students with more advanced skills to make interpretations of complex sedimentary successions. Additionally, the course complements concepts in Sedimentology (Geol 430) and Stratigraphy (Geol 432) by enhancing student skills in sedimentology, while providing new skills in sequence stratigraphy, rock core description, outcrop description and subsurface data interpretation. It is typically taught as an upper-level undergraduate (400) or graduate course (600) at other institutions. The class is stacked with a 600-level (Geol 637) for graduate students.

VI. Topical Course Outline

A. Depositional System Concept
1. Sedimentary Process and Product
2. Facies Definition
3. Facies Paleohydraulic Interpretation- Flow Regime Concept
4. Depositional Environment vs. Depositional System
5. Overview of Depositional Environments
6. Modern Depositional Systems

B. Outcrop Interpretation
1. Architectural Analysis in Fluvial-Lacustrine Outcrop
2. Facies Definition and Interpretation in Outcrop

C. Depositional Environments in a Clastic Shelf to Slope System
1. Shelfal: Regressive Marginal Marine
2. Shelfal: Transgressive Marginal Marine
3. Slope
4. Basin floor and Offshore Mudstone
8. Source-to-Sink Connection of Depositional Environments within a System

D. Depositional Environments in a Carbonate Platform System
1. Platform Carbonates
2. Reef Depositional Models

E. Sequence Stratigraphy
1. Comparison of Sequence Stratigraphy to Lithostratigraphy
2. Terminology
3. Walther's Law
4. History and Development from Seismic Stratigraphy
5. Overview of Seismic and Well-log Data
6. Application of Sequence Stratigraphy in Seismic Data

Course Content Guide
University of Alaska Anchorage

GEOL A445
Geothermal Energy

I. Date of Initiation: Spring 2016

II. Course Information

A. College: CAS
B. Course Subject: Geological Sciences
C. Course Number: GEOL A445
D. Number of Credits: 3.0 (3+0)
E. Course Title: Geothermal Energy
F. Grading Basis: A-F
G. Course Description: Comprehensive coverage of geothermal systems and relevant processes including conductive and convective heat flow, subsurface fluid flow, geothermal exploration, resource assessment, structural settings favorable for geothermal reservoirs, microseismicity, well scaling and corrosion, power generation and enhanced geothermal systems.
H. Course Prerequisites: CHEM A105, GEOL A221, MATH A200, PHYS A124
I. Fee: Yes

III. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will:
1. Provide interactive PowerPoint lectures on the topics listed in the course description and course outline. These topics represent the theoretical and applied foundations of Geothermal Energy from a natural science perspective.
2. Incorporate real-world geothermal reservoir applications through problem sets, selected geothermal reservoir case studies, and field trip to selected geothermal site.

B. Student Learning Outcomes and Evaluation. The students will:

Student Learning Outcomes	Evaluations
Acquire a solid understanding of the fundamental processes and relevant theory used in the geothermal field.	Problem sets and exams.
Demonstrate understanding of real-world problems and applications related to geothermal energy.	Problem sets.

IV. Course Evaluations

Based on grades received on problem sets and exams.

V. Course Level Justification

Geothermal energy encompasses multiple scientific disciplines and requires a significant number of prerequisites. For these reasons, this topic is typically taught at the upper-division under-graduate and graduate levels at Universities, both domestic and abroad. The stacking of this course allows for both undergraduate and graduate students to receive training in this important topic.

VI. Topical Course Outline

A. Introduction to Geothermal Energy
   1. Origin of Earth's Heat
   2. Composition of the Earth
   3. Conversion of Heat into Energy
   4. World Wide Energy Demands and Consumption
   5. Geothermal Resources of the United States

B. Heat Flow
   1. Heat Conduction
   2. Thermal Gradient
   3. Thermal Conductivity
   4. Heat Flow Maps
   5. Convection and Convective Heat Transfer
   6. Rayleigh Number and Natural Convection
   7. Geothermal Exploration and Convective Heat Transfer

C. Fluid Flow
   1. Porosity and Porosity Computation
   2. Permeabiltiy
   3. Darcy's Law
   4. Fluid Energy and Hydraulic Head
   5. Bernoulli Equation and Hubbert Force Potential
   6. Fluid Density and Viscosity
   7. Darcy's Law and Geothermal Reservoirs
   8. Multiphase Darcy's Law

D. Flow Through Fractured Media
   1. Cubic Law
   2. Types of Fractures
   3. Fault Type and Architecture
   4. Hydraulic Function of Faults
   5. Fluid Channeling Within Fractures
   6. Discrete Fracture Networks
   7. Statistical Fracture Network Analysis

E. Structural Settings Favorable for Geothermal
   1. Pacific Ring of Fire
   2. Magmatic Intrusions

3. Crustal Extension
4. Structural Settings Identified Within Great Basin
5. Power Plant Examples

F. Well Scaling and Corrosion – Case Studies
   1. Diaz et al. (2005)
   2. Kaypakoglu et al. (2012)
   3. Ngothai et al. (2010)

G. Microseismicity – Case Studies
   1. Urban and Lermo (2012)
   2. Xu et al. (2012)

H. Geophysical and Remote Sensing for Geothermal
   1. Seismic
   2. Resistivity
   3. Magnetotelluric
   4. Gravity
   5. Borehole Geophysics
   6. Hyperspectral Analysis and Mineral Identification
   7. InSAR

I. Geothermal Power Plants and Power Generation
   1. Enthalpy – Power Relations
   2. Thermodynamic Efficiency
   3. Electrical Generation
   4. Fossil Fuel and Nuclear Power Plants
   5. Dry Steam Power Plants
   6. Single Flash Power Plants
   7. Double Flash Power Plants
   8. Binary Cycle Power Plant
   9. Cooling Towers
   10. Advanced Geothermal Energy Conversion Systems

J. Enhanced Geothermal Systems
   1. Future of Geothermal Energy
   2. Shear Stimulation
   3. Hydraulic Fracturing

VIII. Required Texts

Glassley, W.E., (2010). Geothermal Energy: Renewable Energy and the Environment, CRC Press, Boca Raton, FL, 290 pp.

Massachusetts Institute of Technology, (2006). The Future of Geothermal Energy: Impact of Enhanced Geothermal Systems (EGS) on the United States in the 21st Century, MIT Press, INL/EXT-06-0413.

VIII. Bibliography

DiPippio, R., (2008). Geothermal Power Plants, 2nd Ed., Elsevier, San Francisco, CA, 493 pp.

Fetter, C.W., (2001). Applied Hydrogeology, 4th Ed., Prentice Hall, Upper Saddle River, New Jersey, 598 pp.

Fisher, K. and N. Warpinski, (2011). Hydraulic fracture-height growth: real data, SPE International, SPE 145949, Denver, CO.

Grant, M.A. and P.F. Bixley, (2011). Geothermal Reservoir Engineering, 2nd Ed., Elsevier, San Franciso, CA, 359 pp.

Kaypakoglu, B., M. Sisman, and N. Aksoy, (2012). Preventative methods for scaling and corrosion in geothermal fields, New Zealand Geothermal Workshop Proceedings, Auckland, New Zealand.

McClure, M. and R. Horne, (2013). Is pure shear stimulation always the mechanism of stimulation in EGS?, Proceedings of the Thirty-Eight Workshop on Geothermal Reservoir Engineering, Stanford University, SGP-TR-198, Stanford, CA.

Ngothai, Y., N. Yanagisawa, A. Pring, P. Rose, B. O'Neill, and J. Brugger, (2010). Mineral scaling in geothermal fields: A review, Australian Geothermal Conference, Melbourne, Australia.

Ocampo-Diaz, J.D., B. Valdez-Salaz, M. Shorr, I. Sauceda, N. Rosas-Gonzalez, (2005). Review of corrosion and scaling problems in Cerro Prieto Geothermal Field over 31 years of commercial operations, Proceedings World Geothermal Congress, Antalya, Turkey.

Twiss, R.J. and E.M. Moores (2007). Structural Geology, 2nd Ed., W.H. Freeman and Co., New York, NY, 736 pp.

Urban, E. and J.F. Lermo, (2012). Relationship of local seismic activity, injection wells and active faults in the geothermal fields of Mexico, Proceedings Thirty-Seventh Workshop on Geothermal Reservoir Engineering, Stanford University, SGP-TR-194, Stanford, CA.

Xu, C., P.A. Dowd, and R. Mohais, (2012). Connectivity analysis of the Habanero enhanced geothermal system, Proceedings Thirty-Seventh Workshop on

Geothermal Reservoir Engineering, Stanford University, SGP-TR-194, Stanford, CA.

Course Action Request
University of Alaska Anchorage
Proposal to Initiate, Add, Change, or Delete a Course

1a. School or College AS CAS	1b. Division AMSC Division of Math Science			1c. Department GEOL
2. Course Prefix GEOL	3. Course Number A657	4. Previous Course Prefix & Number	5a. Credits/CEUs 3	5b. Contact Hours (Lecture + Lab) (3+0)

6. Complete Course Title
Advanced Geology of Alaska

Abbreviated Title for Transcript (30 character)

7. Type of Course ☒ Academic ☐ Preparatory/Development ☐ Non-credit ☐ CEU ☐ Professional Development

8. Type of Action: ☒ Add *or* ☐ Change *or* ☐ Delete

If a change, mark appropriate boxes:

☐ Prefix
☐ Credits
☐ Title
☐ Grading Basis
☐ Course Description
☐ Test Score Prerequisites
☐ Automatic Restrictions
☐ Class ☐ Level
☐ College ☐ Major
☐ Other (please specify)

☐ Course Number
☐ Contact Hours
☐ Repeat Status
☐ Cross-Listed/Stacked
☐ Course Prerequisites
☐ Co-requisites
☐ Registration Restrictions
☐ General Education Requirement

9. Repeat Status No # of Repeats Max Credits

10. Grading Basis ☒ A-F ☐ P/NP ☐ NG

11. Implementation Date semester/year
From: Spring 16/ To: 9999/

12. ☐ Cross Listed with

☒ Stacked with A457

Cross-Listed Coordination Signature

13a. Impacted Courses or Programs: List any programs or college requirements that require this course.
Please type into fields provided in table. If more than three entries, submit a separate table. A template is available at www.uaa.alaska.edu/governance.

Impacted Program/Course	*Date of Coordination*	*Chair/Coordinator Contacted*
1. Geological Sciences		K Crossen
2. Natural Sciences		F Rainey
3. AEST - COE		A Dotson

Initiator Name (typed): Kristine J Crossen Initiator Signed Initials: _________ Date:_______________

13b. Coordination Email Date: 4-3-15
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison Date: 4-3-15

14. General Education Requirement
Mark appropriate box:
☐ Oral Communication ☐ Written Communication ☐ Quantitative Skills ☐ Humanities
☐ Fine Arts ☐ Social Sciences ☐ Natural Sciences ☐ Integrative Capstone

15. Course Description *(suggested length 20 to 50 words)*
Alaskan geology including physiographic provinces, earthquakes, volcanoes, plate tectonics, resources, glaciers, permafrost, rivers, coasts and wind. Emphasis on processes, landforms, and differences between specific areas in Alaska. Independent research and professional presentation required. Special Note: Students may be required to provide their own transportation for optional field trips.

16a. Course Prerequisite(s) *(list prefix and number or test code and score)*

16b. Co-requisite(s) *(concurrent enrollment required)*

16c. Automatic Restriction(s)
☐ College ☐ Major ☐ Class ☒ Level

16d. Registration Restriction(s) *(non-codable)*
Graduate Standing

17. ☒ Mark if course has fees

18. ☐ Mark if course is a selected topic course

19. Justification for Action
Stacked with GEOL A457 and graduate students are required to produce an independent research project and present it to class.

Initiator (faculty only) Date
Kristine J Crossen
Initiator (TYPE NAME)

☐ Approved
☐ Disapproved Department Chair Date

☐ Approved
☐ Disapproved College/School Curriculum Committee Chair Date

☐ Approved
☐ Disapproved Dean/Director of School/College Date

☐ Approved
☐ Disapproved Undergraduate/Graduate Academic Board Chair Date

☐ Approved
☐ Disapproved Provost or Designee Date

Course Content Guide
University of Alaska Anchorage

GEOL A657
Advanced Geology of Alaska

I. Date of Initiation: Spring 2016

II. Course Information

A. College or School: CAS
B. Course Subject: Geological Sciences
C. Course Number: GEOL A657
D. Number of Credits: 3.0 (0+9)
E. Course Title: Geology of Alaska
F. Grading Basis: A-F
G. Course Description: Alaskan geology including physiographic provinces, earthquakes, volcanoes, plate tectonics, resources, glaciers, permafrost, rivers, coasts and wind. Emphasis on processes, landforms, and differences between specific areas in Alaska. Independent research and professional presentation required. Special Note: Students may be required to provide their own transportation for optional field trips.
H. Prerequisites: Graduate Standing
I. Fees: yes

III. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will:
   1) Guide students in reading and interpreting the professional literature.
   2) Introduce the regional geology and tectonic setting of specific field areas.
   3) Compare differences between locales to examine resources, landforms, and tectonics of Alaska.

B. Student Learning Outcomes. The students will:

Student Learning Outcomes	Evaluation
Locate and identify landscapes, ranges, rivers and cities across Alaska	Map exercises
Critically evaluate the professional literature	Graded reading summaries
Examine volcanoes and earthquakes within the Aleutian subduction zone and synthesize associated tectonics	Discussion and exams
Investigate resource formation processes and locations; examine specific Alaskan surface processes	Discussion and exams
Produce independent research project and present professional quality presentation.	Professional presentation

IV. Course Evaluation
Students will be evaluated on the basis of their map exercises, exams, summaries of professional readings, and class discussions. Graduate level students will produce independent research on an instructor-approved project and will present a professional quality presentation.

V. Course Level Justification

This course uses both the conceptual and intellectual skills obtained in previous geology courses (including physical and historical geology) to apply to the geology of Alaska. Students will not only learn new material, but will continue to develop and apply critical thinking skills, practice in scientific method, and synthesize the professional literature. Independent research using a primary data set and a professional quality presentation is required.

VI. Topical Course Outline

A. Physiographic provinces
   1. Locations and characteristics

B. Alaskan volcanoes and earthquakes
   1. Aleutian subduction zone, 1964 Alaska earthquake, 2002 Denali earthquake

C. Alaskan Tectonics
   1. Yakutat, Chugach, Peninsular, Wrangellia, and Yukon-Tanana terranes

D. Alaska resources
   1. Arctic Alaska terrane, North Slope petroleum province
   2. Cook Inlet oil, gas, and coal resources
   3. Gold – placer and lode deposits of Interior and Cook Inlet regions

E. Glaciers
   1. Processes, Cook Inlet history, Bering Glacier, Beringia, Qagnax Cave mammoths

F. Permafrost
   1. Processes of jacking, polygons, pingoes
   2. Engineering problems

G. Surface features: comparisons in different locales
   1. Rivers, aeolian, coasts

VII. Suggested Text(s)

There are no currently available texts that synthesize Alaskan geology. Students are required to read, produce written summaries and discuss the professional geologic literature.

VIII. Bibliography

Crossen, K.J. and T.V. Lowell, 2010, Holocene History Revealed by Post-surge Retreat, *in* R. Shuchmann and E. Joshberger, eds., Bering Glacier: Interdisciplinary Studies of North America's Largest Surging Glacier, Geological Society of America Special Paper 462, p. 235-250.

Enk, J.M., Yesner, D.R., O'Rourke, D.H., Crossen, K.J., and Veltre, D., 2009, Phylogeographic analysis of the mid-Holocene Mammoth from Quagnax Cave, St. Paul Island, Alaska, Palaeogeography, Palaeoclimatology, Palaeoecology, v.22, p. 1-7.

French, H.M., 2008, Periglacial Environment, Wiley, Chichester, 458 p.

Ridgway, K.D., Trop, J.M., Glen, J.M.G., and O'Neill, J.M., 2007, Tectonic Growth of a Collisional continental Margin: Crustal Evolution of Southern Alaska, Geological Society of America, Boulder, Special Paper 431, 658 p.

Yesner, D.R., Crossen, K.J., and Easton, N.A., 2011, Early Beringian Artifact Assemblages and Geoarchaeology of Tanana Valley Sites *in* Goebel, T. and Graf, S., eds., Lithic Assemblages in Beringia, Texas A & M Univ. Press.

Veltre, D.W., Yesner, D.R., Crossen, K.J., Graham, R.W., and Coltraine J.B., 2008, Patterns of Faunal Extinction and Paleoclimatic Change from Mid-Holocene Mammoth and Polar Bear Remains, Pribilof Islands, Alaska, Quaternary Research, v. 70, p. 40-50.

and project, meetings, scheduled reports/presentations and the thesis publication.

4) Discuss and assess progress on research project with faculty research advisor and thesis committee through regularly scheduled meetings during the semester. **Assessment:** Thesis project, meetings, scheduled reports/presentations.

IV. Course Evaluation

Course grading is A-F. The evaluation methods, while at the discretion of the faculty member teaching the course, may include the initiation, continuation and/or successful completion of a graduate research project approved by the student's committee and mentored by her/his advisor, culmination the a publishable thesis. Assessment is made through regularly scheduled meetings between the student and advisor and committee members to address the continuity and degree of progress, collection and analysis of reliable and reproducible data sets and the timely completion of directed research project.

V. Course Level Justification

Designed as a required core course for the MS student conducting research in geological sciences for a MS thesis. This is an advanced research course in the context of formulating testable hypotheses, mastering the appropriate scientific literature, experimental design, research methods, data analysis and writing. The student is expected to integrate content of the thesis with their other graduate level courses in geological sciences and successfully write up the results as part of the thesis research.

VI. Topical Course Outline

Variable

VII. Suggested Text(s)

UAA Thesis Format Handbook, 2015. Office of Research and Graduate Studies, University of Alaska Anchorage.

UAA Department of Geological Sciences Requirements and Guidelines for MS thesis proposal and final thesis.

VIII. Bibliography

Bui, Y.N., 2014. How to Write a Master's Thesis, 2nd ed. SAGE Publications, Inc. 305p.