I. **Roll Call**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arlene Schmuland</td>
<td>CAS vacancy</td>
</tr>
<tr>
<td>Susan Garton</td>
<td>FSAL vacancy (CAS)</td>
</tr>
<tr>
<td>Greg Protasel</td>
<td>FSAL vacancy</td>
</tr>
<tr>
<td>Dennis Drinka</td>
<td>FSAL vacancy</td>
</tr>
<tr>
<td>Laura Kelly</td>
<td>FSAL vacancy</td>
</tr>
<tr>
<td>Hsing-Wen Hu</td>
<td>Ex-Officio Members:</td>
</tr>
<tr>
<td>Peter Olsson</td>
<td></td>
</tr>
<tr>
<td>Anthony Paris</td>
<td></td>
</tr>
<tr>
<td>Jamie Spatrisano</td>
<td></td>
</tr>
<tr>
<td>CAS vacancy</td>
<td></td>
</tr>
</tbody>
</table>

II. **Approval of Agenda** (pg. 1-2)

III. **Approval of Meeting Summary** (pg. 3-4)

IV. **Program/Course Action Request – Second Reading**

V. **Program/Course Action Request - First Readings**

- **Chg** BA A603 Fundamentals of Finance (3 cr)(3+0)(pg. 5-9)
- **Chg** BA A636 Financial Decision Making (3 cr)(3+0)(pg. 10-13)
- **Chg** BA A686 Management Simulation (3 cr)(3+0)(pg. 14-19)
- **Chg** Master of Public Health (pg. 20-29)
- **Add** CHEM A611 Advanced Biophysical Chemistry (Stacked with CHEM A411) (3 cr)(3+0)(pg. 30-40)
- **Add** CHEM A650 Advanced Environmental Chemistry (Stacked with CHEM A450) (3 cr)(3+0)(pg. 41-50)
- **Add** CHEM A677 Advanced Bioanalytical Chemistry (Stacked with CHEM A477) (3 cr)(3+0)(pg. 51-61)
- **Add** CHEM A680 Advanced Nuclear Magnetic Resonance (stacked with CHEM A480) (3 cr)(3+0)(pg. 62-70)
- **Add** CHEM A690 Advanced Lecture Topics in Chemistry (Stacked with CHEM A490) (1-3 cr)(1-3+0)(pg. 71-81)
- **Add** CHEM A698 Graduate research (1-6)(0+3-18)(pg. 82-85)
- **Chg** GEOL A654 Glacial and Quaternary Geology (Stacked with GEOL A454) (3 cr)(3+0)(pg. 86-93)
- **Chg** GEOL A655 Permafrost (Stacked with GEOL A455)(3 cr)(3+0)(pg. 94-101)
- **Chg** GEOL A656 Geoarchaeology (Stacked with GEOL A456)(3 cr)(3+0)(pg. 102-110)
- **Chg** GEOL A660 Environmental Geochemistry (Stacked with GEOL A460)(3 cr)(3+0)(pg. 111-120)
- **Chg** GEOL A690 Graduate Topics in Geology (stacked with GEOL A490)(1-4 cr)(1-4+0)(pg. 121-130)

VI. **Administrative Reports**

A. Associate Dean of the Graduate School David Yesner

B. Graduate Student Jaime Spatrisano

C. University Registrar Lora Volden
VII. Chair’s Report
   A. GAB Chair- Arlene Schmuland
   B. Faculty Alliance
   C. Graduate Council

VIII. Old Business

IX. New Business

X. Informational Items and Adjournment
Graduate Academic Board

April 26, 2013
ADM 204
9:30 to 11:30

I. Roll Call

(x) Arlene Schmuland (x) Peter Olsson (x) Zhaohui (Joey) Yang
(x) Tim Hinterberger (x) Susan Garton (x) FSAL vacancy (CAS)
() Patricia Sandberg (x) Mary Dallas Allen (x) FSAL Vacancy
(x) Greg Protasel () Deb Russ (x) FSAL Vacancy
(x) Yoshito Kanamori (x) Hsing-Wen Hu (x) Lora Volden
(x) David Yesner
(x) FSAL Vacancy
(x) Jaime Spatrisano (x) Scheduling & Publications

Ex-Officio Members:

()  Patricia Sandberg (x ) Mary Dallas Allen () FSAL Vacancy  (x) David Yesner
(x)  Greg Protasel  () Deb Russ  () FSAL Vacancy  (x) Lora Volden
(x) Yoshito Kanamori (x) Hsing-Wen Hu                  () Jaime Spatrisano  (x ) Scheduling & Publications

II. Approval of Agenda (pg. 1-2)

Approved

III. Approval of Meeting Summary (pg. 3-4)

Approved

IV. Program/Course Action Request – Second Reading

Add BIOL A604 Experimental Design for Cell/Molecular Biologists (3 cr)(3+0)(pg. 5-8)

Unanimously Approved

Add BIOL A605 Graduate Proseminar in Sciences (3 cr)(3+0)(pg. 9-13)

Unanimously Approved

V. Program/Course Action Request - First Readings

Chg Master of Science, Biological Sciences (pg. 14-22)

Waive first reading, approve for second

Chg EDL A639 Policy, Law, & Ethics in Education (3 cr)(3+0)(pg. 23-28)
Add EDL A650 Human Resources for Principals (2 cr)(2+0)(pg. 29-33)
Add EDL A651 Teacher Supervision and Evaluation (2 cr)(2+0)(pg. 34-38)
Add EDL A652 Professional Development (2 cr)(2+0)(pg. 39-43)
Add EDL A653 Budget and Facility Management for Principals (2 cr)(2+0)(pg. 44-48)
Add EDL A654 Building Community Relations (2 cr)(2+0)(pg. 49-53)
Add EDL A656 Leadership for Social Justice in Education (2 cr)(2+0)(pg. 54-58)

All EDL Courses are accepted for first reading. Another first reading will take place in Fall 2013 after curriculum documents have been resubmitted.

Add PM A695 Project Management Internship (1-6 cr)(1-6+0)(pg. 59-62)

Waive first reading, approve for second

Chg BA A603 Fundamentals of Finance (3 cr)(3+0)(pg. 63-67)
Chg BA A636 Financial Decision Making (3 cr)(3+0)(pg. 68-71)
Chg BA A686 Management Simulation (3 cr)(3+0)(pg. 72-77)

No initiator present

VI. Administrative Reports

A. Associate Dean of the Graduate School David Yesner

Graduate School reviewed the constitution and by-laws; the by-laws were approved, but the constitution was not

Doctoral programs are moving ahead

Hooding ceremony is May 4th at 10:00 in the Wendy Williamson

A new fund has been set up for the Graduate School for Excellence in Graduate Education

B. Graduate Student Jaime Spatrisano

C. University Registrar Lora Volden

Language credit by placement – intending to change the language in the catalog from ‘B or better’ to ‘B or higher’
Discussed the definition of half-time graduate students

Motion: To define half-time graduate students as taking at least five credits

Unanimously Approved

VII. Chair’s Report
   A. GAB Chair- Arlene Schmuland
   B. Faculty Alliance
   C. Graduate Council

VIII. Old Business

IX. New Business
   A. Election of new chair
      Arlene Schmuland has been nominated and elected for the 2013-2014 Chair
   B. Policy on Returning Students / Re Enrollment (pg. 78)
      Presented as informational item
   C. Chapter 12 Catalog Copy Revisions (79-94)
      Changes were recommended
      Unanimously Approved
   D. Review of goals
      Proposed goals and yearlong agenda:
      1. Continue the mission of the Board as detailed in Faculty Senate Bylaws 3b.
      2. In coordination with UAB, develop training for college curriculum committees and faculty initiators.
      3. Liaise with the Graduate Council to identify issues with chapter 12 of the Catalog.
      4. Update the Curriculum Handbook, as needed.
      5. Develop a FAQ for curriculum questions.

X. Informational Items and Adjournment
## Course Action Request

**University of Alaska Anchorage**

**Proposal to Initiate, Add, Change, or Delete a Course**

<table>
<thead>
<tr>
<th>1a. School or College</th>
<th>CB CBPP</th>
<th>1b. Division</th>
<th>ADBP Division of Business Programs</th>
<th>1c. Department</th>
<th>BA</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Course Prefix</td>
<td>BA</td>
<td>3. Course Number</td>
<td>A603</td>
<td>4. Previous Course Prefix &amp; Number</td>
<td>N/A</td>
</tr>
<tr>
<td>5a. Credits/CEUs</td>
<td></td>
<td>5b. Contact Hours</td>
<td>(Lecture + Lab)</td>
<td></td>
<td>(3+0)</td>
</tr>
<tr>
<td>6. Complete Course Title</td>
<td></td>
<td>Abbreviated Title for Transcript (30 character)</td>
<td>Fundamentals of Finance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Type of Course</td>
<td>☑ Academic</td>
<td>☐ Preparatory/Development</td>
<td>☐ Non-credit</td>
<td>☐ CEU</td>
<td>☐ Professional Development</td>
</tr>
<tr>
<td>8. Type of Action:</td>
<td>☐ Add</td>
<td>☐ Change</td>
<td>☐ Delete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Repeat Status No</td>
<td></td>
<td># of Repeats</td>
<td>Max Credits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Grading Basis</td>
<td>☑ A-F</td>
<td>☐ P/NP</td>
<td>☐ NG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Implementation Date</td>
<td></td>
<td>semester/year</td>
<td>From: Spring/2014</td>
<td>To: /9999</td>
<td></td>
</tr>
<tr>
<td>12. Cross Listed with</td>
<td>☐</td>
<td>Stacked with</td>
<td>Cross-Listed Coordination Signature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13a. Impacted Courses or Programs:</td>
<td>List any programs or college requirements that require this course.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13b. Coordination Email</td>
<td>Date: 04/05/2013</td>
<td>13c. Coordination with Library Liaison</td>
<td>Date: 04/05/2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. General Education Requirement</td>
<td></td>
<td>Mark appropriate box: Oral Communication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Course Description (suggested length 20 to 50 words)</td>
<td>Surveys the practice of corporate finance. Topics covered include: Time Value of Money, financial statements analysis, valuation of securities, capital budgeting, risk and return, cost of capital. Special Note: This is a foundational course for MBA students who have not taken any course in finance at the baccalaureate level. Does not count toward MBA degree.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16a. Course Prerequisite(s) (list prefix and number)</td>
<td>ACCT A601</td>
<td>16b. Test Score(s)</td>
<td>N/A</td>
<td>16c. Co-requisite(s) (concurrent enrollment required)</td>
<td>N/A</td>
</tr>
<tr>
<td>16d. Other Restriction(s)</td>
<td>☑ College</td>
<td>☐ Major</td>
<td>☐ Class</td>
<td>☐ Level</td>
<td>16e. Registration Restriction(s) (non-codable)</td>
</tr>
<tr>
<td>17. ☑ Mark if course has fees Standard CBPP computer lab fee</td>
<td></td>
<td>18. ☐ Mark if course is a selected topic course</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Justification for Action</td>
<td>Update course description, textbook, bibliography, and student learning outcomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Initiator Name (typed): Nalinaksha Bhattachayrra**

Initiator Signed Initials: __________ Date: __________

**13b. Coordination Email**

Date: 04/05/2013

submitted to Faculty Listserv: [uaa-faculty@lists.uaa.alaska.edu](mailto:uaa-faculty@lists.uaa.alaska.edu)

**14. General Education Requirement**

Mark appropriate box:
- Oral Communication
- Written Communication
- Social Sciences
- Quantitative Skills
- Natural Sciences
- Humanities
- Integrative Capstone

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

Surveys the practice of corporate finance. Topics covered include: Time Value of Money, financial statements analysis, valuation of securities, capital budgeting, risk and return, cost of capital. Special Note: This is a foundational course for MBA students who have not taken any course in finance at the baccalaureate level. Does not count toward MBA degree.

**16a. Course Prerequisite(s) (list prefix and number)**

ACCT A601

**16b. Test Score(s)**

N/A

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

N/A

**16d. Other Restriction(s)**

- ☑ College
- ☐ Major
- ☐ Class
- ☐ Level

**16e. 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**

Update course description, textbook, bibliography, and student learning outcomes

**Initiator (faculty only): Nalinaksha Bhattachayrra**

Initiator (TYPE NAME)

- Approved
- Disapproved

**Dean/Director of School/College**

- Approved
- Disapproved

**Department Chairperson**

- Approved
- Disapproved

**Curriculum Committee Chairperson**

- Approved
- Disapproved

**Provost or Designee**

- Approved
- Disapproved

**Curriculum Committee Chairperson**

- Approved
- Disapproved
### 13a. Impacted courses or programs BA A603

<table>
<thead>
<tr>
<th>Impacted program/course</th>
<th>Date of coordination</th>
<th>Chair/Coordinator contacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT A650</td>
<td>03/22/2013</td>
<td>C. Patrick Fort</td>
</tr>
<tr>
<td>BA A615</td>
<td>03/22/2013</td>
<td>Ed Forrest</td>
</tr>
<tr>
<td>BA A636</td>
<td>03/22/2013</td>
<td>Ed Forrest</td>
</tr>
<tr>
<td>BA A653</td>
<td>03/22/2013</td>
<td>Ed Forrest</td>
</tr>
<tr>
<td>BA A685</td>
<td>03/22/2013</td>
<td>Ed Forrest</td>
</tr>
<tr>
<td>BA A692</td>
<td>03/22/2013</td>
<td>Ed Forrest</td>
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</table>
I. Date Initiated
   February 2, 2013

II. Course Information
   College/School: College of Business and Public Policy
   Department: Business Administration
   Program: Master of Business Administration
   Course Title: Fundamentals of Finance
   Course Number: BA A603
   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: Surveys the practice of corporate finance. Topics covered include: Time Value of Money, financial statements analysis, valuation of securities, capital budgeting, risk and return, cost of capital. Special Note: This is a foundational course for MBA students who have not taken any course in finance at the baccalaureate level. Does not count toward MBA degree.
   Course Prerequisites: ACCT A601
   Registration Restrictions: Graduate standing
   Fees: Standard CBPP computer lab fee

III. Course Activities
   A. Lectures
   B. Discussions
   C. Mini-case analyses

IV. Course Level Justification
   This is an MBA foundational course. Prior knowledge of introductory accounting, macroeconomics, microeconomics, and statistics is essential for understanding the concepts presented in class.
V.  Outline
A. Introduction to Financial Management
B. Financial Statements, Taxes, and Cash Flows
C. Financial Markets, Institutions, and Interest Rates
D. Time Value and Security Valuation
E. Risk and Rate of Return
F. Capital Budgeting Decisions
G. Sources and Costs of Long-Term Financing
H. Global Financial Management

VI. Suggested Text

VII. Bibliography

Online resources include:
http://www.forbes.com
http://www.fortune.com/fortune
VIII. Instructional Goals and Student Learning Outcomes

A. Instructional Goals

<table>
<thead>
<tr>
<th>The instructor will:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Present an overview of financial management</td>
</tr>
<tr>
<td>2. Discuss the use of financial statement analysis in assessing the strength and weakness of a firm</td>
</tr>
<tr>
<td>3. Discuss the workings of the financial markets and its participants</td>
</tr>
<tr>
<td>4. Explain the concept of compounding and the time value of a cash-flow sequence</td>
</tr>
<tr>
<td>5. Discuss the issuance and valuation of corporate securities</td>
</tr>
<tr>
<td>6. Discuss risk-return trade-off and portfolio risk</td>
</tr>
<tr>
<td>7. Analyze a capital project</td>
</tr>
<tr>
<td>8. Discuss the concept of Cost of Capital.</td>
</tr>
</tbody>
</table>

B. Student Learning Outcomes

<table>
<thead>
<tr>
<th>Students will be able to:</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Demonstrate an understanding of alternate forms of business organizations</td>
<td>Quiz, homework, or exam</td>
</tr>
<tr>
<td>2. Evaluate financial statements as they relate to business profitability and cash-flows</td>
<td>Quiz, homework, or exam</td>
</tr>
<tr>
<td>3. Demonstrate an understanding of financial markets, institutions, and interest rates</td>
<td>Quiz, homework, or exam</td>
</tr>
<tr>
<td>4. Formulate the risk and return trade-off relationships</td>
<td>Quiz, homework, or exam</td>
</tr>
<tr>
<td>5. Explain the time value of money.</td>
<td>Quiz, homework, or exam</td>
</tr>
<tr>
<td>6. Determine the intrinsic value of common stocks, bonds, and hybrid securities</td>
<td>Quiz, homework, or exam</td>
</tr>
<tr>
<td>7. Evaluate capital projects and sources of financing</td>
<td>Quiz, homework, or exam</td>
</tr>
</tbody>
</table>
Course Action Request
University of Alaska Anchorage
Proposal to Initiate, Add, Change, or Delete a Course

<table>
<thead>
<tr>
<th>1a. School or College</th>
<th>2. Course Prefix</th>
<th>3. Course Number</th>
<th>4. Previous Course Prefix &amp; Number</th>
<th>5a. Credits/CEUs</th>
<th>5b. Contact Hours (Lecture + Lab)</th>
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</thead>
<tbody>
<tr>
<td>CB CBPP</td>
<td>BA</td>
<td>A636</td>
<td>N/A</td>
<td>3</td>
<td>(3+0)</td>
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</tbody>
</table>

6. Complete Course Title
Financial Decision Making

7. Type of Course
☑ Academic □ Preparatory/Development □ Non-credit □ CEU □ Professional Development

8. Type of Action:
☐ Add ☑ Change ☐ Delete

If a change, mark appropriate boxes:
☐ Prefix ☑ Course Number ☐ Contact Hours ☐ Repeat Status ☐ Grading Basis ☐ Cross-Listed/Stacked
☐ Title ☑ Course Prerequisites ☐ Co-requisites ☐ Test Score Prerequisites ☐ Registration Restrictions
☐ Other Restrictions ☐ Class ☐ Level ☐ 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: Spring/2014 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.

<table>
<thead>
<tr>
<th>Impacted Program/Course</th>
<th>Catalog Page(s)</th>
<th>Impact</th>
<th>Date of Coordination</th>
<th>Chair/Coordinator Contacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General Management, MBA</td>
<td>03/25/2013</td>
<td>Ed Forrest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. BA A655</td>
<td>03/25/2013</td>
<td>Ed Forrest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Initiator Name (typed): Nalinaksha Bhattachayrra
Initiator Signed Initials: ____________________ Date: __________

13b. Coordination Email
Date: 04/05/2013
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison
Date: 04/05/2013

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 course in financial decision making presenting analytical techniques and concepts. Includes risk and return relationships, Capital Asset Pricing Model (CAPM) and Markowitz diversification, free cash flow and corporate valuation; options and working capital management.

16a. Course Prerequisite(s) (list prefix and number)
BA A603

16b. Test Score(s)
N/A

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

16d. Other Restriction(s)
☐ College ☐ Major ☐ Class ☐ Level

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

16f. Mark if course has fees
Standard CBPP computer lab fee

17. ☐ Mark if course is a selected topic course

18. Justification for Action
Update course description, textbook, bibliography, and outline.

19. Initiator (faculty only)
Nalinaksha Bhattachayrra
Initiator (TYPE NAME)

☐ Approved ☐ Disapproved
Date: __________

Dean/Director of School/College
Date: __________

Approval Process:
☑ Approved ☐ Disapproved
Undergraduate/G Graduate Academic
Date: __________

Board Chairperson
Date: __________

Provost or Designee
Date: __________
I. Date Initiated: April 4, 2013

II. Course Information
College/School: College of Business and Public Policy
Department: Business Administration
Program: Master of Business Administration, General Management
Course Title: Financial Decision Making
Course Number: BA A636
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: Advanced course in financial decision making presenting analytical techniques and concepts. Includes risk and return relationships, Capital Asset Pricing Model (CAPM) and Markowitz diversification, free cash flow and corporate valuation; options and working capital management.
Prerequisites: BA A603
Registration Restrictions: Graduate standing
Fees: Standard CBPP computer lab fee

III. Course Activities
A. Lectures
B. Discussion
C. Guest lecturers
D. Valuation project

IV. Course Level Justification
This is a graduate-level course in financial decision making finance that requires integration of knowledge acquired in baccalaureate-level accounting, statistics, and corporate finance courses.
V. Outline
A. Multifactor Asset Pricing Model
B. Free Cash Flow and Corporate Valuation
C. Risk Analysis in Capital Budgeting
D. Real Options
E. Capital Structure Theories
F. Financing with Convertible Securities
G. Mergers and Acquisitions
H. Corporate Bankruptcies

VI. Suggested Text


VIII. Bibliography


Useful information on financial institutions is available on following websites.
http://www.businessweek.com
http://www.cbt.com
http://www.federalreserve.gov
http://www.forbes.com
http://www.fortune.com/fortune
http://www.nasdaq.com
http://www.nyse.com
IX. Instructional Goals and Student Outcomes

<table>
<thead>
<tr>
<th>A. Instructional Goals</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The instructor will:</strong></td>
<td></td>
</tr>
<tr>
<td>1. Present risk and return relationships</td>
<td></td>
</tr>
<tr>
<td>2. Present CAPM and Markowitz Diversification</td>
<td></td>
</tr>
<tr>
<td>3. Discuss free cash and corporate valuation</td>
<td></td>
</tr>
<tr>
<td>4. Discuss options</td>
<td></td>
</tr>
<tr>
<td>5. Discuss working capital management</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Student Learning Outcomes</th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students will be able to:</strong></td>
<td></td>
</tr>
<tr>
<td>1. Evaluate risk and return relationships</td>
<td>Exam, homework, or quiz</td>
</tr>
<tr>
<td>2. Explain CAPM and Markowitz Diversification</td>
<td>Exam, homework, or quiz</td>
</tr>
<tr>
<td>3. Demonstrate valuation of business.</td>
<td>Exam, homework, or quiz</td>
</tr>
<tr>
<td>4. Demonstrate an understanding of options</td>
<td>Exam, homework, or quiz</td>
</tr>
<tr>
<td>5. Explain the principles of working capital management</td>
<td>Exam, homework, and quiz</td>
</tr>
</tbody>
</table>
### Course Action Request

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

---

**1. School or College**  
CB CBPP

**2. Course Prefix**  
BA

**3. Course Number**  
A686

**4. Previous Course Prefix & Number**  
N/A

**5a. Credits/CEUs**  
3

**5b. Contact Hours**  
(3+0)

**6. Complete Course Title**  
Management Simulation

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

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

---

**9. Repeat Status No**  
# of Repeats  
Max Credits

**10. Grading Basis**  
☒ A-F  
☐ P/NP  
☐ NG

**11. Implementation Date**  
From: Spring/2014  
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.

<table>
<thead>
<tr>
<th>Impacted Program/Course</th>
<th>Catalog Page(s) Impacted</th>
<th>Date of Coordination</th>
<th>Chair/Coordinator Contacted</th>
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<tbody>
<tr>
<td>1. General Management, MBA</td>
<td>296</td>
<td>03/18/2013</td>
<td>Ed Forrest</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
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<tr>
<td>3.</td>
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**13b. Coordination Email**  
Date: 03/22/2013  
Submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

**13c. Coordination with Library Liaison**  
Date: 03/22/2013

---

**14. General Education Requirement**

Mark appropriate box:

- ☐ Oral Communication  
- ☐ Written Communication  
- ☐ Quantitative Skills  
- ☐ Humanities  
- ☐ Social Sciences  
- ☐ Natural Sciences  
- ☐ Integrative Capstone

---

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

Students experience running a business as a member of a senior management team. Teams select competitive strategies, execute them within a simulated online decision-making framework and examine how a firm's production, marketing, R&D, HR, and financial operations interact with one another in a competitive market. Teams compete simultaneously with fellow classmates and student teams from universities around the world.

**16a. Course Prerequisite(s) (list prefix and number)**  
N/A

**16b. Test Score(s)**  
N/A

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

**16d. Other Restriction(s)**

- ☐ College  
- ☐ Major  
- ☐ Class  
- ☐ Level

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

Graduate standing; completion of undergraduate or graduate course in finance and accounting.

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

**18. Mark if course is a selected topic course**

---

**19. Justification for Action**

Update course description, bibliography, and textbook.

---

**Initiator (faculty only) Ed Forrest**

Initiator (TYPE NAME)

- ☐ Approved  
- ☐ Disapproved  
- ☐ Undergraduate/Graduate Academic  
- ☐ Provost or Designee

Initiator Signed Initials: _________  
Date: __________

---

**1a. School or College**  
CB CBPP

**2. Course Prefix**  
BA

**3. Course Number**  
A686

**4. Previous Course Prefix & Number**  
N/A

**5a. Credits/CEUs**  
3

**5b. Contact Hours**  
(3+0)

---

**Initiator Signed Initials: _________  
Date: __________

---

Dean/Director of School/College  
Date

---

Department Chairperson  
Date

---

Board Chairperson  
Date

---

Provost or Designee  
Date
I. Date Initiated: August 20, 2013

II. Course Information
   College/School: College of Business and Public Policy
   Department: Business Administration
   Program: Master of Business Administration, General Management
   Course Title: Management Simulation
   Course Number: BA A686
   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: Students experience running a business as a member of a senior
   management team. Teams select competitive strategies, execute them within a
   simulated online decision-making framework and examine how a firm's production,
   marketing, R&D, HR, and financial operations interact with one another in a
   competitive market. Teams compete simultaneously with fellow classmates and
   student teams from universities around the world.
   Course Prerequisites: None
   Registration Restrictions: Graduate standing; completion of undergraduate or
   graduate course in finance and accounting.
   Fees: Standard CBPP computer lab fee

III. Course Activities
   A. Lectures and discussions
   B. In-class exercises
   C. Online assignments
   D. Team conferences
   E. Simulation participation

IV. Course Level Justification
   This is an advanced 600-level course that integrates and applies the key concepts and
   management principles of all functional areas of business.
V. Outline

A. Introduction and Overview
   1. Introduction to simulation
   2. Definition of functional domains: nature and scope of decision matrices

B. Situation Analysis: Strengths, Weaknesses, Opportunities, Threats (SWOT)
   1. Consumer segments, buying criteria and product perceptions
   2. Mapping competitive position
   3. Demand analysis
   4. Capacity analysis
   5. Margin analysis

C. Strategic Planning
   1. Mission and vision
   2. Growth strategies
   3. Competitive strategies

D. Performance Assessment
   1. Financial rations
   2. Leveraging competitive strategy and measures of success

E. Developing and Implementing the Business Plan
   1. Functional alignment and tactical decision making
   2. Developing sales forecasts and evaluation product success

F. Simulation Trial Rounds
   1. Performance evaluation
   2. Policy reconsiderations and decisions

G. Simulation Competitive Rounds
   1. Strategic and tactical decisions: logic, consequences and adjustments
   2. Final report and presentation: lessons learned

VI. Bibliography


Marsden, Alan. "Strategic management; which way to competitive advantage?" 
<http://www.cbpp.uaa.alaska.edu/afef/NewStratMgt.htm>.


*Classics:*


VII. Instructional Goals and Student Learning Outcomes

A. Instructional Goals.
   The instructor will:

   1. Provide a comprehensive explanation and demonstration of the essential components and process of strategic planning and marketing management

   2. Define and delineate the role, range, benefits, and drawbacks of key competitive strategies

   3. Discuss and demonstrate the logic and importance of functional integration with competitive strategy

   4. Explain market and financial performance assessment techniques and criteria

   5. Describe and demonstrate the characteristics of marketing, market segmentation, and target marketing

   6. Define situation and SWOT analysis and illustrate their application to strategic decision making and business plan formulation

B. Student Learning Outcomes.
   Students will be able to:

<table>
<thead>
<tr>
<th></th>
<th>Assessment Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Develop and implement strategies and plans to enhance organizational performance</td>
<td>In-class exercises and simulation performance</td>
</tr>
<tr>
<td>2. Formulate, implement, and assess the effectiveness of distinct competitive strategies</td>
<td>In-class exercises and simulation performance</td>
</tr>
<tr>
<td>3. Determine and implement specific tactical decisions that demonstrate functional alignment with selected competitive strategies</td>
<td>In-class exercises and simulation performance</td>
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<tr>
<td>4.</td>
<td>Select—according to operant competitive strategy—appropriate performance assessment measures</td>
</tr>
<tr>
<td>5.</td>
<td>Conduct situational analyses of consumers, competitor, and market conditions</td>
</tr>
<tr>
<td>6.</td>
<td>Formulate a business plan based on the results of a market situation and SWOT analysis</td>
</tr>
</tbody>
</table>
MEMORANDUM

Subject: Minor Change to Master of Public Health (MPH) Catalog Copy
Date: April 18, 2013
From: Rhonda Johnson, MPH Program Coordinator

A proposed addition to the Catalog Copy for the Master in Public Health in Public Health Practice is attached. Presently, the catalog copy does not include the Public Health Practice Track-Specific Competencies. Inclusion of the Public Health Practice Track-Specific Competencies is in keeping with guidelines for the Council on Education for Public Health (CEPH), the national accrediting organization for graduate programs in public health. The proposed addition makes our program more consistent with national norms and does not have any resource implications.
### Program/Prefix Action Request
#### University of Alaska Anchorage
Proposal to Initiate, Add, Change, or Delete a Program of Study or Prefix

<table>
<thead>
<tr>
<th>1a. School or College</th>
<th>1b. Department</th>
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<tbody>
<tr>
<td>CH College of Health</td>
<td>Health Sciences</td>
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<table>
<thead>
<tr>
<th>2. Complete Program Title/Prefix</th>
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<tbody>
<tr>
<td>Master of Public Health</td>
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<th>3. Type of Program</th>
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<td>Choose one from the appropriate drop down menu:</td>
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<tr>
<td>Undergraduate: or Graduate:</td>
</tr>
<tr>
<td><strong>CHOOSE ONE</strong></td>
</tr>
<tr>
<td>Master of Public Health</td>
</tr>
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This program is a Gainful Employment Program:  
- [ ] Yes  
- [x] No

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<tr>
<td>□ Change</td>
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<tr>
<td>□ Inactivate</td>
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<table>
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<tr>
<th>5. Implementation Date (semester/year)</th>
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<td>From: Fall/2013</td>
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<td>To: /9999</td>
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<table>
<thead>
<tr>
<th>6a. Coordination with Affected Units</th>
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</thead>
<tbody>
<tr>
<td>Department, School, or College:</td>
</tr>
<tr>
<td>College of Health</td>
</tr>
</tbody>
</table>

Initiator Name (typed): Virginia Miller  
Initiator Signed Initials: 

Date: 

<table>
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<tr>
<th>6b. Coordination Email submitted to Faculty Listserv (<a href="mailto:uaa-faculty@lists.uaa.alaska.edu">uaa-faculty@lists.uaa.alaska.edu</a>)</th>
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<th>6c. Coordination with Library Liaison</th>
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<tbody>
<tr>
<td>Date: 4.19.13</td>
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<table>
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<tr>
<th>7. Title and Program Description - Please attach the following:</th>
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</table>
| [x] Cover Memo  
[x] Catalog Copy in Word using the track changes function |

<table>
<thead>
<tr>
<th>8. Justification for Action</th>
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<tbody>
<tr>
<td>Minor addition of the MPH Public Health Practice Track-Specific Competencies will align with national accreditation guidelines.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Initiator (faculty only)</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virginia Miller</td>
<td></td>
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</tbody>
</table>

<table>
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<tr>
<th>Initiator (TYPE NAME)</th>
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<table>
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<tr>
<th>Approved \ Disapproved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virginia Miller</td>
</tr>
<tr>
<td>Department Chair</td>
</tr>
<tr>
<td>College/School Curriculum Committee Chair</td>
</tr>
</tbody>
</table>

21
Master of Public Health, Public Health Practice

Public health embraces an ecological approach that recognizes the interactions and relationships among multiple determinants of health. Public health professionals typically take a community or population focus. Our graduate program prepares public health practitioners who identify and assess needs of populations; plan, implement and evaluate programs to address those needs; and otherwise assure conditions that protect and promote the health of populations. The Master of Public Health (MPH) in Public Health Practice is an interdisciplinary degree designed to provide a broad background to meet the challenges of the diverse and complex field of public health, with a particular focus on the needs of Alaska and the circumpolar north. Students with backgrounds in the natural sciences, social sciences, health professions, human services, business, education and law have successfully entered the field of public health at the graduate level.

Both mid-career students and recent graduates may pursue their careers with minimal disruption while working on the MPH degree, because all required courses are offered via distance format. Students are required to attend one mandatory meeting in Anchorage each year, typically in conjunction with the Alaska Public Health Summit, and are expected to communicate frequently with their MPH academic advisor. In-person oral defense of the capstone thesis in Anchorage is also expected of the student at the end of the MPH program.

This degree requires core courses in health education and behavioral sciences, environmental and occupational health, health management and policy, biostatistics, and epidemiology. It also includes coursework in research methods, program evaluation, circumpolar health issues and management of public health emergencies and disasters, as well as the opportunity to create an individualized emphasis as the foundation for the required capstone project.

MPH Mission Statement

The MPH in Public Health Practice program at the University of Alaska Anchorage enhances health in diverse communities across Alaska, the circumpolar north, the nation, and the world. This is accomplished through excellence in the education of public health practice leaders, scientific investigation of public health issues, and engaging communities in an organized effort to identify, assess, prevent, and mitigate community health challenges.

MPH Program Goals and Program-Level Objectives

Based on national accreditation criteria and quality standards, the program goals are:

Service

To provide leadership and service to enhance public health practice at the local, state, national and international levels.

1. Provide expertise to public health agencies and organizations in the surrounding region in order to find innovative solutions to existing public health problems.
2. Promote collaboration with a variety of public and private agencies in the rural areas and the surrounding region to meet current and future public health practice needs.
3. Provide leadership to national, regional, and state public health and community health education professional organizations.

Teaching and Research

To develop an academic public health program that contributes to and helps train students and support faculty to participate in conducting and translating the growing body of knowledge to enhance the health of communities and strengthen evidence-based public health practice.

1. Support a local and global research agenda through enhanced international collaboration and increased graduate student involvement in research.
2. Increase the opportunities for students to participate in and learn from faculty-directed research designed to inform public health decision-making.
3. Facilitate qualitative, quantitative, and mixed-method research.
4. Stimulate innovative, interdisciplinary research (grounded in the ecological model) that will help solve public health problems.
5. Facilitate the publication and dissemination of student and faculty research.
6. Strengthen and support student and faculty capacity for conducting ethical research.
**Workforce Development**

To provide an instructional program that enhances public health education practice and strengthens the capacity of the existing public health workforce.

1. Conduct needs and/or asset assessments of communities or professionals in region to determine needs for workforce capacity building.
2. Conduct continuing education programs that help meet the needs determined in the assessments above.
3. Facilitate student collaboration with faculty to participate in community and continuing education.
4. Periodically evaluate the current program, student/faculty perceptions and experiences.
5. Revise or enhance courses, the program, opportunities, and resources based on an evolving body of knowledge and on results of periodic evaluations.
6. Create and/or enhance mechanisms (media, pamphlets/fliers, meetings, seminars, and others) to provide educational opportunities regarding ongoing and emerging public health issues, especially those based on community concerns.
7. Provide student MPH opportunities in communities to disseminate information and foster action on public health issues.

**Student Learning Outcomes**

To prepare public health professionals who can demonstrate attainment of our MPH program competencies.

1. Give, solicit and receive oral, written, graphic and numerical information, taking into consideration target audience and using a variety of mechanisms in both formal and informal settings. [Competency: Communication]
2. Interact sensitively and professionally with individuals and communities with diverse characteristics. [Competency: Diversity and cultural proficiency]
3. Create and communicate a shared vision to improve the public’s health.
4. Develop and champion solutions to population health challenges.
5. Demonstrate ethical choices, values and professional practices implicit in public health decisions, giving consideration to the effect of choices on community stewardship, equity, social justice and accountability, as well as to commit to personal and institutional development. [Competency: Professionalism and ethics]
6. Design, develop, implement and evaluate strategies and interventions to improve individual and community health. [Competency: Program planning and assessment]
7. Recognize dynamic interactions among human and social systems and how they affect the relationships among individuals, groups, organizations and communities. [Competency: Systems thinking]
8. Utilize biostatistics in the practice of public health. [Competency: Biostatistics]
9. Design, develop, implement and evaluate approaches for assessing, preventing and controlling environmental hazards that pose risks to human health and safety. [Competency: Environmental health]
10. Utilize epidemiological skills for informing scientific, ethical, economic, and public health policy decisions on health issues. [Competency: Epidemiology]
11. Understand the main components and issues of the organization, financing and delivery of health services and public health systems in the US. [Competency: Health policy and management]
12. Understand the role of social, behavioral and community factors in both the onset and solution of public health problems. [Competency: Social and behavioral science].

**Environment**

To create an environment where diverse faculty, students, and staff work collaboratively and respectfully to promote public health.

1. Maintain a diverse student body that reflects the diversity of the region we serve.
2. Maintain a student body with diverse educational and professional backgrounds.
3. Provide a multi-disciplinary, ethnically diverse, and experienced public health faculty and staff.
4. Provide students with contact and involvement with diverse communities and peoples within and outside the MPH program, that provide and/or enhance knowledge and experience.
5. Annually monitor and continually evaluate processes for recruitment and admission into the program.

**MPH Public Health Practice Track-Specific Competencies**

Students completing the MPH Program will have public health practice knowledge and skills in the following:

1. Community Needs Assessment- Diagnose public health problems in the community and gather the information needed to determine when and whether to involve public health specialist and other experts.
2. Public Health Response- Respond quickly and effectively to emerging public health concerns, coordinating the response and enlisting the help of specialist as appropriate.

3. Applied Research and Evaluation- Apply the core public health research and evaluation skills in real world situations where the practitioner may have little control.

**Professional Program Fee**

A professional program fee is required of all students in the MPH program in addition to course tuition fees, lab fees, course material fees, and student activity fees. The professional program fee is a sum equal to 50 percent of resident tuition, and is charged upon enrollment in MPH courses. The fee contributes directly to program support.

**Admission Requirements**

See the beginning of this chapter for Admission Requirements for Graduate Degrees. In addition, students should also meet the following criteria when applying for admission to the MPH program:

1. Have earned a baccalaureate degree from a regionally accredited institution in the United States, or a foreign equivalent.
2. Have a GPA of at least 3.00 (B average on a 4.00 scale) in their baccalaureate degree.
3. Submit documentation indicating a grade of 2.00 (C) or higher in an introductory statistics course which covers descriptive and inferential statistics.
4. Provide copies of one or more substantial professional writing samples.
5. Submit an essay explaining how and why obtaining the MPH degree would contribute to the student’s career goals.
6. Completed applications are reviewed twice each year. The Department of Health Sciences deadlines are March 1 for fall admission and October 1 for spring admission. UAA admission must be successfully processed before the Department of Health Sciences will consider an application complete. The UAA process may take as long as four months, so applicants are encouraged to apply to the university first and early.

Note also that:

1. To the extent that there are limited positions available in the program, preference may be given to residents of the state of Alaska as defined by the university’s policy on residency for tuition purposes.
2. Preference may also be given to applicants with two or more years work experience in the field of public health. Such applicants must submit documentation of their public health-related work experience, and a request for special consideration to the admissions committee.

**Academic Progress**

In order to maintain satisfactory academic progress toward the degree, a student in the MPH program is expected to complete a minimum of 6 semester credits each academic year, beginning with the first semester of enrollment. For satisfactory academic progress, the 6 semester credits may consist of prerequisite courses or program courses. Failure to comply with the 6 credit minimum each academic year may result in the student being removed from the degree program. See the beginning of this chapter for additional requirements to remain in good standing, and to maintain satisfactory academic progress toward the degree.

**Candidacy Requirements**

See the section Advancement to Candidacy at the beginning of this chapter.

**Graduation Requirements**

See University Requirements for Graduate Degrees at the beginning of this chapter.

**Program Requirements**

1. Complete the MPH core courses (28 credits total):

   - HS A605 Public Health and Society 3
   - HS A610 Environmental and Occupational Health 3
   - HS A615 Health Services Administration 3
   - HS A624 Circumpolar Health Issues 3
   - HS/NS A625 Biostatistics for Health Professionals 3
   - HS/NS A626 Principles of Epidemiology 3
   - HS/SWK A628 Program Evaluation 3
   - HS A629 Public Health Research Tools and Methods 4
   - HS A630 Public Health Emergencies and Disasters 3

2. Complete three focused public health-related emphasis courses at the 600-level (graduate) with advisor approval 9
3. Complete a Project Practicum (HS A698) or
   Thesis Practicum (HS A699) 5
4. A total of 42 credits are required for the degree.

FACULTY

Betty J. Monsour, Associate Professor, Betty.Monsour@uaa.alaska.edu
Gabriel Garcia, Assistant Professor, GGarcia16@uaa.alaska.edu
Liz Hodges Snyder, Assistant Professor, EHodges4@uaa.alaska.edu
Rhonda M. Johnson, Professor/MPH Coordinator, Rhonda.Johnson@uaa.alaska.edu
Jenny Miller, Assistant Professor, VLMiller2@uaa.alaska.edu
Nancy Nix, Assistant Professor, NANix@uaa.alaska.edu
Master of Public Health, Public Health Practice

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   3. Provide leadership to national, regional, and state public health and community health education professional organizations.

**Teaching and Research**

B. To develop an academic public health program that contributes to and helps train students and support faculty to participate in conducting and translating the growing body of knowledge to enhance the health of communities and strengthen evidence-based public health practice.
   1. Support a local and global research agenda through enhanced international collaboration and increased graduate student involvement in research.
   2. Increase the opportunities for students to participate in and learn from faculty-directed research designed to inform public health decision-making.
   3. Facilitate qualitative, quantitative, and mixed-method research.
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2. Interact sensitively and professionally with individuals and communities with diverse characteristics. [Competency: Diversity and cultural proficiency]
3. Create and communicate a shared vision to improve the public’s health.
4. Develop and champion solutions to population health challenges.
5. Demonstrate ethical choices, values and professional practices implicit in public health decisions, giving consideration to the effect of choices on community stewardship, equity, social justice and accountability, as well as to commit to personal and institutional development. [Competency: Professionalism and ethics]
6. Design, develop, implement and evaluate strategies and interventions to improve individual and community health. [Competency: Program planning and assessment]
7. Recognize dynamic interactions among human and social systems and how they affect the relationships among individuals, groups, organizations and communities. [Competency: Systems thinking]
8. Utilize biostatistics in the practice of public health. [Competency: Biostatistics]
9. Design, develop, implement and evaluate approaches for assessing, preventing and controlling environmental hazards that pose risks to human health and safety. [Competency: Environmental health]
10. Utilize epidemiological skills for informing scientific, ethical, economic, and public health policy decisions on health issues. [Competency: Epidemiology]
11. Understand the main components and issues of the organization, financing and delivery of health services and public health systems in the US. [Competency: Health policy and management]
12. Understand the role of social, behavioral and community factors in both the onset and solution of public health problems. [Competency: Social and behavioral science].

**Environment**

To create an environment where diverse faculty, students, and staff work collaboratively and respectfully to promote public health.

1. Maintain a diverse student body that reflects the diversity of the region we serve.
2. Maintain a student body with diverse educational and professional backgrounds.
3. Provide a multi-disciplinary, ethnically diverse, and experienced public health faculty and staff.
4. Provide students with contact and involvement with diverse communities and peoples within and outside the MPH program, that provide and/or enhance knowledge and experience.
5. Annually monitor and continually evaluate processes for recruitment and admission into the program.

**MPH Public Health Practice Track-Specific Competencies**

Students completing the MPH Program will have public health practice knowledge and skills in the following:

1. Community Needs Assessment: Diagnose public health problems in the community and gather the information needed to determine when and whether to involve public health specialist and other experts.
2. Public Health Response: Respond quickly and effectively to emerging public health concerns, coordinating the response and enlisting the help of specialists as appropriate.

3. Applied Research and Evaluation: Apply the core public health research and evaluation skills in real-world situations where the practitioner may have little control.

Professional Program Fee

A professional program fee is required of all students in the MPH program in addition to course tuition fees, lab fees, course material fees, and student activity fees. The professional program fee is a sum equal to 50 percent of resident tuition, and is charged upon enrollment in MPH courses. The fee contributes directly to program support.

Admission Requirements

See the beginning of this chapter for Admission Requirements for Graduate Degrees. In addition, students should also meet the following criteria when applying for admission to the MPH program:

1. Have earned a baccalaureate degree from a regionally accredited institution in the United States, or a foreign equivalent.
2. Have a GPA of at least 3.00 (B average on a 4.00 scale) in their baccalaureate degree.
3. Submit documentation indicating a grade of 2.00 (C) or higher in an introductory statistics course which covers descriptive and inferential statistics.
4. Provide copies of one or more substantial professional writing samples.
5. Submit an essay explaining how and why obtaining the MPH degree would contribute to the student’s career goals.
6. Completed applications are reviewed twice each year. The Department of Health Sciences deadlines are March 1 for fall admission and October 1 for spring admission. UAA admission must be successfully processed before the Department of Health Sciences will consider an application complete. The UAA process may take as long as four months, so applicants are encouraged to apply to the university first and early.

Note also that:

1. To the extent that there are limited positions available in the program, preference may be given to residents of the state of Alaska as defined by the university’s policy on residency for tuition purposes.
2. Preference may also be given to applicants with two or more years work experience in the field of public health. Such applicants must submit documentation of their public health-related work experience, and a request for special consideration to the admissions committee.

Academic Progress

In order to maintain satisfactory academic progress toward the degree, a student in the MPH program is expected to complete a minimum of 6 semester credits each academic year, beginning with the first semester of enrollment. For satisfactory academic progress, the 6 semester credits may consist of prerequisite courses or program courses. Failure to comply with the 6 credit minimum each academic year may result in the student being removed from the degree program. See the beginning of this chapter for additional requirements to remain in good standing, and to maintain satisfactory academic progress toward the degree.

Candidacy Requirements

See the section Advancement to Candidacy at the beginning of this chapter.

Graduation Requirements

See University Requirements for Graduate Degrees at the beginning of this chapter.

Program Requirements

1. Complete the MPH core courses (28 credits total):
   
   - HS A605 Public Health and Society 3
   - HS A610 Environmental and Occupational Health 3
   - HS A615 Health Services Administration 3
   - HS A624 Circumpolar Health Issues 3
   - HS/NS A625 Biostatistics for Health Professionals 3
   - HS/NS A626 Principles of Epidemiology 3
   - HS/SWK A628 Program Evaluation 3
   - HS A629 Public Health Research Tools and Methods 4
   - HS A630 Public Health Emergencies and Disasters 3

2. Complete three focused public health-related emphasis courses at the 600-level (graduate) with advisor approval 9
3. Complete a Project Practicum (HS A698) or Thesis Practicum (HS A699) 5
4. A total of 42 credits are required for the degree.

FACULTY
Betty J. Monsour, Associate Professor, Betty.Monsour@uaa.alaska.edu
Gabriel Garcia, Assistant Professor, GCarc16@uaa.alaska.edu
Liz Hodges Snyder, Assistant Professor, EIHodges4@uaa.alaska.edu
Rhonda M. Johnson, Professor/MPH Coordinator, Rhonda.Johnson@uaa.alaska.edu
Jenny Miller, Assistant Professor, VL.Miller2@uaa.alaska.edu
Nancy Nix, Assistant Professor, NNix@uaa.alaska.edu
## Course Action Request

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

<table>
<thead>
<tr>
<th>1a. School or College</th>
<th>1b. Division</th>
<th>1c. Department</th>
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<tbody>
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<td>AMSC Division of Math Science</td>
<td>Chemistry</td>
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<th>2. Course Prefix</th>
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<th>5a. Credits/CEUs</th>
<th>5b. Contact Hours (Lecture + Lab)</th>
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<td>A611</td>
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<td>3</td>
<td>(3+0)</td>
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### 6. Complete Course Title

**Advanced Biophysical Chemistry**  
Adv Biophysical Chemistry

*Abbreviated Title for Transcript (30 character)*

### 7. Type of Course

- [ ] Academic  
- [ ] Preparatory/Development  
- [ ] Non-credit  
- [ ] CEU  
- [ ] Professional Development

### 8. Type of Action:

- [ ] Add  
- [ ] Change  
- [ ] Delete

*If a change, mark appropriate boxes:*

- Prefix
- Credits
- Title
- Grading Basis
- Course Description
- Test Score Prerequisites
- Other Restrictions
- Class
- Level
- College
- Major
- Other

### 9. Repeat Status

- Repeat Status No: 0  
- # of Repeats: 0  
- Max Credits

### 10. Grading Basis

- [ ] A-F  
- [ ] P/NP  
- [ ] NG  

### 11. Implementation Date

- From: Fall/2013  
- To: 9999

### 12. Cross Listed with

- Stacked with CHEM A411

### 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](http://www.uaa.alaska.edu/governance).*

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Initiator Name (typed): Holmberg  
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

*Advanced study of Biophysical Chemistry through the principles of thermodynamics, kinetic concepts and spectroscopic analysis. Introduction to computational techniques in physical chemistry. Examination of the current literature in Biophysical Chemistry.*

### 16a. Course Prerequisite(s)

(list prefix and number or test code and score)

### 16b. Co-requisite(s)

(concurrent enrollment required)

### 16c. Other Restriction(s)

- [ ] College  
- [ ] Major  
- [ ] Class  
- [ ] Level

### 16d. Registration Restriction(s)

(non-codable)

Instructor permission and graduate standing.

### 17. Mark if course has fees

### 18. Mark if course is a selected topic course

### 19. Justification for Action

Addition of graduate level course stacked with CHEM A411 for inclusion in the Interdisciplinary Masters Program.

Initiator (faculty only)

Initiator (TYPE NAME)

Instructor permission and graduate standing.

[ ] 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 for CHEM A611  
University of Alaska Anchorage  
College of Arts and Sciences

I. **Date of Initiation:** February 22, 2013

II. **Course information**

A. **College:** College of Arts and Sciences

B. **Course Subject:** CHEM

C. **Course Number:** A611

D. **Number of Credits:** 3

E. **Contact Hours:** 3+0

F. **Course Title:** Advanced Biophysical Chemistry

G. **Grading Basis:** A – F

H. **Implementation Date:** Fall 2013

I. **Course Description:** Advanced study of Biophysical Chemistry through the principles of thermodynamics, kinetic concepts and spectroscopic analysis. Introduction to computational techniques in physical chemistry. Examination of the current literature in Biophysical Chemistry.

J. **Course Attributes:** N/A

K. **Prerequisites:** N/A

L. **Test Scores:** N/A

M. **Corequisites:** N/A

N. **Registration Restrictions:** Instructor permission and graduate standing.

O. **Course Fee:** No

P. **Stacked With:** CHEM A411
III. Instructional Goals and Student Learning Outcomes

A. Instructional Goals:

The instructor will:

1. Present advanced principles of thermodynamics with applications to biochemical systems.
2. Detail advanced concepts in molecular kinetic theory with applications to transport properties of macromolecules.
3. Present chemical kinetics with heavy accent on enzymatic catalysis and biological system modeling.
4. Utilize spectroscopic techniques for bio-molecular characterization as well as modern computational techniques.
5. Derivation of pertinent expressions from basic principles using theoretical modeling techniques.

B. Student Learning Outcomes:

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
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<tbody>
<tr>
<td>Students will:</td>
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<tr>
<td>Demonstrate critical thinking skills for explanation and</td>
<td>Quizzes, Exams, Class Activities</td>
</tr>
<tr>
<td>prediction of biophysical/bio-chemical phenomena using</td>
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<tr>
<td>thermodynamics and chemical kinetics.</td>
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<tr>
<td>Integrate mathematical skills such as calculus, differential</td>
<td>Quizzes, Exams, Class Activities</td>
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<tr>
<td>equations, and linear algebra and chemical concepts with</td>
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<td>applications in physical chemistry. Proficiency in derivation</td>
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<td>of advanced concepts from fundamental principles.</td>
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<td>Apply a range of spectroscopic and computational techniques</td>
<td>Quizzes, Exams, Research Paper</td>
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<td>for bio-molecular characterization and applications to</td>
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<td>biochemical problems.</td>
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<tr>
<td>Apply the knowledge of kinetics to design methods for</td>
<td>Quizzes, Exams, Research Paper</td>
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<td>determination of reactions’ mechanisms. Mechanistic</td>
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</tr>
<tr>
<td>modeling.</td>
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IV. Course Activities

A. Lecture
B. Assignments
C. Critical Thinking Questions
D. Quizzes
E. Exams
F. Research Paper

V. Guidelines for Evaluation

The students will be evaluated based on their performance on quizzes, in-class exams, research papers and comprehensive final. The grades A – F will be assigned based on a curve that is deemed reasonable by the instructor.

VI. Course Level Justification

This course requires a background in the principles of chemistry, advanced calculus and mathematical techniques such as differential equations and linear algebra, and concepts in physics. It also requires analytical thinking, critical analysis, and attention to detail. Students will be required to assimilate a number of concepts while clearly describing complex biological phenomenon.

VII. Course Outline

A. Principles of Thermodynamics: laws of thermodynamics, application to biochemical systems. Applications topics discussed can include thermodynamic basis of protein stability, ligand binding equilibria, Scatchard’s and Hill’s models, differential scanning calorimetry, transport across membranes, phase transition in lipid bilayers, equilibria in double stranded helices of complementary oligonucleotides.

B. Molecular Kinetic Theory and Transport Properties, applications to Fick’s Laws, viscosity and sedimentation as applied to bio-molecular measurements.

C. Chemical Kinetics as applied to enzymatic catalysis.

D. Introduction to spectroscopy and computational techniques as applied to characterization of secondary and tertiary structure of proteins, as well as structural characterization of RNA/DNA molecules.
VIII. Suggested Texts


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

<table>
<thead>
<tr>
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<th>5a. Credits/CEUs</th>
<th>5b. Contact Hours (Lecture + Lab)</th>
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<td>CHEM</td>
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6. Complete Course Title  
Biophysical Chemistry  
Abbreviated Title for Transcript (30 character)

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

8. Type of Action:  
☐ Add  
☐ Change  
☐ Delete

If a change, mark appropriate boxes:

<table>
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<tr>
<th>○ Prefix</th>
<th>☑ Course Number</th>
<th>☑ Title</th>
<th>☑ Contact Hours</th>
<th>☑ Repeat Status</th>
<th>☑ Cross-Listed/Stacked</th>
<th>☑ Course Prerequisites</th>
<th>☑ Co-requisites</th>
<th>☑ Registration Restrictions</th>
<th>☑ Other Restrictions</th>
<th>☑ College</th>
<th>☑ Major</th>
<th>☑ Class</th>
<th>☑ Level</th>
<th>☑ Other CCG (please specify)</th>
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9. Repeat Status No  
# of Repeats: 0  
Max Credits

10. Grading Basis  
☑ A-F  
☐ P/NP  
☐ NG

11. Implementation Date  
From: Fall/2013  
To: /9999

12. ☐ Cross Listed with

<table>
<thead>
<tr>
<th>☑ Stacked with CHEM A611</th>
<th>Cross-Listed Coordination</th>
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</table>

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.

<table>
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<td>1. See attached table.</td>
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Initiator Name (typed): Holmberg  
Initiator Signed Initials: ________________  
Date: __________________

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

13c. Coordination with Library Liaison  
Date: ____________

14. General Education Requirement  
Mark appropriate box:

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<tr>
<th>☑ Oral Communication</th>
<th>☑ Written Communication</th>
<th>☑ Quantitative Skills</th>
<th>☑ Humanities</th>
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<tr>
<td>☑ Fine Arts</td>
<td>☑ Social Sciences</td>
<td>☑ Natural Sciences</td>
<td>☑ Integrative Capstone</td>
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</tbody>
</table>

15. Course Description (suggested length 20 to 50 words)  
Introduction to Biophysical Chemistry through the principles of thermodynamics, kinetic concepts and spectroscopic analysis. Study of principles of thermodynamics, chemical kinetics, molecular kinetic theory and spectroscopy as applied to biochemical systems. Applications to solutions, phase equilibria, bio-chemical reactions, transport properties, and spectroscopic techniques for bio-molecular characterization. Introduction to computational techniques in physical chemistry.

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

| CHEM A106 with minimum grade of C and MATH A201 with minimum grade of C and PHYS A124 with minimum grade of C. |

16b. Co-requisite(s) (concurrent enrollment required)  
n/a

16c. Other Restriction(s)

| ☑ College | ☑ Major | ☑ Class | ☑ Level |

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

| ☐ Mark if course has fees |

17. ☐ Mark if course is a selected topic course

18. ☐ Mark course as an elective class for science majors due to student demand.

19. Justification for Action  
Updating course level to appropriate numbering considering course depth and breadth and title as a required course for Chemistry/Biochemistry option and CHEM minor as an elective class for science majors due to student demand.
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<th>Date</th>
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Course Content Guide for **CHEM A411**  
University of Alaska Anchorage  
College of Arts and Sciences

I. **Date of Initiation:** February 22, 2013

II. **Course information:**

A. **College:** College of Arts and Sciences

B. **Course Subject:** CHEM

C. **Course Number:** A411

D. **Number of Credits:** 3

E. **Contact Hours:** 3+0

F. **Course Title:** Biophysical Chemistry

G. **Grading Basis:** A – F

H. **Implementation Date:** Fall 2013

I. **Course Description:** Introduction to Biophysical Chemistry through the principles of thermodynamics, kinetic concepts and spectroscopic analysis. Study of principles of thermodynamics, chemical kinetics, molecular kinetic theory and spectroscopy as applied to biochemical systems. Applications to solutions, phase equilibria, bio-chemical reactions, transport properties, and spectroscopic techniques for bio-molecular characterization. Introduction to computational techniques in physical chemistry.

J. **Course Attributes:** N/A

K. **Prerequisites:** CHEM A106 with minimum grade of C and MATH A201 with minimum grade of C and PHYS A124 with minimum grade of C.

L. **Test Scores:** N/A

M. **Corequisites:** N/A
N. **Registration Restrictions:** N/A

O. **Course Fee:** No

P. **Stacked With:** CHEM A611

III. **Instructional Goals and Student Learning Outcomes**

A. **Instructional Goals:**

Instructor will:

1. Present principles of thermodynamics with applications to biochemical systems.
2. Introduce molecular kinetic theory with applications to transport properties of macromolecules.
3. Introduce chemical kinetics with heavy accent on enzymatic catalysis.
4. Demonstrate spectroscopic techniques for bio-molecular characterization as well as modern computational techniques.

B. **Student Learning Outcomes:**

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
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<tbody>
<tr>
<td>Demonstrate critical thinking skills for explanation and prediction of biophysical/bio-chemical phenomena using thermodynamics and chemical kinetics.</td>
<td>Quizzes, Exams, Class Activities</td>
</tr>
<tr>
<td>Integrate mathematical skills and concepts learned in MATH 200-201 classes with applications in physical chemistry.</td>
<td>Quizzes, Exams, Class Activities</td>
</tr>
<tr>
<td>Demonstrate knowledge of spectroscopic and computational techniques for bio-molecular characterization.</td>
<td>Quizzes, Exams</td>
</tr>
<tr>
<td>Apply the knowledge of kinetics to design methods for determination of reactions’ mechanisms.</td>
<td>Quizzes, Exams</td>
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</table>
IV. **Course Activities**

A. Lecture  
B. Assignments  
C. Critical Thinking Questions  
D. Quizzes  
E. Exams  

V. **Guidelines for Evaluation**

The students will be evaluated based on their performance on quizzes, in-class exams and comprehensive final. The grades A – F will be assigned based on a curve that is deemed reasonable by the instructor.

VI. **Course Level Justification**

This course requires a background in the principles of chemistry, calculus and basic concepts in physics. It also requires a great deal of analytical thinking, critical analysis, medium to advanced level mathematics and attention to detail.

VII. **Course Outline**

A. Principles of Thermodynamics: laws of thermodynamics, application to biochemical systems. Application topics discussed can include thermodynamic basis of protein stability, ligand binding equilibria, Scatchard’s and Hill’s models, differential scanning calorimetry, transport across membranes, phase transition in lipid bilayers, equilibria in double stranded helices of complementary oligonucleotides.  
B. Molecular Kinetic Theory and Transport Properties, applications to Fick’s Laws, viscosity and sedimentation as applied to bio-molecular measurements.  
C. Chemical Kinetics as applied to enzymatic catalysis.  
D. Introduction to spectroscopy and computational techniques as applied to characterization of secondary and tertiary structure of proteins, as well as structural characterization of RNA/DNA molecules.

VIII. **Suggested Texts**


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

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<th>4. Previous Course Prefix &amp; Number</th>
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<th>5b. Contact Hours</th>
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<td>(Lecture + Lab) (3+0)</td>
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6. Complete Course Title
Adv Environmental Chemistry
Adv Environmental Chemistry
Abbreviated Title for Transcript (30 character)

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<th>7. Type of Course</th>
<th>Academic</th>
<th>Preparatory/Development</th>
<th>Non-credit</th>
<th>CEU</th>
<th>Professional Development</th>
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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
- Other Restrictions
- Class
- Level
- College
- Major
- Other (please specify)

9. Repeat Status No # of Repeats Max Credits

10. Grading Basis A-F P/NC NG

11. Implementation Date From: Fall/2013 To: 99/9999

12. Cross Listed with
- Stacked with CHEM A450 Cross-Listed Coordination

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.

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Initiator Name (typed): John M. Kennish
Initiator Signed Initials: _________ Date: __________

13b. Coordination Email: Date: submitted to Faculty Listserv: john.m.kennish@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)
This course will exam in detail the structure and function of planet earth as a living chemical system as constructed around the atmosphere, hydrosphere, lithosphere and biosphere. The system will be examined as driven energetically by solar energy and energy provided by human technology. Chemical models will be detailed along with the mathematical models required to understand the integration of the global system with resource utilization by humans. Special Note: Not available for credit to students who have taken CHEM A450.

16a. Course Prerequisite(s) (list prefix and number)
16b. Test Score(s)
16c. Co-requisite(s) (concurrent enrollment required)

16d. Other Restriction(s)
- College
- Major
- Class
- Level
16e. 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
Addition of graduate level course stacked with CHEM A450 for inclusion into the Interdisciplinary Masters Program.

Initiator (faculty only) Date
John M. Kennish
Initiator (TYPE NAME)

Dean/Director of School/College Date

Undergraduate/Graduate Academic Date

Provost or Designee Date
Course Content Guide for CHEM A650

University of Alaska Anchorage

College of Arts & Sciences

I. Date of Initiation: February 22, 2013

II. Course Information:

A. College: College of Arts & Sciences

B. Course Subject: CHEM

C. Course Number: A650

D. Number of Credits: 3

E. Contact Hours: 3 + 0

F. Course Title: Advanced Environmental Chemistry

G. Grading Basis: A – F

H. Implementation Date: Fall 2013

I. Course Description: This course will examine in detail the structure and function of planet earth as a living chemical system as constructed around the atmosphere, hydrosphere, lithosphere and biosphere. The system will be examined as driven energetically by solar energy and energy provided by human technology. Chemical models will be detailed along with the mathematical models required to understand the integration of the global system with resource utilization by humans. Special Note: Not available for credit to students who have taken CHEM A450.

J. Course Attributes: N/A

K. Prerequisites: N/A

L. Test Scores: N/A

M. Co-requisites: N/A
N. **Registration Restrictions**: Graduate standing.

O. **Course Fee**: No

P. **Stacked With**: CHEM A450

### III. Instructional Goals and Student Learning Outcomes

#### A. Instructional Goals:

The instructor will:

1. Present chemical models for investigation and develop problem solving and observational skills on problems relevant to current issues and topics in environmental chemistry.
2. Present convergent and divergent questions to initiate discussion on the relevance of current environmental models to observe and understand natural phenomena, help students differentiate, link and integrate ideas and develop their own concepts, to articulate their thinking and explain models and solutions.
3. Provide multiple historical, cultural, environmental and socially relevant contexts for applying concepts and quantitative skills and invite students to defend and verify their models and their solutions to problems relevant to these contexts.

#### B. Student Learning Outcomes:

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<th>Assessment Methods</th>
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<tr>
<td>Students will:</td>
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<tr>
<td>Solve problems relevant to the origin and evolution of the earth’s environment, about man’s impacts on this environment resulting from energy production and use of the atmosphere, hydrosphere and the biosphere.</td>
<td>Assigned problems and Exam</td>
</tr>
<tr>
<td>Use quantitative chemical principles to evaluate the interrelationships of anthropomorphic influences on changes occurring in the atmosphere, hydrosphere and biosphere.</td>
<td>Assigned problems and Exam</td>
</tr>
<tr>
<td>Communicate problems and verify solutions.</td>
<td>Assigned problems and Exam</td>
</tr>
<tr>
<td>Design and submit a written research proposal testing a hypothesis answering a specific question concerning a current contamination mechanism.</td>
<td>Research Proposal</td>
</tr>
</tbody>
</table>
Make a 20 minute presentation to the class with 10 minutes to answer questions in order to defend their proposal.

IV. **Course Activities**

A. Lecture  
B. Assigned problems  
C. Exams  
D. Research Proposal

V. **Guidelines for Evaluation**

Students will be evaluated based on their performance on assigned problems, in-class exams, a research proposal, and presentation. The grades A – F will be assigned based on a curve that is deemed reasonable by the instructor.

VI. **Course Level Justification**

This is a graduate level course which may be taken without prerequisite by Biology Chemistry, Engineering, Geology and Physics students who have graduate status. This course requires extensive multidisciplinary knowledge from biology, chemistry, engineering, mathematics, and physics. It requires the integration of this knowledge to solve multidimensional problems and understand complex concepts.

VII. **Course Outline**

1. **Energy**
   a. Energy Flows and Supplies  
   b. Fossil Fuels  
   c. Nuclear Energy  
   d. Renewable Energy  
   e. Energy Utilization

2. **Atmosphere**
   a. Climate  
   b. Oxygen Chemistry  
   c. Stratospheric Ozone  
   d. Air Pollution

3. **Hydrosphere / Lithosphere**
   a. Water Resources  
   b. Water as Solvent  
   c. Water and the Lithosphere
d. Oxygen and Life

e. Water Pollution and Water Treatment

4. Biosphere

VIII. Suggested Texts


IX. Bibliography


### Course Action Request

#### University of Alaska Anchorage

**Proposal to Initiate, Add, Change, or Delete a Course**

<table>
<thead>
<tr>
<th>1a. School or College</th>
<th>1b. Division</th>
<th>1c. Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS CAS</td>
<td>AMSC Division of Math Science</td>
<td>CHEMISTRY</td>
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<table>
<thead>
<tr>
<th>2. Course Prefix</th>
<th>3. Course Number</th>
<th>4. Previous Course Prefix &amp; Number</th>
<th>5a. Credits/CEUs</th>
<th>5b. Contact Hours (Lecture + Lab)</th>
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<td>A450</td>
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<th>6. Complete Course Title</th>
<th>Abbreviated Title for Transcript (30 character)</th>
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<tbody>
<tr>
<td>Environmental Chemistry</td>
<td></td>
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| 7. Type of Course | | |
|-------------------|---------------|
| ☑ Academic        | ☐ Preparatory/Development | ☐ Non-credit | ☐ CEU | ☐ Professional Development |

| 8. Type of Action: | | |
|-------------------|---------------|
| ☑ Add             | ☐ Change | ☐ Delete |

**If a change, mark appropriate boxes:**

- Prefix
- Credits
- Title
- Grading Basis
- Course Description
- Test Score Prerequisites
- Other Restrictions
- Class
- Level
- College
- Major
- Other CCG (please specify)
- Cross-Listed/Stacked
- Course Prerequisites
- Co-requisites
- Registration Restrictions

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<th>9. Repeat Status No</th>
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| 10. Grading Basis | | |
|--------------------|---------------|
| ☑ A-F              | ☐ P/NP | ☐ NG |

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<th>12. Cross Listed with</th>
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<td>Stacked with CHEM A650</td>
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<tr>
<th>13a. Impacted Courses or Programs:</th>
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<td>2. CHEM 450 course listing</td>
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<td>2/22/2013</td>
<td>Eric Holmberg</td>
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**Initiator Name (typed): John M. Kennish**

**Initiator Signed Initials:** __________ Date: ______________

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**14. General Education Requirement**

Mark appropriate box:

- Oral Communication
- Written Communication
- Quantitative Skills
- Humanities
- Fine Arts
- Social Sciences
- Natural Sciences
- Integrative Capstone

<table>
<thead>
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<th>15. Course Description (suggested length 20 to 50 words)</th>
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<td>This course examines the origin and evolution of the environment, energy, mineral resources, solid wastes, recycling, air and water pollution, and the effects of foreign substances on living systems. The relationships among these problems will be demonstrated and quantitative chemical principles applied. Special Note: This course is an introduction to environmental chemistry for all science majors.</td>
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<th>16c. Co-requisite(s) (concurrent enrollment required)</th>
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<td>Level</td>
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<th>19. Justification for Action</th>
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<td>Course now stacked with the newly created CHEM A650.</td>
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**Initiator (TYPE NAME): John M. Kennish**

**Initiator Signed Initials:** __________ Date: ______________

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<td>Board Chairperson</td>
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**Initiator (TYPE NAME): John M. Kennish**

**Initiator Signed Initials:** __________ Date: ______________

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<td>Curriculum Committee Chairperson</td>
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**Initiator (TYPE NAME): John M. Kennish**

**Initiator Signed Initials:** __________ Date: ______________

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**Initiator (faculty only) Date: ___/___/___**

**Initiator (TYPE NAME): John M. Kennish**

**Initiator Signed Initials:** __________ Date: ______________
Course Content Guide for **CHEM A450**

University of Alaska Anchorage

College of Arts & Sciences

I. **Date of Initiation:** February 22, 2013

II. **Course Information:**

A. **College:** College of Arts & Sciences

B. **Course Subject:** CHEM

C. **Course Number:** A450

D. **Number of Credits:** 3

E. **Contact Hours:** 3 + 0

F. **Course Title:** Environmental Chemistry

G. **Grading Basis:** A – F

H. **Implementation Date:** Fall 2013

I. **Course Description:** This course examines the origin and evolution of the environment, energy, mineral resources, solid wastes, recycling, air and water pollution, and the effects of foreign substances on living systems. The relationships among these problems will be demonstrated and quantitative chemical principles applied. Special Note: This course is an introduction to environmental chemistry for all science majors.

J. **Course Attributes:** N/A

K. **Prerequisites:** CHEM A106 with grade of C or better.

L. **Test Scores:** N/A

M. **Co-requisites:** N/A

N. **Registration Restrictions:** Instructor approval required.
O. Course Fee: No

P. Stacked With: CHEM A650

III. Instructional Goals and Student Learning Outcomes

A. Instructional Goals:

The instructor will:

1. Present chemical models for investigation and develop problem solving and observational skills on problems relevant to current issues and topics in environmental chemistry.

2. Present convergent and divergent questions to initiate discussion on the relevance of current environmental models to observe and understand natural phenomena, help students differentiate, link and integrate ideas and develop their own concepts, to articulate their thinking and explain models and solutions.

3. Provide multiple historical, cultural, environmental and socially relevant contexts for applying concepts and quantitative skills and invite students to defend and verify their models and their solutions to problems relevant to these contexts.

B. Student Learning Outcomes:

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<td>Communicate problems and verify solutions.</td>
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IV. **Course Activities**

A. Lecture  
B. Assigned problems  
C. Exams  
D. Research Proposal  

V. **Guidelines for Evaluation**

Students will be evaluated based on their performance on assigned problems, in-class exams, and a research proposal. The grades A – F will be assigned based on a curve that is deemed reasonable by the instructor.

VI. **Course Level Justification**

This course requires extensive multidisciplinary knowledge from biology, chemistry, engineering, mathematics, and physics. It requires the integration of this knowledge to solve multidimensional problems and understand complex concepts.

VII. **Course Outline**

1. Energy  
   a. Energy Flows and Supplies  
   b. Fossil Fuels  
   c. Nuclear Energy  
   d. Renewable Energy  
   e. Energy Utilization  
2. Atmosphere  
   a. Climate  
   b. Oxygen Chemistry  
   c. Stratospheric Ozone  
   d. Air Pollution  
3. Hydrosphere / Lithosphere  
   a. Water Resources  
   b. Water as Solvent  
   c. Water and the Lithosphere  
   d. Oxygen and Life  
   e. Water Pollution and Water Treatment  
4. Biosphere
VIII. **Suggested Texts**


IX. **Bibliography**


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
Chemistry

2. Course Prefix
CHEM

3. Course Number
A677

4. Previous Course Prefix & Number
N/A

5a. Credits/CEUs
5

5b. Contact Hours
(Lecture + Lab)
(3+6)

6. Complete Course Title
Advanced Bioanalytical Chemistry
Adv Bioanalytical Chemistry

Abbreviated Title for Transcript (30 character)

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

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

If a change, mark appropriate boxes:

☐ Prefix ☐ Credit ☒ Contact Hours ☐ Repeat Status
☐ Grade Basis ☒ Cross-Listed/Stacked ☐ Course Prerequisites
☐ Co-requisites ☒ Registration Restrictions
☐ General Education Requirement
☐ College ☐ Class Level ☐ Major ☐ Other (please specify)

9. Repeat Status No

# of Repeats

Max Credits

10. Grading Basis
☒ A-F ☐ P/NP ☐ NG

11. Implementation Date
From: Fall/2013
To:

12. ☐ Cross Listed with

Stacked with CHEM A477

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.

<table>
<thead>
<tr>
<th>Impacted Program/Course</th>
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<th>Chair/Coordinator Contacted</th>
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<tbody>
<tr>
<td>1. Interdisciplinary Masters Program</td>
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Initiator Name (typed): Mark McCoy
Initiator Signed Initials: ___________

13b. Coordination Email

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 techniques in operating instrumentation and laboratory methods for the analysis of biomolecules. Graduate students will be required to develop a bioanalytical technique in the lab and give a seminar on their findings. Special Note: Not available for credit to students who have completed CHEM A477.

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

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

16c. Other Restriction(s)

☐ College ☐ Major ☐ Class ☒ Level

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

Graduate standing and instructor approval.

17. ☒ Mark if course has fees

18. ☐ Mark if course is a selected topic course

19. Justification for Action

Addition of graduate level course stacked with CHEM A477 for inclusion in the Interdisciplinary Masters Program.

Initiator (faculty only)
Mark McCoy
Initiator (TYPE NAME)

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

Approved ☐ Disapproved ☐ Undergraduate/Graduate Academic Date

Approved ☐ Disapproved ☐ Board Chair Date

Approved ☐ Disapproved ☐ Provost or Designee Date

Type: Grad/Prof

Mark McCoy
Initiator (TYPE NAME)

Approved ☐ Disapproved ☐ Department Chair Date

Approved ☐ Disapproved ☐ College/School Curriculum Committee Chair Date

51
Course Content Guide for **CHEM A677**  
University of Alaska Anchorage  
College of Arts & Sciences

I. **Date of Initiation:** February 22, 2013

II. **Course Information:**

A. **College:** College of Arts & Sciences  
B. **Course Subject:** CHEM  
C. **Course Number:** A677  
D. **Number of Credits:** 5  
E. **Contact Hours:** 3 + 6  
F. **Course Title:** Advanced Bioanalytical Chemistry  
G. **Grading Basis:** A-F  
H. **Implementation Date:** Fall 2013  
I. **Course Description:** Advanced techniques in operating instrumentation and laboratory methods for the analysis of biomolecules. Graduate students will be required to develop a bioanalytical technique in the lab and give a seminar on their findings. Special Note: Not available for credit to students who have completed CHEM A477.  
J. **Course Attributes:** N/A  
K. **Prerequisites:** None.  
L. **Test Scores:** N/A  
M. **Co-requisites:** N/A  
N. **Registration Restrictions:** Graduate standing and instructor approval.  
O. **Course Fee:** Yes  
P. **Stacked with:** CHEM A477
III. Instructional Goals and Student Learning Outcomes:

A. Course Activities:

Students will explore concepts and solve problems relevant to the latest bioanalytical techniques. Activities will provide students with models or data followed by questions to guide the students through learning. Understanding will be gained through a process emulating the scientific method. In the lecture portion of the course the instructor will guide the students through understanding the fundamental science behind modern and historical bioanalytical methods. Teaching methods may include: lectures, facilitation of class discussions, facilitation of real-time problem solving, and use of the Socratic Method. Laboratory activities will include method development, use of modern analytical equipment, computer assisted data collection, data analysis, statistical analysis, and interpretation of results. Students will also research, develop, and implement a bioanalytical strategy in the laboratory, which will be presented as a short in-class seminar.

B. Instructional Goals:

This course is designed as an advanced laboratory techniques course; it will provide a training base in bioanalytical techniques, which emulates conditions found in research laboratories and industry.

The instructor will:

1. Present models of molecular interactions between biomolecules with chemicals, substrates, and instrumentation and guide students in learning how these interactions can be applied to modern bioanalytical techniques.
2. Present convergent and divergent questions to initiate discussion on relevant scientific problems and how our current discussions could be applied in these cases.
3. Provide multiple historical, cultural, environmental and socially relevant contexts for applying concepts and analytical skills. Invite students to defend or verify their solutions to these problems.
4. Provide students with recent scientific breakthroughs in bioanalytical techniques. Facilitate classroom discussion for understanding of methods.
5. Demonstrate modern bioanalytical techniques in the laboratory. Facilitate student exploration in the laboratory to develop an understanding of the techniques as well as a scientific understanding of the fundamental concepts.
6. Facilitate the student’s exploration into a modern bioanalytical technique that is relevant to their research.
C. **Student Learning Outcomes:**

Students will solve complex problems related to bioanalytical methods. They will develop an understanding of the fundamental science behind the techniques and gain advanced understanding of how to apply it in the laboratory.

The student will:

1. Apply observation, investigative and problem solving skills to problems relevant to current issues and topics in bioanalytical chemistry.
2. Model laboratory processes as part of the lecture curriculum, after which they perform representative processes in the laboratory.
3. Demonstrate skills in science methodology such as exploring and selecting appropriate models.
4. Apply quality control to the student’s own performance in the laboratory with the goal of excellence in performance.
5. Create, communicate, and defend solutions to problems across multiple contexts.
6. Utilize a wide range of laboratory equipment and instrumentation and perform extensive data analysis and interpretation of results.
7. Identify potential methods that could be used for particular analyses and weigh the strengths and weaknesses of each approach.
8. Research a bioanalytical method, develop an experiment, and implement the experiment in the lab.
9. Give a short topic seminar about the developed bioanalytical method including background, methods, and results of laboratory experiments.

D. **Assessment Measures:**

Various assessment tools can be used at the discretion of the instructor, including but not limited to homework, lab reports, take-home exams, in-class exams, quizzes, student discussion participation, and evaluation of independent research and seminar.

E. **Guidelines for Evaluation:**

Evaluation can be based on a variety of instruments such as: evaluation of independent research and seminar, homework, lab reports, take-home exams, in-class exams, quizzes, and student discussion participation.

IV. **Course Level Justification:**

This course provides students with a more in-depth look at bioanalytical laboratory techniques and advanced methods of analysis. Students learn skills in applied research, verification of research results, and researching and developing
new bioanalytical techniques. Verification for comprehension and retention of concepts are performed using appropriate evaluation tools.

V. **Topical Course Outline:**

1. **Biomolecules**

2. **Chromatography**
   a. Basic principals
   b. Chromatographic techniques of protein separation
   c. Protein isolation and separation in the laboratory

3. **Electrophoresis**
   a. Gel electrophoresis in the laboratory
   b. Capillary electrophoresis in the laboratory

4. **Mass Spectrometry**
   a. Peptide analysis and sequencing in the laboratory

5. **Molecular Recognition**
   a. Antibody based bioassays
   b. ELISA techniques and flow cytometry in the laboratory
   c. Biosensors
   d. DNA arrays

6. **Nucleic Acids**
   a. PCR (RT-PCR in the laboratory)
   b. DNA sequencing
   c. RNA/DNA isolation techniques

7. **Protein Sequencing**

VI. **Suggested Texts:**


VII. **Bibliography:**


1a. School or College  
AS CAS

1b. Division  
AMSC Division of Math Science

1c. Department  
Chemistry

2. Course Prefix  
CHEM

3. Course Number  
A477

4. Previous Course Prefix & Number  
N/A

5a. Credits/CEUs  
5

5b. Contact Hours  
(Lecture + Lab)  
(3+6)

6. Complete Course Title  
Bioanalytical Chemistry

Abbreviated Title for Transcript (30 character)  

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

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

If a change, mark appropriate boxes:
- Prefix
- Credits
- Title
- Grading Basis
- Course Description
- Test Score Prerequisites
- Other Restrictions
  - Class Level
  - College Major
  - Other
- 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  
From: Fall/2013  
To: 

12. ☐ Cross Listed with  
Stacked with  
CHEM A677  
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.

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<td>Eric Holmberg</td>
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</tbody>
</table>

Initiator Name (typed): Mark McCoy  
Initiator Signed Initials: _______  
Date:______________

13b. Coordination Email  
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)  
Techniques in operating instrumentation and laboratory methods for the analysis of biomolecules. For students in biology, chemistry, and allied fields.

16a. Course Prerequisite(s) (list prefix and number or test code and score)  
CHEM A312 with minimum grade of C or CHEM A441 with a minimum grade of C.

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

16c. Other 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  
Creating an elective course for science majors by student demand. New junior faculty adding an elective course in his field.

Initiator (faculty only)  
Mark McCoy  
Initiator (TYPE NAME)

☐ Approved  ☐ Disapproved

Dean/Director of School/College  
Date

Undergraduate/Graduate Academic  
Board Chair  
Date

Provost or Designee  
Date
Course Content Guide for **CHEM A477**  
University of Alaska Anchorage  
College of Arts & Sciences

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<td>A. College:</td>
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<td>E. Contact Hours:</td>
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<td>Fall 2013</td>
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<td>Techniques in operating instrumentation and laboratory methods for the analysis of biomolecules. For students in biology, chemistry, and allied fields.</td>
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<td>J. Course Attributes:</td>
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<td>O. Course Fee:</td>
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<tr>
<td>P. Stacked with:</td>
<td>CHEM A677</td>
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III. Instructional Goals and Student Learning Outcomes:

A. Course Activities:

Students will explore concepts and solve problems relevant to the latest bioanalytical techniques. Activities will provide students with models or data followed by questions to guide the students through learning. Understanding will be gained through a process emulating the scientific method. In the lecture portion of the course the instructor will guide the students through understanding the fundamental science behind modern and historical bioanalytical methods. Teaching methods may include: lectures, facilitation of class discussions, facilitation of real-time problem solving, and use of the Socratic Method. Laboratory activities will include method development, use of modern analytical equipment, computer assisted data collection, data analysis, statistical analysis, and interpretation of results.

B. Instructional Goals:

This course is designed as an advanced laboratory techniques course; it will provide a training base in bioanalytical techniques, which emulates conditions found in research laboratories and industry.

The instructor will:

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2. Present convergent and divergent questions to initiate discussion on relevant scientific problems and how our current discussions could be applied in these cases.
3. Provide multiple historical, cultural, environmental and socially relevant contexts for applying concepts and analytical skills. Invite students to defend or verify their solutions to these problems.
4. Provide students with recent scientific breakthroughs in bioanalytical techniques. Facilitate classroom discussion for understanding of methods.
5. Demonstrate modern bioanalytical techniques in the laboratory. Facilitate student exploration in the laboratory to develop an understanding of the techniques as well as a scientific understanding of the fundamental concepts.

C. Student Learning Outcomes:

Students will solve complex problems related to bioanalytical methods. They will develop an understanding of the fundamental science behind the techniques and gain a basic understanding of how to apply it in the laboratory.

The student will:
1. Apply observation, investigative and problem solving skills to problems relevant to current issues and topics in bioanalytical chemistry.
2. Model laboratory processes as part of the lecture curriculum, after which the student will perform representative processes in the laboratory.
3. Demonstrate skills in science methodology such as exploring and selecting appropriate models.
4. Apply quality control to the student’s own performance in the laboratory with the goal of excellence in performance.
5. Create, communicate, and defend solutions to problems across multiple contexts.
6. Utilize a wide range of laboratory equipment and instrumentation and perform extensive data analysis and interpretation of their results.
7. Identify potential methods that could be used for particular analyses and weigh the strengths and weaknesses of each approach.

D. **Assessment Measures:**

Various assessment tools can be used at the discretion of the instructor, including but not limited to homework, lab reports, take-home exams, in-class exams, quizzes, and student discussion participation.

E. **Guidelines for Evaluation:**

Evaluation can be based on a variety of instruments such as: homework, lab reports, take-home exams, in-class exams, quizzes, and student discussion participation.

IV. **Course Level Justification:**

This course provides students with a more in-depth look at bioanalytical laboratory techniques and methods of analysis. Students learn skills in applied research and verification of research results. Verification for comprehension and retention of concepts are performed using appropriate evaluation tools.

V. **Topical Course Outline:**

1. **Biomolecules**

2. **Chromatography**
   a. Basic principals
   b. Chromatographic techniques of protein separation
   c. Protein isolation and separation in the laboratory

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d. DNA arrays

6. **Nucleic Acids**  
a. PCR (RT-PCR in the laboratory)  
b. DNA sequencing  
c. RNA/DNA isolation techniques

7. **Protein Sequencing**

VI. **Suggested Texts:**


VII. **Bibliography:**


### 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**
Chemistry

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<th>2. Course Prefix</th>
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<th>5b. Contact Hours (Lecture + Lab)</th>
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<td>CHEM A680</td>
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**6. Complete Course Title**
Advanced Nuclear Magnetic Resonance
Adv Nuclear Magnetic Resonance

**Abbreviated Title for Transcript (30 character)**

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

**8. Type of Action:**
- **Add**
- **Change**
- **Delete**

If a change, mark appropriate boxes:
- Prefix
- Credits
- Title
- Grading Basis
- Course Description
- Test Score Prerequisites
- Other Restrictions
  - Class
  - Level
  - College
  - Major
- (please specify)

**9. Repeat Status**
- No
- # of Repeats: 0
- Max Credits: n/a

**10. Grading Basis**
- A-F
- P/NP
- NG

**11. Implementation Date**
- semester/year:
  - From: Fall/2013
  - To: 9999

**12. Cross Listed with**
- Stacked with CHEM A480

**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](http://www.uaa.alaska.edu/governance).

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Initiator Name (typed): **Vugmeyster**
Initiator Signed Initials: ________ Date: __________

**13b. Coordination Email**

| Date: __________ |
| submitted to Faculty Listserv: [uaa-faculty@lists.uaa.alaska.edu](mailto: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 Nuclear Magnetic Resonance theory and principles for elucidation of one- and multi-dimensional pulse sequences for structural analysis. Literature will be reviewed with regards to recent applications to biomolecules and soil analysis. Special Note: Not available for credit to students who completed CHEM A480.

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

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

**16c. Other Restriction(s)**
- College
- Major
- Class
- Level

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

Graduate standing and instructor approval.

**17. Mark if course has fees**

**18. Mark if course is a selected topic course**

**19. Justification for Action**

Addition of graduate level course stacked with CHEM A480 for inclusion in the Interdisciplinary Masters program.

Initiator (faculty only) Date

**Vugmeyster**

Initiator (TYPE NAME) Date

Approved

Disapproved

Dean/Director of School/College Date

Approved

Disapproved Undergraduate/Graduate Academic Date

Approved

Disapproved Board Chair Date

Approved

Disapproved Provost or Designee Date

Approved

Disapproved Department Chair Date

Approved

Disapproved College/School Curriculum Committee Chair Date
Course Content Guide for **CHEM A680**
University of Alaska Anchorage
College of Arts and Sciences

I. **Date of Initiation:** February 22, 2013

II. **Course Information**

A. **College:** College of Arts and Sciences

B. **Course Subject:** CHEM

C. **Course Number:** A680

D. **Number of Credits:** 3

E. **Contact Hours:** 3 + 0

F. **Course Title:** Advanced Nuclear Magnetic Resonance

G. **Grading Basis:** A – F

H. **Implementation Date:** Fall 2013

I. **Course Description:** Advanced Nuclear Magnetic Resonance theory and principles for elucidation of one- and multi-dimensional pulse sequences for structural analysis. Literature will be reviewed with regards to recent applications to biomolecules and soil analysis. Special Note: Not available for credit to students who completed CHEM A480.

J. **Course Attributes:** N/A

K. **Prerequisites:** N/A

L. **Test Scores:** N/A

M. **Corequisites:** N/A

N. **Registration Restrictions:** Graduate standing and instructor approval.
O. **Course Fee:** No

P. **Stacked With:** CHEM A480

III. **Instructional Goals and Student Learning Outcomes**

A. **Instructional Goals:**

The Instructor will:

1. Present theoretical principles of nuclear magnetic resonance.
2. Describe main experimental approaches.
3. Introduce applications to problems in biological and earth sciences.
4. Challenge students with modern applications of the literature in the field.

B. **Student Learning Outcomes:**

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
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<tbody>
<tr>
<td>Students will:</td>
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<tr>
<td>Demonstrate understanding of principles of</td>
<td>Quizzes, Exams</td>
</tr>
<tr>
<td>nuclear magnetic resonance spectroscopy.</td>
<td></td>
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<tr>
<td>Demonstrate knowledge of main experimental</td>
<td>Quizzes, Exams</td>
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<tr>
<td>approaches.</td>
<td></td>
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<tr>
<td>Demonstrate key applications to problems in</td>
<td>Presentations of research articles</td>
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<td>biological and earth sciences through a critical</td>
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<td>review of literature.</td>
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</table>

IV. **Course Activities**

A. Lecture
B. Assignments
C. Analysis of research articles
D. Quizzes
E. Exams
V. **Guidelines for Evaluation**

Students will be evaluated based on their performance on quizzes, in-class exams and presentations. The grades A – F will be assigned based on a curve that is deemed reasonable by the instructor.

VI. **Course Level Justification**

This course requires a background in calculus, physical chemistry, and physics. It also requires a great deal of analytical thinking and attention to detail. Additional knowledge of literature database is expected of graduate students.

VII. **Course Outline**

A. Principles of nuclear magnetic resonance spectroscopy.
B. Modern experimental techniques in solution and solid state NMR and metabolomics.
C. Applications to problems in biological and earth sciences. Examples include bio-molecular structure and function, protein folding, metabolomics, and advanced analysis of soil matrix.

VIII. **Suggested Text**


IX. **Bibliography**


Recommended search engines for literature searches: ISI Web of Knowledge and PubMed.
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 Chemistry

2. Course Prefix CHEM 3. Course Number A480
4. Previous Course Prefix & Number
5a. Credits/CEUs 3
5b. Contact Hours (Lecture + Lab) (3+0)

6. Complete Course Title
Nuclear Magnetic Resonance
Abbreviated Title for Transcript (30 character)

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

8. Type of Action:
☑ Add ☐ Change ☐ Delete
If a change, mark appropriate boxes:
☑ Prefix ☐ Credits ☐ Course Number
☐ Title ☐ Repeat Status ☐ Contact Hours
☐ Grading Basis ☐ Cross-Listed/Stacked ☐ Course Prerequisites
☐ Test Score Prerequisites ☐ Co-requisites ☐ Registration Restrictions
☐ Other Restrictions ☐ Class ☐ Level
☐ College ☐ Major
☐ Other (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/2013 To: /9999

12. ☐ Cross Listed with
☑ Stacked with CHEM A680
Cross-Listed Coordination

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.

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<td>Sam Thiru</td>
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<td>2. CHEM A411</td>
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<td>Eric Holmberg</td>
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<td>3. PHYS A212</td>
<td>2/22/2013</td>
<td>Jim Pantaleone</td>
</tr>
</tbody>
</table>

Initiator Name (typed): Vugmeyster 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 Nuclear Magnetic Resonance spectroscopy and basic application to problems in biology and earth sciences.

16a. Course Prerequisite(s) (list prefix and number or test code and score)
[MATH A201 and (CHEM A411 or PHYS A212)] with a grade of C or better.

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

16c. Other 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
Creating an elective class for science majors by student demand. Junior faculty adding an elective course in her field.

Initiator (faculty only) Date
Vugmeyster
Initiator (TYPE NAME) Date

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

☐ Approved ☐ Disapproved
Undergraduate/Graduate Academic Date

☐ Approved ☑ Disapproved
Board Chair Date

☐ Approved ☐ Disapproved
Provost or Designee Date

67
Course Content Guide for **CHEM A480**
University of Alaska Anchorage
College of Arts and Sciences

I. **Date of Initiation:** February 22, 2013

II. **Course information**

A. **College:** College of Arts and Sciences

B. **Course Subject:** CHEM

C. **Course Number:** A480

D. **Number of Credits:** 3

E. **Contact Hours:** 3+0

F. **Course Title:** Nuclear Magnetic Resonance

G. **Grading Basis:** A – F

H. **Implementation Date:** Fall 2013

I. **Course Description:** Introduction to Nuclear Magnetic Resonance spectroscopy and basic application to problems in biology and earth sciences.

J. **Course Attributes:** N/A

K. **Prerequisites:** [MATH A201 and (CHEM A411 or PHYS A212)] with a grade of C or better.

L. **Test Scores:** N/A

M. **Corequisites:** N/A

N. **Registration Restriction:** N/A

O. **Course Fee:** No

P. **Stacked With:** CHEM A680
III. Instructional Goals and Student Learning Outcomes

A. Instructional Goals:

The instructor will:

1. Present theoretical principles of nuclear magnetic resonance.
2. Describe main experimental approaches.
3. Introduce applications to problems in biological and earth sciences.

B. Student Learning Outcomes:

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrate understanding of principles of nuclear magnetic resonance spectroscopy.</td>
<td>Quizzes, Exams</td>
</tr>
<tr>
<td>Demonstrate knowledge of main experimental approaches.</td>
<td>Quizzes, Exams</td>
</tr>
<tr>
<td>Demonstrate critical thinking in applying spectroscopic principles to problems in biological and earth sciences.</td>
<td>Oral presentations, quizzes</td>
</tr>
</tbody>
</table>

IV. Course Activities

A. Lecture
B. Assignments
C. Quizzes
D. Exams

V. Guidelines for Evaluation

Students will be evaluated based on their performance on quizzes, in-class exams and presentations. The grades A – F will be assigned based on a curve that is deemed reasonable by the instructor.

VI. Course Level Justification

This course requires a background in calculus, physical chemistry, and physics. It also requires analytical thinking and attention to detail.
VII. **Course Outline**

A. Principles of nuclear magnetic resonance spectroscopy.
B. Modern experimental techniques in solution and solid state NMR and metabolomics.
C. Applications to problems in biological and earth sciences. Examples include biomolecular structure and function, protein folding, metabolomics, and advanced analysis of soil matrix.

VIII. **Suggested Text**


IX. **Bibliography**


1a. School or College  
AS CAS

1b. Division  
AMSC Division of Math Science

1c. Department  
CHEMISTRY

2. Course Prefix  
CHEM

3. Course Number  
A690

4. Previous Course Prefix & Number  
N/A

5a. Credits/CEUs  
1-3

5b. Contact Hours  
(1-3+0)

6. Complete Course Title  
Advanced Lecture Topics in Chemistry  
Adv Lecture Topics Chemistry

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
- ☐ Other Restrictions
- ☐ College
- ☐ Major
- ☐ Other CCG (please specify)

9. Repeat Status Yes  # of Repeats  11  Max Credits  12

10. Grading Basis  ☒ A-F  ☐ P/NP  ☐ NG

11. Implementation Date  
From: Fall/2013  To: /9999

12. ☐ Cross Listed with  
☒ Stacked with CHEM A490  
Cross-Listed Coordination

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

Initiator Name (typed): Colin McGill  
Initiator Signed Initials:  Date:_______________

13b. Coordination Email  Date:  
13c. Coordination with Library Liaison  Date:

submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

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 coverage of a selected lecture topic in chemistry presented at a breadth and depth appropriate for graduate studies. Activities vary according to topic. Exposure to the topic will rely extensively on independent review of the literature supplemented with text and lecture for reference. Students will be required to integrate and apply knowledge from multiple sources to address topical questions and discuss their interpretations, and they will be required to conduct a research project on an advanced topic relevant to the course. For students in chemistry and allied fields. Special Notes: See schedules for specific subtitles to be offered. With changes in subtitles, course may be repeated for credit although course prerequisites and corequisites may vary with topic.

16a. Course Prerequisite(s) (list prefix and number)  
16b. Test Score(s)  
16c. Co-requisite(s) (concurrent enrollment required)

16d. Other Restriction(s)  
- ☐ College  ☐ Major  ☐ Class  ☒ Level

16e. 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  
Provide a flexible graduate level curriculum for Interdisciplinary Graduate Students addressing material not taught on a regular basis.
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<th>Initiator (faculty only)</th>
<th>Date</th>
<th>Dean/Director of School/College</th>
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<td>Colin McGill</td>
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<td>Department Chairperson</td>
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Course Content Guide for **CHEM A690**  
University of Alaska Anchorage  
College of Arts & Sciences

I. **Date of Initiation:** February 22, 2013

II. **Course Information**

   A. **College:** College of Arts & Sciences
   
   B. **Course Subject:** CHEM
   
   C. **Course Number:** A690
   
   D. **Number of Credits:** 1-3
   
   E. **Contact Hours:** 1-3 + 0
   
   F. **Course Title:** Advanced Lecture Topics in Chemistry
   
   G. **Grading Basis:** A-F
   
   H. **Implementation Date:** Fall 2013

I. **Course Description:** Advanced coverage of a selected lecture topic in chemistry presented at a breadth and depth appropriate for graduate studies. Activities vary according to topic. Exposure to the topic will rely extensively on independent review of the literature supplemented with text and lecture for reference. Students will be required to integrate and apply knowledge from multiple sources to address topical questions and discuss their interpretations, and they will be required to conduct a research project on an advanced topic relevant to the course. For students in chemistry and allied fields. Special Notes: See schedules for specific subtitles to be offered. With changes in subtitles, course may be repeated for credit although course prerequisites and corequisites may vary with topic.

J. **Course Attributes:** N/A

K. **Prerequisites:** N/A

L. **Test Scores:** N/A

M. **Corequisites:** N/A

N. **Registration Restrictions:** Graduate standing.
O. Course Fee: No

P. Stacked With: CHEM A490

III. Instructional Goals and Student Learning Outcomes

A. Instructional Goals:

Instructional goals will vary according to topic. An example is provided below for course subtitled “Bioorganic Chemistry and Chemical Biology”.

The instructor will:

1. Introduce students to advanced topics concerning the chemical origins of biology emphasizing regulation at the chemical level.
2. Encourage knowledge integration by presenting bioorganic chemistry in an integrated context that relates knowledge from biology, chemistry and modeling to understand macromolecular structure and function.
3. Encourage critical thinking by providing reading assignments from primary literature, and leading in-class discussion that requires critical assessments of the articles by the students.

B. Student Learning Outcomes:

Student learning outcomes will vary according to topic. An example is provided below for course subtitled “Bioorganic Chemistry and Chemical Biology”.

<table>
<thead>
<tr>
<th>Student Learning Outcomes – Students will:</th>
<th>Assessment Strategies and Student Artifacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be able to demonstrate a working knowledge of the chemical basis for the production and function of classic biological macromolecules.</td>
<td>Written reports, In-Class Discussion, Exams</td>
</tr>
<tr>
<td>Be able to integrate mechanistic arrow pushing in the study of biochemistry and molecular biology.</td>
<td>Written reports, In-Class Discussion, Exams</td>
</tr>
<tr>
<td>Be able to describe enzyme function and regulation by integrating crystal structure data, NMR data, and classical organic chemistry.</td>
<td>Written reports, In-Class Discussion, Exams</td>
</tr>
</tbody>
</table>
Independently integrate information from the literature to address specific questions concerning the function of classic enzyme systems.

Oral (or written) presentations and in-class discussion work facilitated by the instructor.

IV. **Course Activities:**

A. Lecture
B. Critical reading, analysis and discussion of primary research literature with written (or oral) reports
C. Assigned problems to be worked outside of class
D. Exams
E. Research and/or papers reviewing literature on a current theoretical or practical topic in biochemistry

V. **Guidelines for Evaluation**

A. At least 3 written exams, one of which is a comprehensive final exam
B. Reports (written or oral) on primary literature
C. Research paper
D. Grades will be assigned based primarily on exam performance with no more than 30% of the grade based on reports and a research paper. The grading scale is defined in the syllabus or assigned after a normal curve distribution.

VI. **Course Level Justification**

This is an advanced lecture course in the principles and processes of biochemistry topics emphasizing the mechanistic aspects of function and regulation at the chemical level. Success in the course requires functional knowledge in multiple 300- and 400-level chemistry and biology courses and the ability to integrate this knowledge with data in the literature.

VII. **Topic Course Outline**

A. Chemical origins of biology
B. DNA and RNA
C. Peptide and protein structure
D. Protein function and regulation at the chemical level
E. Glycobiology
F. Terpenes
G. Chemical control of signal transduction

VIII. **Suggested Texts**


**IX. Bibliography**

3. Scientific Journals such as (not a comprehensive list):
   - Biological Chemistry
   - Biochemistry
   - Biophysical Journal
   - Cell
   - European Journal of Molecular Biology
   - Journal of Biological Chemistry
   - Journal of Molecular Biology
   - Molecular Biology
   - Molecular Cell
   - Nature
   - Nature Structure
   - Proceedings of the National Academy of Sciences
   - Science
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
CHEMISTRY

2. Course Prefix
CHEM

3. Course Number
A490

4. Previous Course Prefix & Number
N/A

5a. Credits/CEUs
1-3

5b. Contact Hours
(Lecture + Lab) (1-3+0)

6. Complete Course Title
Selected Lecture Topics in Chemistry
Selected Lect Topics Chemistry

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

8. Type of Action: ☑ Add ☐ Change ☐ Delete

If a change, mark appropriate boxes:
- Prefix
- Credits
- Title
- Grading Basis
- Course Description
- Test Score Prerequisites
- Other Restrictions
- Class
- College
- Major
- Other CCG (please specify)

9. Repeat Status Yes

9a. # of Repeats
11

9b. Max Credits
12

10. Grading Basis
☑ A-F ☐ P/NP ☐ NG

11. Implementation Date
From: Fall/2013 To: /9999

12. Cross Listed with
☐ Stacked with CHEM A690 Cross-Listed Coordination

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.

<table>
<thead>
<tr>
<th>Impacted Program/Course</th>
<th>Catalog Page(s)</th>
<th>Impacted</th>
<th>Date of Coordination</th>
<th>Chair/Coordinator Contacted</th>
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<td>1. B.S. Chemistry</td>
<td></td>
<td></td>
<td>2/22/2013</td>
<td>Eric Holmberg</td>
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</table>

Initiator Name (typed): Colin McGill
Initiator Signed Initials: _______ Date: __________

13b. Coordination Email
Date:

13c. Coordination with Library Liaison
Date:

submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

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)
Detailed coverage of a selected lecture topic in chemistry presented at a breadth and depth appropriate for undergraduate studies. Activities will vary according to the topic. Exposure to the topic will rely principally on text, lecture, and directed review of selected articles in the literature. For students in chemistry and allied fields. Special Notes: See schedules for specific subtitles to be offered. With changes in subtitles, course may be repeated for credit although course prerequisites and corequisites may vary with topic.

16a. Course Prerequisite(s) (list prefix and number)
16b. Test Score(s)
16c. Co-requisite(s) (concurrent enrollment required)

16d. Other Restriction(s)
☐ College ☐ Major ☐ Class ☐ Level

16e. Registration Restriction(s) (non-codable)
Junior or senior standing and instructor approval.

17. Mark if course has fees

18. ☑ Mark if course is a selected topic course

19. Justification for Action
Provide additional upper division elective opportunities for undergraduate chemistry students, by student demand.

Initiator (faculty only)
Colin McGill
Initiator (TYPE NAME)

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

☐ Approved ☐ Disapproved
Undergraduate/Graduate Academic Date

☐ Approved ☐ Disapproved
Board Chairperson

☐ Approved ☐ Disapproved
Provost or Designee Date
Course Content Guide for **CHEM A490**
University of Alaska Anchorage
College of Arts & Sciences

I. **Date of Initiation:** February 22, 2013

II. **Course Information**

A. **College:** College of Arts & Sciences

B. **Course Subject:** CHEM

C. **Course Number:** A490

D. **Number of Credits:** 1-3

E. **Contact Hours:** 1-3 + 0

F. **Course Title:** Selected Lecture Topics in Chemistry

G. **Grading Basis:** A-F

H. **Implementation Date:** Fall 2013

I. **Course Description:** Detailed coverage of a selected lecture topic in chemistry presented at a breadth and depth appropriate for undergraduate studies. Activities will vary according to the topic. Exposure to the topic will rely principally on text, lecture, and directed review of selected articles in the literature. For students in chemistry and allied fields. Special Notes: See schedules for specific subtitles to be offered. With changes in subtitles, course may be repeated for credit although course prerequisites and corequisites may vary with topic.

J. **Course Attributes:** N/A

K. **Prerequisites:** N/A

L. **Test Scores:** N/A

M. **Corequisites:** N/A

N. **Registration Restrictions:** Junior or senior standing and instructor approval.

O. **Course Fee:** No
III. Instructional Goals and Student Learning Outcomes

A. Instructional Goals:

Instructional goals will vary according to topic. An example is provided below for course subtitled “Bioorganic Chemistry and Chemical Biology”.

The instructor will:

1. Introduce students to the fundamental topics of the chemical origins of biology emphasizing regulation at the chemical level.
2. Encourage knowledge integration by presenting bioorganic chemistry in an integrated context that relates knowledge from biology, chemistry and modeling to understand macromolecular structure and function.
3. Encourage critical thinking by providing reading assignments from primary literature, and leading in-class discussion that requires critical assessments of the articles by the students.

B. Student Learning Outcomes:

Student learning outcomes will vary according to topic. An example is provided below for course subtitled “Bioorganic Chemistry and Chemical Biology”.

<table>
<thead>
<tr>
<th>Student Learning Outcomes – Students will:</th>
<th>Assessment Strategies and Student Artifacts</th>
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</thead>
<tbody>
<tr>
<td>Be able to demonstrate a working knowledge of the chemical basis for the production and function of classic biological macromolecules.</td>
<td>Written reports, In-Class Discussion, Exams</td>
</tr>
<tr>
<td>Be able to integrate mechanistic arrow pushing in the study of biochemistry and molecular biology.</td>
<td>Written reports, In-Class Discussion, Exams</td>
</tr>
<tr>
<td>Be able to describe enzyme function and regulation by integrating crystal structure data, NMR data, and classical organic chemistry.</td>
<td>Written reports, In-Class Discussion, Exams</td>
</tr>
</tbody>
</table>
Actively participate in and contribute to in-class discussion of primary research literature. Oral (or written) presentations and in-class discussion work facilitated by the instructor.

IV. **Course Activities**:

   A. Lecture  
   B. Critical reading, analysis and discussion of primary research literature with written (or oral) reports  
   C. Assigned problems to be worked outside of class  
   D. Exams  
   E. Research and/or papers reviewing literature on a current theoretical or practical topic in biochemistry

V. **Guidelines for Evaluation**

   A. At least 3 written exams, one of which is a comprehensive final exam  
   B. Reports (written or oral) on primary literature  
   C. Research paper  
   D. Grades will be assigned based primarily on exam performance with no more than 30% of the grade based on reports and a research paper. The grading scale is defined in the syllabus or assigned after a normal curve distribution.

VI. **Course Level Justification**

   This course builds upon a foundation of knowledge established in 300-level chemistry and biology courses.

VII. **Topic Course Outline**

   A. Chemical origins of biology  
   B. DNA and RNA  
   C. Peptide and protein structure  
   D. Protein function and regulation at the chemical level  
   E. Glycobiology  
   F. Terpenes  
   G. Chemical control of signal transduction

VIII. **Suggested Texts**


IX. Bibliography

3. Scientific Journals such as (not a comprehensive list):
   - Biological Chemistry
   - Biochemistry
   - Biophysical Journal
   - Cell
   - European Journal of Molecular Biology
   - Journal of Biological Chemistry
   - Journal of molecular Biology
   - Molecular Biology
   - Molecular Cell
   - Nature
   - Nature Structure
   - Proceedings of the National Academy of Sciences
   - Science
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: Chemistry

2. Course Prefix: CHEM
3. Course Number: A698
4. Previous Course Prefix & Number: 
5a. Credits/CEUs: 1-6
5b. Contact Hours: (Lecture + Lab) (0+3-18)

6. Complete Course Title: Graduate Research
Abbreviated Title for Transcript (30 character): 

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

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

9. Repeat Status: ☐ Yes ☐ No
# of Repeats: 
Max Credits: 12

10. Grading Basis: ☐ A-F ☘ P/NP ☐ NG

11. Implementation Date: semester/year
From: Fall/2013 To: /9999

12. ☐ Cross Listed with 
Stacked with 

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.

<table>
<thead>
<tr>
<th>Impacted Program/Course</th>
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<th>Chair/Coordinator Contacted</th>
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<tr>
<td>1. Interdisciplinary Masters Program</td>
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Initiator Name (typed): Vugmeyster
Initiator Signed Initials: _________ Date: __________

13b. Coordination Email: _________
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 ☐ Social Sciences
☐ Fine Arts ☐ Natural Sciences ☐ Humanities ☐ Integrative Capstone

15. Course Description (suggested length 20 to 50 words)
Thesis specific research for interdisciplinary graduate students. Topic of study to be approved and directed by a faculty member.
Special Notes: Permission of graduate advisor required. May be repeated for a maximum of 12 credits.

16a. Course Prerequisite(s) (list prefix and number or test code and score)
16b. Co-requisite(s) (concurrent enrollment required)

16c. Other Restriction(s) (circle appropriate boxes)
☐ 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
Curriculum addition for the Interdisciplinary Masters degree program.

<table>
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<th>Initiator (faculty only)</th>
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Initiator (TYPE NAME) | Date | Approved | Disapproved |
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Disapproved | | | |

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<th>Date</th>
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82
Course Content Guide for **CHEM A698**  
University of Alaska Anchorage  
College of Arts and Sciences

I. **Date of Initiation:** February 22, 2013

II. **Course Information:**

A. **College:** College of Arts and Sciences

B. **Course Subject:** CHEM

C. **Course Number:** A698

D. **Number of Credits:** 1-6

E. **Contact Hours:** 0 + 3-18

F. **Course Title:** Graduate Research

G. **Grading Basis:** Pass/No Pass

H. **Implementation Date:** Fall 2013

I. **Course Description:** Thesis specific research for interdisciplinary graduate students. Topic of study to be approved and directed by a faculty member. Special Notes: Permission of graduate advisor required. May be repeated for a maximum of 12 credits.

J. **Course Attributes:** N/A

K. **Prerequisites:** N/A

L. **Test Scores:** N/A

M. **Corequisites:** N/A

N. **Registration Restriction:** Graduate standing.

O. **Course Fees:** Yes
III. Instructional Goals and Defined Outcomes

A. Instructional Goals:

The instructor will mentor the conceptualization, formulation of hypotheses based on observation and literature review, experimental or computational design, methodologies, data analyses using appropriate discipline-specific tools, refinement of hypotheses, integrating results with appropriate literature reports and writing of a research project.

B. Student Learning Outcomes:

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct original research in physical sciences under the mentorship of a faculty advisor.</td>
<td>Research projects, Meetings, Scheduled reports, Research paper.</td>
</tr>
<tr>
<td>Apply appropriate analyses to generate results suitable for a publishable thesis or scientific papers.</td>
<td>Research projects, Meetings, Scheduled reports, Research paper.</td>
</tr>
<tr>
<td>Discuss and assess progress on a research project with faculty research advisor during the semester through regularly scheduled one-on-one meetings.</td>
<td>Research projects, Meetings, Scheduled reports, Research paper.</td>
</tr>
</tbody>
</table>

IV. Course Activities

A. Laboratory / field directed research course meeting 3 hours per week per credit up to 6 credits per semester.
B. One-on-one discussions with a faculty advisor.

V. Guidelines for Evaluation

Course grading is Pass/No Pass. 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 culminating in suitably publishable results relevant to the thesis research. Assessment is made through
regularly scheduled one-on-one meetings between the student and the faculty mentor to address the continuity and degree of progress.

VI. **Course Level Justification**

Designed as a required course for the interdisciplinary M.S. degree program comparable to graduate-level directed research offered at other universities. This is an advanced research course in the context of formulating working hypotheses, experimental or theoretical design, and selecting appropriate research methodologies.

VII. **Course Outline**

Will vary.

VIII. **Suggested Text**


IX. **Bibliography**

Will vary depending on the discipline.

## Course Action Request

**University of Alaska Anchorage**

**Proposal to Initiate, Add, Change, or Delete a Course**

<table>
<thead>
<tr>
<th>1a. School or College</th>
<th>1b. Division</th>
<th>1c. Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS CAS</td>
<td>AMSC Division of Math Science</td>
<td>Geological Sciences</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Course Prefix</th>
<th>3. Course Number</th>
<th>4. Previous Course Prefix &amp; Number</th>
<th>5a. Credits/CEUs</th>
<th>5b. Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL</td>
<td>A654</td>
<td>N/A</td>
<td>3</td>
<td>(3+0)</td>
</tr>
</tbody>
</table>

### 6. Complete Course Title

**Glacial and Quaternary Geology**

**Abbreviated Title for Transcript (30 character)**

### 8. Type of Course

- [x] Academic
- [ ] Preparatory/Development
- [ ] Non-credit
- [ ] CEU
- [ ] Professional Development

### 9. Repeat Status

<table>
<thead>
<tr>
<th># of Repeats</th>
<th>Max Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 10. Grading Basis

- [x] A-F
- [ ] P/NP
- [ ] NG

### 11. Implementation Date

**From:** Spring/2013  **To:** /

### 12. Cross Listed with

- Stacked with GEOL A454  
  Cross-Listed Coordination

### 13. 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](http://www.uaa.alaska.edu/governance).

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<td>1. Geological Sciences - BS</td>
<td>2-26-13</td>
<td>L. Munk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. AAEST - COE</td>
<td>2-26-13</td>
<td>A. Dotson</td>
<td></td>
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</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

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

Examines glacial processes of erosion and deposition, and the modern and ancient landforms produced by ice. Topics include: Quaternary history of glaciers, climate fluctuation, changes in terrestrial and marine environments, and evidence and techniques used to reconstruct past environments. Independent research project and weekend field trip required. Special note: Students are required to provide their own transportation to field locales.

### 16a. Course Prerequisite(s)

(list prefix and number)

### 16b. Test Score(s)

### 16c. Co-requisite(s) (concurrent enrollment required)

### 16d. Other Restriction(s)

- [x] College
- [ ] Major
- [ ] Class
- [x] Level

### 16e. 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

Designed as 600-level graduate course requiring independent research.

Initiator (faculty only): **Kristine J Crossen**  
Date: __________

Initiator (TYPE NAME): **Kristine J Crossen**  
Date: __________

Approved

Dean/Director of School/College  
Date: __________

Disapproved

Undergraduate/Graduate Academic  
Date: __________

Approved

Board Chairperson  
Date: __________

Disapproved

Provost or Designee  
Date: __________

Approved

Department Chairperson  
Date: __________

Disapproved

Curriculum Committee Chairperson  
Date: __________

Disapproved
I. **Date of Initiation:** Spring 2013

II. **Course Information:**
   A. College: CAS
   B. Course Subject: Geological Sciences
   C. Course Number: GEOL A654
   D. Number of Credits: 3.0 (3+0)
   E. Course Title: Glacial and Quaternary Geology
   F. Grading Basis: A-F
   G. Course Description: Examines glacial processes of erosion and deposition, and the modern and ancient landforms produced by ice. Topics include: Quaternary history of glaciers, climate fluctuation, changes in terrestrial and marine environments, and evidence and techniques used to reconstruct past environments. Independent research project and weekend field trip required. Special note: Students are required to provide their own transportation to field locales.
   H. Course Prerequisites: GEOL A221
   I. Restrictions: Graduate Standing
   J. Fee: Yes

III. **Instructional Goals and Student Outcomes**
   A. Instructional Goals
      The instructor will:
      1. Present information concerning formation of, and the processes associated with, a variety of glaciers and their landforms.
      2. Present evidence for and reconstructions of the past Ice Ages.
      3. Teach students to analyze and critically evaluate the professional literature concerning glaciers and climate change.

   B. Student Outcomes.
      The students will:
      1. Determine changes in environments based on glacial features and landforms. Assessment: Exams and exercises.
      3. Critique the relevant professional literature considering both the techniques used to gather data and the resulting interpretations made by the authors. Assessment: Written summaries and discussion.
IV. Course Evaluations

Based on grades received on exams, class exercises, field trip attendance and independent research project report.

V. Course Level Justification

Requires students to analyze and critique the professional literature. Graduate students must select and complete an appropriate research topic, and make a professional presentation on their topic.

VI. Topical Course Outline

Glaciology – Modern Glacial Processes
  Subglacial Processes
  Meltwater Processes

Glacial Geology – Glacial Processes and Landforms
  Erosional Processes and Landforms
  Debris Transport
  Glacial Depositional Processes and Landforms
  Glacial Marine and Glacial Lacustrine Processes and Landforms
  Glacial Reconstructions

Quaternary Geology- Reconstructing past Ice Ages
  Isostacy and Eustacy
  Palynological Evidence and Paleoenvironmental Reconstructions
  Vertebrate and Invertebrate Evidence and Paleoenvironments
  Dating Techniques
  Deep Sea Cores and Oxygen Isotopes
  Ice Cores and Interpretations

Professional Papers – Summaries and Discussions
  Beringian Paleoecology
  Cook Inlet Quaternary Geology
  Little Ice Age Reconstructions
  Mammoths
  Ice Man of the Alps

Professional Quality Presentation
  Selection of appropriate topic
  Topic research
  Professional presentation
VII. Suggested Text(s)


VIII. Bibliography


Proposal to Initiate, Add, Change, or Delete a Course

1. **School or College**
   - AS CAS

2. **Course Prefix**
   - GEOL

3. **Course Number**
   - A454

4. **Previous Course Prefix & Number**
   - N/A

5a. **Credits/CEUs**
   - 3

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

6. **Complete Course Title**
   - Glacial and Quaternary Geology

7. **Type of Course**
   - [ ] Academic
   - [ ] Preparatory/Development
   - [ ] Non-credit
   - [ ] CEU
   - [ ] Professional Development

8. **Type of Action**
   - [ ] Add
   - [X] Change
   - [ ] Delete

9. **Repeat Status No**
   - # of Repeats
   - Max Credits

10. **Grading Basis**
    - [X] A-F
    - [ ] P/NP
    - [ ] NG

11. **Implementation Date**
    - From: Fall/2014
    - To: /

12. **Cross Listed with**
    - [ ] Cross Listed
    - [X] Stacked with GEOL A654

13a. **Impacted Courses or Programs**

14. **General Education Requirement**
    - Mark appropriate box:
      - [ ] Oral Communication
      - [ ] Written Communication
      - [ ] Quantitative Skills
      - [ ] Humanities
      - [ ] Social Sciences
      - [ ] Natural Sciences
      - [ ] Integrative Capstone

15. **Course Description**
    - Examines glacial processes of erosion and deposition, and the modern and ancient landforms produced by ice. Topics include: Quaternary history of glaciers, climate fluctuation, changes in terrestrial and marine environments, and evidence and techniques used to reconstruct past environments. Weekend field trip required. Special note: Students are required to provide their own transportation to field locales.

16a. **Course Prerequisite(s)** (list prefix and number)
    - GEOL A221

16d. **Other Restriction(s)**
    - [ ] College
    - [ ] Major
    - [ ] Class
    - [ ] Level

17. **Mark if course has fees**

19. **Justification for Action**
    - Course stacking to allow graduate students access to the course offering. Additional information concerning field trips.

---

**Initiator Name:** Kristine J Crossen
**Initiator Signed Initials:** _________
**Date:** _______________

**Coordination Email:** Date: 2-28-13
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

**Coordination with Library Liaison:** Date: 4-1-13

**Proposal to Initiate, Add, Change, or Delete a Course**

---
I. **Date of Initiation:** Spring 2013

II. **Course Information:**
   A. College: CAS
   B. Course Subject: Geological Sciences
   C. Course Number: GEOL A454
   D. Number of Credits: 3.0 (3+0)
   E. Course Title: Glacial and Quaternary Geology
   F. Grading Basis: A-F
   G. Course Description: Examines glacial processes of erosion and deposition, and the modern and ancient landforms produced by ice. Topics include: Quaternary history of glaciers, climate fluctuation, changes in terrestrial and marine environments, and evidence and techniques used to reconstruct past environments. Weekend field trip required. Special note: Students are required to provide their own transportation to field locales.
   H. Course Prerequisites: GEOL A221
   I. Fee: Yes

III. **Instructional Goals and Student Learning Outcomes**
   A. Instructional Goals
      The instructor will:
      1. Present information concerning formation of, and the processes associated with, a variety of glaciers and their landforms.
      2. Present evidence for and reconstructions of the past Ice Ages.
      3. Teach students to analyze and critically evaluate the professional literature concerning glaciers and climate change.

   B. Student Learning Outcomes.
      The students will:
      1. Determine changes in environments based on glacial features and landforms. Assessment: Exams and exercises.
      3. Critique the relevant professional literature considering both the techniques used to gather data and the resulting interpretations made by the authors. Assessment: Written summaries and discussion.
IV. Course Evaluations

Based on grades received on exams, class exercises, field trip attendance and report.

V. Course Level Justification

Refines skills students have learned in earlier courses and requires students to analyze and critique the professional literature.

VI. Topical Course Outline

Glaciology – Modern Glacial Processes
  Subglacial Processes
  Meltwater Processes

Glacial Geology – Glacial Processes and Landforms
  Erosional Processes and Landforms
  Debris Transport
  Glacial Depositional Processes and Landforms
  Glacial Marine and Glacial Lacustrine Processes and Landforms
  Glacial Reconstructions

Quaternary Geology- Reconstructing past Ice Ages
  Isostacy and Eustacy
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  Ice Cores and Interpretations

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  Cook Inlet Quaternary Geology
  Little Ice Age Reconstructions
  Mammoths
  Ice Man of the Alps
VII. Suggested Text(s)


VIII. Bibliography


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

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<td>(3+0)</td>
</tr>
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</table>

6. Complete Course Title
Permafrost

Abbreviated Title for Transcript (30 character)

7. Type of Course
- [ ] Academic
- [ ] Preparatory/Development
- [ ] Non-credit
- [ ] CEU
- [ ] Professional Development

8. Type of Action:
- [x] Add
- [ ] Change
- [ ] Delete

If a change, mark appropriate boxes:
- [ ] Prefix
- [ ] Course Number
- [ ] Contact Hours
- [ ] Repeat Status
- [ ] Grading Basis
- [ ] Cross-Listed/Stacked
- [ ] Course Description
- [ ] Course Prerequisites
- [ ] Co-requisites
- [ ] Test Score Prerequisites
- [ ] Registration Restrictions
- [ ] Other Requirements
- [ ] Class
- [ ] Level
- [ ] College
- [ ] Major
- [ ] Other CCG (please specify)

9. Repeat Status No
- [ ] # of Repeats
- [x] Max Credits
- [ ] A-F
- [ ] P/NC
- [ ] NG

10. Grading Basis
- [x] A-F
- [ ] P/NC
- [ ] NG

11. Implementation Date
From: Fall/2014
To: / / 

12. [ ] Cross Listed with
- [ ] Stacked with GEOL A455
- [ ] Cross-Listed Coordination

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.

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<td>L. Munk</td>
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Initiator Name (typed): Kristine J Crossen
Initiator Signed Initials: _________
Date: ________________

13b. Coordination Email
Date: 2/28/13
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison
Date: 4/1/13

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)
Examines permafrost geomorphic processes, environments and landforms. Topics include: properties of ground ice and patterned ground, permafrost landscape dynamics, engineering and environmental problems, and impacts of climate change on permafrost systems. One weekend field trip and independent research required. Special note: Students are required to provide their own transportation to field locales.

16a. Course Prerequisite(s) (list prefix and number)
GEOL A221

16b. Test Score(s)

16c. Co-requisite(s) (concurrent enrollment required)

16d. Other Restriction(s)
- [ ] College
- [ ] Major
- [ ] Class
- [ ] Level

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

17. [x] Mark if course has fees

18. [ ] Mark if course is a selected topic course

19. Justification for Action
Designed as 600-level graduate course requiring independent research.

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

[ ] Approved
[ ] Disapproved

Dean/Director of School/College
Date

[ ] Approved
[ ] Disapproved

Undergraduate/Graduate Academic
Date

Board Chairperson

[ ] Approved

Provost or Designee
Date

[ ] Approved

Curriculum Committee Chairperson
Date
Course Content Guide  
University of Alaska Anchorage  

GEOL A655  
Permafrost

I. Date of Initiation: Spring 2013

II. Course Information:  
A. College or School: CAS  
B. Course Subject: Geological Sciences  
C. Course Number: GEOL A655  
D. Number of Credits: 3.0 (3+0)  
E. Course Title: Permafrost  
F. Grading Basis: A-F  
G. Course Description: Examines permafrost geomorphic processes, environments and landforms. Topics include properties of ground ice and patterned ground, permafrost landscape dynamics, engineering and environmental problems, and impacts of climate change on permafrost systems. One weekend field trip and independent research required. Special note: Students are required to provide their own transportation to field locales.  
H. Prerequisites: GEOL A221  
I. Restrictions: Graduate standing  
J. Fee: yes

III. Instructional Goals and Student Outcomes:  
A. Instructional Goals.  
The instructor will:  
1) Present concepts, methods, and problems important to the study of permafrost and periglacial geomorphology.  
2) Guide students toward an understanding of the linkages between cryosphere processes and resulting patterns in landforms, surface features, and ecosystems.  
3) Design lectures and class exercises that will focus on aspects of theoretical and applied methods of describing and investigating frozen ground phenomena.  

B. Student Learning Outcomes. The students will:  
1) Demonstrate knowledge of permafrost geomorphic processes, physical principles, and the factors affecting these processes. Assessment: Exams and exercises.  
2) Combine knowledge gained about cryogenic processes with both predicted and observed patterns in landform and sediments. Assessment: Exams and exercises.
3) Integrate observational and conceptual information to interpret field data. Assessment: Projects.
4) Assess and critique current literature, formulate, justify, and adequately communicate educated opinions. Assessment: Summaries and projects.
5) Develop, investigate, and give a professional presentation of an independent research project. Assessment: Project.

IV. Course Evaluation
Students will be evaluated through exams focused on basic concepts, methods, and terminology. Essay components will be used to evaluate student ability to synthesize and communicate information. Exercises will be graded for quality of work, degree of understanding, and integration of outside knowledge. Students will discuss professional quality papers and make presentations.

V. Course Level Justification
This course uses both the conceptual and intellectual skills obtained in previous geology courses to apply to the study of permafrost geology. 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 as characteristic of upper division courses. Independent research of appropriate topic is required.

VI. Topical Course Outline
A. Introduction / Concepts
   a. Laws of Thermodynamics / Heat flow
   b. Physical properties of ice / ice mechanics
B. Cold regions weathering processes
   a. Frost cracking, riving, weathering
   b. Frost action: heaving, frost mounds, needle ice
   c. Slope processes: creep, solifluction, rock glaciers, nivation, altiplanation
C. Permafrost
   a. Definitions, distribution, current research
   b. Permafrost processes
      i. Ice aggradation: sygenetic and epigenetic wedges
      ii. Lens ice, reticulated ice, remnant ice
   c. Active layer processes and landforms
      i. Frost heave, frost boils, sorted circles, stripes
      ii. Pingos and palsas
      iii. Polygonal ground patterns and processes
   d. Thermokarst processes and landforms
D. Cold Regions Hydrology / Fluvial Geomorphology
   a. Fluvial processes and problems
      i. Freeze-up / break-up, channel scour
      ii. Aufeis, overflow, channel morphology of frozen rivers
   b. Ground water in permafrost environments
   c. Cold regions lake dynamics / limnology
E. Engineering / Environmental issues in Permafrost environments
   a. Methods in mapping and detecting permafrost hazards
   b. Infrastructure, contaminants, hydrologic issues

F. Permafrost Landscape Dynamics
   a. Associated processes (aeolian, glacial, coastal) & landscape assemblage
   b. Cold region ecosystems and transitions (boreal, sub arctic, artic, high
   arctic tundra / vegetations assemblages)
   c. Plant and animal adaptations to periglacial environments
   d. Periglacial and permafrost soils

G. Climate Change
   a. Pleistocene Environments (permafrost taphonomy, paleoenvironmental
   reconstruction)
   b. Changing landscapes of the present – land use, climate change
   c. Global warming in permafrost environments

H. Student Research
   a. Research of appropriate topic
   b. Professional quality presentation

VII. Suggested Text(s)


VIII. Bibliography


Institute of Northern Engineering, Fairbanks, 2100 p.

Knight, J. and Harrison, S., eds. (2009) Periglacial and Paraglacial Processes and


of river systems to climate change. Quaternary International 79, 111-121.
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
A455

4. Previous Course Prefix & Number
N/A

5a. Credits/CEUs
3

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

6. Complete Course Title
Permafrost

Abbreviated Title for Transcript (30 character) Permafrost

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

8. Type of Action:
☐ Add ☐ Change ☐ Delete

If a change, mark appropriate boxes:

- Prefix
- Credits
- Title
- Grading Basis
- Course Description
- Test Score Prerequisites
- Other Restrictions
- Class
- Level
- Other CCG (please specify)

9. Repeat Status No

# of Repeats

Max Credits

10. Grading Basis
☒ A-F ☐ P/NP ☐ NG

11. Implementation Date
From: Fall/2014 To: / 

12. ☐ Cross Listed with
☒ Stacked with GEOL A655 Cross-Listed Coordination

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](http://www.uaa.alaska.edu/governance).

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<td>L. Munk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Environment and Society - BA, BS</td>
<td>2/28/13</td>
<td>D. VanDommelen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
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</table>

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

13b. Coordination Email
Date: 2/28/13

submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison
Date: 4/1/13

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)

Examines permafrost geomorphic processes, environments and landforms. Topics include properties of ground ice and patterned ground, permafrost landscape dynamics, engineering and environmental problems, and impacts of climate change on permafrost systems. One weekend field trip required. Special note: Students are required to provide their own transportation to field locales.

16a. Course Prerequisite(s) (list prefix and number)

GEOL A221

16b. Test Score(s)

16c. Co-requisite(s) (concurrent enrollment required)

16d. Other Restriction(s)

☐ College ☐ Major ☐ Class ☐ Level

16e. Registration Restriction(s) (non-codable)

17. ☒ Mark if course has fees

18. ☐ Mark if course is a selected topic course

19. Justification for Action

Course stacking to allow graduate students access to the course offering. Additional information concerning field trips.

Initiator (faculty only) Kristine J Crossen

Initiator (TYPE NAME)

Approved ☐ Disapproved ☐ Date

Dean/Director of School/College Date

Approved ☐ Disapproved ☐ Undergraduate/Graduate Academic Date

Approved ☐ Disapproved ☐ Provost or Designee Date

Approved ☐ Disapproved ☐ Department Chairperson Date

Approved ☐ Disapproved ☐ Board Chairperson Date
Course Content Guide  
University of Alaska Anchorage  

GEOL A455  
Permafrost

I. Date of Initiation: Spring 2013

II. Course Information:
A. College or School: CAS  
B. Course Subject: Geological Sciences  
C. Course Number: GEOL A455  
D. Number of Credits: 3.0 (3+0)  
E. Course Title: Permafrost  
F. Grading Basis: A-F  
G. Course Description: Examines permafrost geomorphic processes, environments and landforms. Topics include properties of ground ice and patterned ground, permafrost landscape dynamics, engineering and environmental problems, and impacts of climate change on permafrost systems. One weekend field trip required. Special note: Students are required to provide their own transportation to field locales.  
H. Prerequisites: GEOL A221  
I. Fee: yes

III. Instructional Goals and Student Outcomes:
A. Instructional Goals.  
The instructor will:  
1) Present concepts, methods, and problems important to the study of permafrost and periglacial geomorphology.  
2) Guide students toward an understanding of the linkages between cryosphere processes and resulting patterns in landforms, surface features, and ecosystems.  
3) Design lectures and class exercises that will focus on aspects of theoretical and applied methods of describing and investigating frozen ground phenomena.  

B. Student Learning Outcomes. The students will:  
1) Demonstrate knowledge of permafrost geomorphic processes, physical principles, and the factors affecting these processes. Assessment: Exams and exercises.  
2) Combine knowledge gained about cryogenic processes with both predicted and observed patterns in landform and sediments. Assessment: Exams and exercises.  
3) Integrate observational and conceptual information to interpret field data.
Assessment: Projects.
4) Assess and critique current literature, formulate, justify, and adequately communicate educated opinions. Assessment: summaries and projects.

IV. Course Evaluation
Students will be evaluated through exams focused on basic concepts, methods, and terminology. Essay components will be used to evaluate student ability to synthesize and communicate information. Exercises will be graded for quality of work, degree of understanding, and integration of outside knowledge. Students will discuss professional quality papers and make presentations.

V. Course Level Justification
This course uses both the conceptual and intellectual skills obtained in previous geology courses to apply to the study of permafrost geology. 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 as characteristic of upper division courses.

VI. Topical Course Outline
A. Introduction / Concepts
   a. Laws of Thermodynamics / Heat flow
   b. Physical properties of ice / ice mechanics
B. Cold regions weathering processes
   a. Frost cracking, riving, weathering
   b. Frost action: heaving, frost mounds, needle ice
   c. Slope processes: creep, solifluction, rock glaciers, nivation, altiplanation
C. Permafrost
   a. Definitions, distribution, current research
   b. Permafrost processes
      i. Ice aggradation: sygenetic and epigenetic wedges
      ii. Lens ice, reticulated ice, remnant ice
   c. Active layer processes and landforms
      i. Frost heave, frost boils, sorted circles, stripes
      ii. Pingos and palsas
      iii. Polygonal ground patterns and processes
   d. Thermokarst processes and landforms
D. Cold Regions Hydrology / Fluvial Geomorphology
   a. Fluvial processes and problems
      i. Freeze-up / break-up, channel scour
      ii. Aufeis, overflow, channel morphology of frozen rivers
   b. Ground water in permafrost environments
   c. Cold regions lake dynamics / limnology
   d. Sea ice processes, current issues, and remote sensing
E. Engineering / Environmental issues in Permafrost environments
   a. Methods in mapping and detecting permafrost hazards
   b. Infrastructure, contaminants, hydrologic issues
F. Permafrost Landscape Dynamics
   a. Associated processes (aeolian, glacial, coastal) & landscape assemblage
   b. Cold region ecosystems and transitions (boreal, sub arctic, artic, high
      arctic tundra / vegetations assemblages)
   c. Plant and animal adaptations to periglacial environments
   d. Periglacial and permafrost soils
G. Climate Change
   a. Pleistocene Environments (permafrost taphonomy, paleoenvironmental
      reconstruction)
   b. Changing landscapes of the present – land use, climate change
   c. Global warming in permafrost environments

VII. Suggested Text(s)


VIII. Bibliography


Institute of Northern Engineering, Fairbanks, 2100 p..

Knight, J. and Harrison, S., eds. (2009) Periglacial and Paraglacial Processes and


Vandenberghe, J. (2001) Typology of Pleistocene cold-based rivers: The response of
river systems to climate change. Quaternary International 79, 111-121.
## Proposal to Initiate, Add, Change, or Delete a Course

### 1. School or College
- **AS CAS**

### 2. Course Prefix
- **GEOL**

### 3. Course Number
- **A656**

### 4. Previous Course Prefix & Number
- **N/A**

### 5. Credits/CEUs
- **3**

### 6. Complete Course Title
- **Geoarchaeology**

### 7. Type of Course
- **Academic**

### 8. Type of Action:
- **Add**

### 9. Repeat Status
- **# of Repeats**
- **Max Credits**

### 10. Grading Basis
- **A-F**
- **P/NP**
- **NG**

### 11. Implementation Date
- **semester/year**
- **From: Fall 2014**
- **To: 1999**

### 12. Cross Listed with
- **Stacked**
- **with GEOL A456**

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

### 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
Integration of geology and archaeology. Rock identification of lithic sources, sediment analysis of site deposits, paleolandscape reconstruction, geochronology, and environmental change. Response to changes in resources and climate by past societies and application to contemporary problems and issues. Independent research project required. Special Note: Students are required to provide their own transportation to field locales.

### 16a. Course Prerequisite(s) (list prefix and number)
- **ANTH A211** and **GEOL A221**

### 16b. Test Score(s)

### 16c. Co-requisite(s) (concurrent enrollment required)

### 16d. Other Restriction(s)
- **College**
- **Major**
- **Class**
- **Level**

### 17. Mark if course has fees

### 18. Mark if course is a selected topic course

### 19. Justification for Action
Designed as 600-level graduate course requiring independent research. Stacked with GEOL A456.

---

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

**13b. Coordination Email**  
**Date:** 2/28/13  
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

**13c. Coordination with Library Liaison**  
**Date:** 4/1/13

---

**Initiator (faculty only) only)**  
**Date:** ______________  
**Approved**

**Kristine J Crossen**  
**Initiator (TYPE NAME)**

**Disapproved**

---

**Dean/Director of School/College**  
**Date:** ______________  
**Approved**

**Disapproved**

---

**Undergraduate/Graduate Academic**  
**Date:** ______________  
**Approved**

**Disapproved**

---

**Provost or Designee**  
**Date:** ______________  
**Approved**

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Course Content Guide  
University of Alaska Anchorage  

GEOL A656  
Geoarchaeology  

I. Date of Initiation: Spring 2013  

II. Course Information:  
A. College: CAS  
B. Course Subject: Geological Sciences  
C. Course Number: GEOL A656  
D. Number of Credits: 3.0 (3+0)  
E. Course Title: Geoarchaeology  
F. Grading Basis: A-F  
G. Course Description: Integration of geology and archaeology. Rock identification of lithic sources, sediment analysis of site deposits, paleolandscape reconstruction, geochronology, and environmental change. Response to changes in resources and climate by past societies and application to contemporary problems and issues. Independent research project required. Special Note: Students are required to provide their own transportation to field locales.  
H. Course Prerequisites: ANTH A211 and GEOL A221  
I. Restrictions: Graduate Standing  
J. Fees: Yes  

III. Instructional Goals and Student Learning Outcomes  
A. Instructional Goals: The instructor will:   
   1) Present the use of geologic concepts and methods to solve archaeological problems.   
   2) Apply earth science approaches of chronology, sedimentology, and environmental reconstructions to archaeological situations.   
   3) Assign reading and writing exercises that incorporate quantitative and critical thinking skills applied to investigate past societies and their links to modern environmental and climatic problems.  
B. Student Learning Outcomes. The students will be able to:   
   1) Identify different lithologies used in tool making, determine Alaskan lithic sources, and analyze sediments and soils. Assessment: Exams and exercises.   
   2) Assess the processes that produce different types of landforms, and evaluate landforms using aerial photography. Assessment: Exams.   
   3) Critique the different dating techniques used in archaeological sites. Assessment: exams and exercises.   
   4) Assess the major climate sequences over the past 4 million years, and judge the effect on site formation processes. Assessment: Exercises and discussion.
5) Demonstrate the ability to think critically about problems associated with partial data, discrepancies in dating techniques, and differences in data from a variety of sources. Assessment: Discussion.

6) Judge problems logically and resolve them reasonably using scientific methods. Assessment: Exercises and exams.

7) Assess past environmental changes and their impacts of human society and relate these to contemporary issues facing modern societies. Assessment: Discussion.

8) Investigate an appropriate research topic, complete independent research and make a professional quality presentation to the class. Assessment: Presentation.

IV. Course Evaluations

The course will assess each student's ability to communicate effectively in both the written and oral formats through individual and group oral projects and through written synthesis of the professional literature. Projects will require students to locate and appropriately use a variety of library and web resources to complete their projects. The assignments will require quantitative and critical thinking skills to apply the lessons learned from past societies to understand and critically judge the responses of modern societies to problems of resource utilization, shortages, and climate change. The outcome will be evaluated using essay exams, research papers and/or oral presentations, class exercises, annotated bibliographies, and class discussions. Graduate students are required to complete an independent research topic and make a professional quality presentation.

V. Course Level Justification

This interdisciplinary capstone course incorporates both archaeology (anthropology) and geology. This course requires prerequisites from two different disciplines, and requires the students to have the ability to read, analyze and synthesize the professional literature. The course requires graduate standing and independent research.

VI. Topical Course Outline

Section 1 – Lithics
Identification of rocks and minerals
Lithics used for tools and Alaskan lithic sources

Section 2 – Sediments
Depositional Environments
Soil formation

Section 3 – Paleolandscape reconstruction
Processes of landscape formation
Interpretation of aerial photography
Section 4 - Geochronology
Dating techniques used in archaeology

Section 5 - Quaternary Climate Change
Effect of climate change on site formation and preservation
Human response to past climate change
Modern climate change and its effect on human societies

Section 6 - Professional literature on important sites
Reading professional papers, writing annotated bibliographies, class discussion.

Section 7 – Independent research project and class presentation

VII. Suggested Text(s)


VIII. Bibliography


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
A456

4. Previous Course Prefix & Number
N/A

5a. Credits/CEUs
3

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

6. Complete Course Title
Geoarchaeology

Abbreviated Title for Transcript (30 character)

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

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

If a change, mark appropriate boxes:
☐ Prefix
☐ Credits
☒ Title
☐ Grading Basis
☐ Cross-Listed/Stacked
☐ Course Description
☐ Test Score Prerequisites
☐ Co-requisites
☐ Registration Restrictions
☐ Other Restrictions
☐ Class
☐ Level
☐ College
☐ Major
☒ Other CCG (please specify)

9. Repeat Status No

☒ A-F
☐ P/NC
☐ NG

10. Grading Basis

11. Implementation Date
From: Fall/2014
To: /9999

12. ☒ Cross Listed with

Stacked with GEOL A656
Cross-Listed Coordination

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.

<table>
<thead>
<tr>
<th>Impacted Program/Course</th>
<th>Catalog Page(s)</th>
<th>Impacted</th>
<th>Date of Coordination</th>
<th>Chair/Coordinator Contacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Geological Sciences - BS</td>
<td>2/28/13</td>
<td>L. Munk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Anthropology - BS, BA</td>
<td>2/28/13</td>
<td>S. Langdon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
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</tr>
</tbody>
</table>

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

13b. Coordination Email
Date: 2/28/13
submitted to Faculty Listserv: (uas-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison
Date: 4/1/13

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)
Integration of geology and archaeology. Rock identification of lithic sources, sediment analysis of site deposits, paleolandscape reconstruction, geochronology, and environmental change. Response to changes in resources and climate by past societies and application to contemporary problems and issues. Special Note: Students are required to provide their own transportation to field locales.

16a. Course Prerequisite(s) (list prefix and number)
ANTH A211 and GEOL A221

16b. Test Score(s)

16c. Co-requisite(s) (concurrent enrollment required)

16d. Other Restriction(s)
☐ College
☐ Major
☐ Class
☐ Level

16e. Registration Restriction(s) (non-codable)

17. ☒ Mark if course has fees

18. ☒ Mark if course is a selected topic course

19. Justification for Action
Course stacking to allow graduate students access to the course offering. Additional information concerning field trips.

Initiator (faculty only) only
Date

Initiator (TYPE NAME)

Initiator Signed Initials: _________
Date:______________

☐ Approved
☐ Disapproved

Dean/Director of School/College
Date

Undergraduate/Graduate Academic
Board Chairperson
Date

Provost or Designee
Date
Course Content Guide  
University of Alaska Anchorage  

GEOL A456  
Geoarchaeology  

I. Date of Initiation: Spring 2013  

II. Course Information:  
A. College: CAS  
B. Course Subject: Geological Sciences  
C. Course Number: GEOL A456  
D. Number of Credits: 3.0 (3+0)  
E. Course Title: Geoarchaeology  
F. Grading Basis: A-F  
G. Course Description: Integration of geology and archaeology. Rock identification of lithic sources, sediment analysis of site deposits, paleolandscape reconstruction, geochronology, and environmental change. Response to changes in resources and climate by past societies and application to contemporary problems and issues. Special Note: Students are required to provide their own transportation to field locales.  
H. Course Prerequisites: ANTH A211 and GEOL A221  
I. Restrictions: Junior Standing  
J. Fees: None  

III. Instructional Goals and Student Learning Outcomes  
A. Instructional Goals: The instructor will:  
   1) Present the use of geologic concepts and methods to solve archaeological problems.  
   2) Apply earth science approaches of chronology, sedimentology, and environmental reconstructions to archaeological situations.  
   3) Assign reading and writing exercises that incorporate quantitative and critical thinking skills applied to investigate past societies and their links to modern environmental and climatic problems.  

B. Student Learning Outcomes. The students will be able to:  
   1) Identify different lithologies used in tool making, determine Alaskan lithic sources, and analyze sediments and soils. Assessment: Exams and exercises.  
   2) Assess the processes that produce different types of landforms, and evaluate landforms using aerial photography. Assessment: Exams.  
   3) Critique the different dating techniques used in archaeological sites. Assessment: Exams and exercises.  
   4) Assess the major climate sequences over the past 4 million years, and judge the effect on site formation processes. Assessment: Exercises.
5) Demonstrate the ability to think critically about problems associated with partial data, discrepancies in dating techniques, and differences in data from a variety of sources. Assessment: Discussion.
6) Judge problems logically and resolve them reasonably using scientific methods. Assessment: Exercises and exams.
7) Assess past environmental changes and their impacts of human society and relate these to contemporary issues facing modern societies. Assessment: Exercises and discussion.

IV. Course Evaluations

The course will assess each student's ability to communicate effectively in both the written and oral formats through individual and group oral projects and through written synthesis of the professional literature. Projects will require students to locate and appropriately use a variety of library and web resources to complete their projects. The assignments will require quantitative and critical thinking skills to apply the lessons learned from past societies to understand and critically judge the responses of modern societies to problems of resource utilization, shortages, and climate change. The outcome will be evaluated using essay exams, research papers and/or oral presentations, class exercises, annotated bibliographies, and class discussions.

V. Course Level Justification

This interdisciplinary capstone course incorporates both archaeology (anthropology) and geology and satisfies the general education requirement. This course enables students to apply their background skills in GER basic college level courses (Tier 1) with geology and archeology disciplinary areas (Tier 2). Students must meet the criteria of Junior standing and have taken two 200-level courses as prerequisites. This course is part of the geology curriculum, requires prerequisites from two different disciplines, and requires the students to have the ability to read, analyze and synthesize the professional literature.

VI. Integrated Capstone Justification

1. Knowledge Integration/Interrelationships and synergy among GER disciplines: The course strives to integrate geology (natural science) and archaeology/anthropology (social science).

2. Effective Communication Skills: The course demands successful communication skills through essay examinations, individual and group classroom presentations, and discussions of current problems including climate change.

3. Critical Thinking: Students are required to integrate information across disciplines and to critically evaluate data, positions and arguments. They will be
required to demonstrate their critical thinking in writing assignments, class presentations and examinations.

4. Information Literacy: Students will use computer and internet skills to acquire information, research scientific literature for information, and show that they can organize and analyze information from diverse sources. Discussions and presentations will test these skills.

5. Quantitative Perspectives: Students will use statistical analyses, graphical data, and tables of scientific data to investigate concepts and conclusions, and will generate graphical displays of their own results. Examinations and presentations will test these skills.

6. Evolving Realities of the 21st century: Understanding modern and past climate change as well as the human influences on climate change (and other processes occurring on the earth’s surface) help illustrate the connections between science, policy and social attitudes. This course strives to help students understand the impact of climate change on human societies (and vice versa) and understand the effects geologic processes on human societies (and vice versa) both in the past and present times.

VII. Topical Course Outline

Section 1 – Lithics
Identification of rocks and minerals
Lithics used for tools and Alaskan lithic sources

Section 2 – Sediments
Depositional Environments
Soil formation

Section 3 – Paleolandscape reconstruction
Processes of landscape formation
Interpretation of aerial photography

Section 4 - Geochronology
Dating techniques used in archaeology

Section 5 - Quaternary Climate Change
Effect of climate change on site formation and preservation
Human response to past climate change
Modern climate change and its effect on human societies

Section 6 - Professional literature on important sites
Reading professional papers, writing annotated bibliographies, class discussion.

Section 7 – Preparation of a final project and class presentation
VIII. Suggested Text(s)


IX. Bibliography


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
   A660

4. Previous Course Prefix & Number
   N/A

5a. Credits/CEUs
   3
5b. Contact Hours
   (Lecture + Lab) (3+0)

6. Complete Course Title
   Environmental Geochemistry
   Abbreviated Title for Transcript (30 character)

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

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

If a change, mark appropriate boxes:
- Prefix
- Credits
- Title
- Grading Basis
- Course Description
- Test Score Prerequisites
- Other Restrictions
- Class
- Level
- College
- Major
- Other CCG (please specify)

9. Repeat Status No   # of Repeats

10. Grading Basis
    ☒ A-F   ☐ P/NP   ☐ NG

11. Implementation Date
    From: Fall/2014
    To: 9999

12. ☐ Cross Listed with
    ☒ GEOL Applied A460
    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.

<table>
<thead>
<tr>
<th>Impacted Program/Course</th>
<th>Catalog Page(s)</th>
<th>Date of Coordination</th>
<th>Chair/Coordinator Contacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geological Sciences BS</td>
<td>107-109</td>
<td>2/28/13</td>
<td>LeeAnn Munk</td>
</tr>
<tr>
<td>Chemistry BS</td>
<td>101-103</td>
<td>2/28/13</td>
<td>Eric Holmberg</td>
</tr>
<tr>
<td>Applied Environmental Science &amp; Technology MS</td>
<td>315-317</td>
<td>2/28/13</td>
<td>Aaron Dotson</td>
</tr>
</tbody>
</table>

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

13b. Coordination Email
    Date: 2/28/13
    submitted to Faculty Listserv: uaa-faculty@lists.uaa.alaska.edu

13c. Coordination with Library Liaison
    Date: 4/1/13

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)

16a. Course Prerequisite(s) (list prefix and number)
    GEOL A360

16b. Test Score(s)

16c. Co-requisite(s) (concurrent enrollment required)

16d. Other Restriction(s)
    ☐ College   ☐ Major   ☐ Class   ☐ Level

16e. Registration Restriction(s) (non-codable)

17. ☒ Mark if course has fees

18. ☐ Mark if course is a selected topic course

19. Justification for Action
    The course description, instructional goals, student outcomes, course outline, and course evaluation have been updated and/or condensed, the bibliography and suggested texts have been updated and this course will be stacked with GEOL A460.
<table>
<thead>
<tr>
<th>Initiator (faculty only)</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Kristine J Crossen</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th>Initiator (TYPE NAME)</th>
<th>Date</th>
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<table>
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<tr>
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<th>Disapproved</th>
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<tbody>
<tr>
<td>Department Chairperson</td>
<td>Date</td>
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<td>Curriculum Committee Chairperson</td>
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<td>Dean/Director of School/College</td>
<td>Date</td>
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<tbody>
<tr>
<td>Undergraduate/Graduate Academic Board Chairperson</td>
<td>Date</td>
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<tbody>
<tr>
<td>Provost or Designee</td>
<td>Date</td>
</tr>
</tbody>
</table>
I. Date of Initiation: Spring 2013

II. Course Information:
   A. College or School: CAS
   B. Course Subject: Geological Sciences
   C. Course Number: A660
   D. Number of Credits: 3.0 (3+0)
   E. Course Title: Environmental Geochemistry
   F. Grading Basis: A-F
   G. Course Description: Principles and applications of environmental geochemistry on a global scale. Geochemical cycles and chemical mass balance of elements. Chemical weathering and the composition of natural waters. Processes affecting the distribution of trace elements in geologic environments. Stable isotope fractionation and applications to modeling environmental systems. Review of specific cases of modern environmental geochemistry problems. Independent research project required.
   H. Course Prerequisites: GEOL A360
   I. Restrictions: Graduate standing
   J. Fees: yes

III. Instructional Goals and Student Learning Outcomes:

   A. Instructional Goals. The instructor will:

   1) present the concepts important in the study of environmental geochemistry
   2) guide students to an understanding of the principles and applications of geochemistry to various environmental problems
   3) demonstrate how to utilize geochemical data to understand the geochemical cycles of metals
   4) provide novel and challenging assignments that require students to take their knowledge beyond the classroom instruction to solve “real world” problems
   5) Provide additional opportunities for graduate level students to develop their critical thinking skills through the analysis of professional literature in environmental geochemistry and the design and completion of independent research projects.
B. Student Learning Outcomes and Evaluation

<table>
<thead>
<tr>
<th>Student Outcomes</th>
<th>Evaluation Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Model the distribution of chemical elements between geochemical reservoirs on Earth</td>
<td>Homework assignments, quizzes and exams</td>
</tr>
<tr>
<td>2) Utilize geochemical models to understand the composition of natural waters and the effects of pollution</td>
<td>Homework assignments, quizzes and exams</td>
</tr>
<tr>
<td>3) Derive the principles of isotope fractionation and applications to environmental problems</td>
<td>Analysis, discussion, and synthesis of relevant professional literature, complete an original research project</td>
</tr>
<tr>
<td>4) Use a dataset to apply to the understanding of a local, regional, national or international environmental problem</td>
<td>Analysis of data set, discussion, and synthesis of relevant professional literature, presentation</td>
</tr>
<tr>
<td>5) Apply course content to thesis research or an environmental problem of interest</td>
<td>Research paper and presentation</td>
</tr>
</tbody>
</table>

IV. Course Evaluation

Students are evaluated based on homework assignments, quizzes, exams, class project, research paper and oral presentation.

V. Course Level Justification

This course requires graduate level standing.

VI. Topical Course Outline

1. Global water cycle and origin of water on Earth
2. Atmospheric and oceanic circulation and chemical composition
3. Chemical composition of natural waters
4. Sulfur, nitrogen, carbon and oxygen cycles
5. Trace element cycles
6. Chemical weathering of rocks and soil formation
7. Stable isotope fractionation and environmental applications
8. Mixing models
9. Weathering of metallic mineral deposits
10. Geochemical exploration for ore deposits
VII. Suggested Text(s)


VIII. Example Bibliography

Chakhmouradian, A.R., Wall, F., eds., 2012. Rare Earth Elements, Elements, vol. 8, no. 5, ISSN 1811-5209, 321-400


Lyons, W.B., Harmon, R.S., eds., 2012. Urban Geochemistry, Elements, vol.8, no.6, ISSN 1811-5209, 401-480.

### Course Action Request

**University of Alaska Anchorage**

**Proposal to Initiate, Add, Change, or Delete a Course**

<table>
<thead>
<tr>
<th>1a. School or College</th>
<th>1b. Division</th>
<th>1c. Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS CAS</td>
<td>AMSC Division of Math Science</td>
<td>Geological Sciences</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>2. Course Prefix</th>
<th>3. Course Number</th>
<th>4. Previous Course Prefix &amp; Number</th>
<th>5a. Credits/CEUs</th>
<th>5b. Contact Hours (Lecture + Lab)</th>
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</thead>
<tbody>
<tr>
<td>GEOL</td>
<td>A460</td>
<td>N/A</td>
<td>3</td>
<td>(3+0)</td>
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</tbody>
</table>

**6. Complete Course Title**

Environmental Geochemistry

*Abbreviated Title for Transcript (30 character)*

<table>
<thead>
<tr>
<th>7. Type of Course</th>
<th>8. Type of Action:</th>
<th>9. Repeat Status No</th>
<th># of Repeats</th>
<th>Max Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic</td>
<td>Add</td>
<td></td>
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If a change, mark appropriate boxes:

- Prefix
- Credits
- Title
- Grading Basis
- Cross-Listed/Stacked
- Course Description
- Co-requisites
- Test Score Prerequisites
- Registration Restrictions
- Other Restrictions
- College
- Major
- Other CCG (please specify)

<table>
<thead>
<tr>
<th>10. Grading Basis</th>
<th>11. Implementation Date (semester/year)</th>
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</thead>
<tbody>
<tr>
<td>A-F</td>
<td>From: Fall/2014 To: /9999</td>
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</table>

12. Cross Listed with GEOL A660

<table>
<thead>
<tr>
<th>13a. Impacted Courses or Programs:</th>
<th>13b. Coordination Email Date: 2/28/13</th>
<th>13c. Coordination with Library Liaison Date: 4/1/13</th>
</tr>
</thead>
</table>

*Initiator Name (typed): Kristine J Crossen*

Initiator Signed Initials: ______________ Date: __________________

14. General Education Requirement

Mark appropriate box:

- Oral Communication
- Written Communication
- Quantitative Skills
- Social Sciences
- Natural Sciences
- Integrative Capstone

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


16a. Course Prerequisite(s) (list prefix and number)

GEOL A360

16b. Test Score(s)

16c. Co-requisite(s) (concurrent enrollment required)

16d. Other Restriction(s)

- College
- Major
- Class
- Level

16e. Registration Restriction(s) (non-codable)

17. Mark if course has fees

18. Mark if course is a selected topic course

19. Justification for Action

The course description, student outcomes, course outline, and course evaluation have been updated and/or condensed, the bibliography and suggested texts have been updated and this course will be stacked at the 600 level to allow graduate students to take it for graduate credit.
<table>
<thead>
<tr>
<th>Initiator (faculty only)</th>
<th>Date</th>
<th>Dean/Director of School/College</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kristine J. Crossen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Approved</td>
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<tr>
<td>Department Chairperson</td>
<td>Date</td>
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<tr>
<td>Curriculum Committee Chairperson</td>
<td>Date</td>
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<td>Approved</td>
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<td>Disapproved</td>
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<td>Provost or Designee</td>
<td>Date</td>
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<tr>
<td>Disapproved</td>
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<td>Disapproved</td>
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</table>
I. Date of Initiation: Spring 2013

II. Course Information:
   A. College or School: CAS
   B. Course Subject: Geological Sciences
   C. Course Number: A460
   D. Number of Credits: 3.0 (3+0)
   E. Course Title: Environmental Geochemistry
   F. Grading Basis: A-F
   G. Course Description: Principles and applications of environmental geochemistry on a global scale. Geochemical cycles and chemical mass balance of elements. Chemical weathering and the composition of natural waters. Processes affecting the distribution of trace elements in geologic environments. Stable isotope fractionation and applications to modeling environmental systems. Review of specific cases of modern environmental geochemistry problems.
   H. Course Prerequisites: GEOL A360
   I. Fees: yes

III. Instructional Goals and Student Learning Outcomes:
   A. Instructional Goals. The instructor will:

   1) present the concepts important in the study of environmental geochemistry
   2) guide students to an understanding of the principles and applications of geochemistry to various environmental problems
   3) demonstrate how to utilize geochemical data to understand the geochemical cycles of metals
   4) provide novel and challenging assignments that require students to take their knowledge beyond the classroom instruction to solve "real world" problems
B. Student Learning Outcomes and Evaluation

<table>
<thead>
<tr>
<th>Student Outcomes</th>
<th>Evaluation Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Model the distribution of chemical elements between geochemical reservoirs on Earth</td>
<td>Homework assignments, quizzes and exams</td>
</tr>
<tr>
<td>2) Utilize geochemical models to understand the composition of natural waters and the effects of pollution</td>
<td>Homework assignments, quizzes and exams</td>
</tr>
<tr>
<td>3) Derive the principles of isotope fractionation and applications to environmental problems</td>
<td>Analysis, discussion, and synthesis of relevant professional literature, complete an original research project</td>
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<tr>
<td>4) Use a dataset to apply to the understanding of a local, regional, national or international environmental problem</td>
<td>Analysis of data set, discussion, and synthesis of relevant professional literature, presentation</td>
</tr>
</tbody>
</table>

IV. Course Evaluation

Students are evaluated based on homework assignments, quizzes, exams, class project, and oral presentation.

V. Course Level Justification

This course has a 300-level prerequisite.

VI. Topical Course Outline

1. Global water cycle and origin of water on Earth
2. Atmospheric and oceanic circulation and chemical composition
3. Chemical composition of natural waters
4. Sulfur, nitrogen, carbon and oxygen cycles
5. Trace element cycles
6. Chemical weathering of rocks and soil formation
7. Stable isotope fractionation and environmental applications
8. Mixing models
9. Weathering of metallic mineral deposits
10. Geochemical exploration for ore deposits
VII. Suggested Text(s)


VIII. Example Bibliography


  Lyons, W.B., Harmon, R.S., eds., 2012. Urban Geochemistry, Elements, vol.8, no.6, ISSN 1811-5209, 401-480.

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
   A690

4. Previous Course Prefix & Number
   none

5a. Credits/CEUs
   1-4

5b. Contact Hours (Lecture + Lab)
   (1-4+0)

6. Complete Course Title
   Graduate Topics in Geology
   Abbreviated Title for Transcript (30 character):
   GEOL

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

8. Type of Action:
   ☑ Add
   ☐ Change
   ☐ Delete
   If a change, mark appropriate boxes:
   [ ] Prefix
   [ ] Credits
   [ ] Course Number
   [ ] Title
   [ ] Grading Basis
   [ ] Cross-Listed/Stacked
   [ ] Test Score Prerequisites
   [ ] Co-requisites
   [ ] Other Prerequisites
   [ ] Registration Restrictions
   [ ] Contact Hours
   [ ] Repeat Status
   [ ] Co-requisites
   [ ] Registration Restrictions

9. Repeat Status
   ☑ Yes
   # of Repeats
   2
   Max Credits
   12

10. Grading Basis
    ☑ A-F
    ☐ P/NP
    ☐ NG

11. Implementation Date
    semester/year
    From: Spring/2013
    To: 

12. ☐ Cross Listed
    Stacked

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.

    Impact Program/Course Catalog Page(s) Impacted Date of Coordination Chair/Coordinator Contacted
    1. 
    2. 
    3. 

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

13b. Coordination Email
    Date: 10/20/12
    submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison
    Date: 10/20/12

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)
    Intensive study of narrowly defined topic in geology with emphasis on current problems. Independent research project required.
    Special note: May be repeated twice for a maximum of 12 credits with change of topic.

16a. Course Prerequisite(s) (list prefix and number)
    Graduate status

16b. Test Score(s)

16c. Co-requisite(s) (concurrent enrollment required)

16d. Other Restriction(s)
    [ ] College
    [ ] Major
    [ ] Class
    [ ] Level

16e. 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
    Designed as 600-level graduate course requiring independent research. Course takes advantage of the expertise of resident faculty, visiting faculty and community professionals. Current issues and topics not normally taught on a scheduled basis will be offered under this heading.

Initiator (faculty only)

Initiator (TYPE NAME)

Approved
Disapproved
Date

Dean/Director of School/College

Date

Undergraduate/Graduate Academic

Date

Board Chairperson

Approved
Disapproved
Date

Provost or Designee

Date

Kristine J Crossen

Date
I. Date of Initiation: Spring 2013

II. Course Information:
   A. College or School: College of Arts and Sciences
   B. Course Title: Graduate Topics in Geology
   C. Course Subject/Number: GEOL A690
   D. Credit Hours: 1-4
   E. Contact time: (1-4 + 0)
   F. Grading Information: A-F
   G. Course Description: Intensive study of narrowly defined topic in geology with emphasis on current problems. Independent research project required. Special note: May be repeated twice for a maximum of 12 credits with change of topic.
   H. Status of course relative to degree program: Graduate level course to serve students in interdisciplinary studies, the AEST joint CAS/SOE master’s program, and other M.S. degree programs.
   I. Course Attributes: Applies toward graduate level degree programs in interdisciplinary studies, AEST and other M.S. programs.
   J. Lab fees: yes
   K. Coordination: UAA faculty list serve
   L. Registration restrictions: Graduate standing

III. Instructional Goals and Student Learning Outcomes:
   A. Instructional Goals. The instructor will:
      1) Convey the geological concepts to the study of the particular topic.
      2) Demonstrate the applications of the selected topic to solving geologic problems and problems related to environmental sciences or other areas of interest.
      3) Guide students to utilize their problem solving skills to understand both the principles and applications of the selected geologic topic.
      4) Guide students in choosing a research topic and completing it in a professional manner.
   B. Student Learning Outcomes. The students will:
      1) Apply the principles of the selected topic to geologic, environmental, and other appropriate fields of study. Assessment: exams.
      2) Analyze recent literature and examples of modern applications of geological studies. Assessment: literature reviews and discussions.
3) Demonstrate research skills by participating in original research projects. Assessment: presentations and written papers.
4) Produce a professional quality presentation and a professional quality report at the conclusion of an individual research project. Improve their critical thinking skills through the analysis, discussion and synthesis of relevant professional literature. Assessment: professional quality presentations and written reports.

IV. Course Activities

The course consists of lectures, discussions, and small group collaboration facilitated by the instructor. Each student will initiate and complete a research project under the direction of the instructor.

VI Methods of Assessment:

Students will be evaluated based on homework assignments, exams, presentations, reports, and analysis, discussion, and synthesis of professional literature and the design and completion of professional quality research projects. Grades will be determined according to the syllabus of the individual instructor.

VI. Course Level Justification

Designed to be used as graduate level course to serve students in interdisciplinary studies, the AEST joint CAS/SOE master’s program, and other M.S. degree programs. Independent research, professional quality presentations and written reports required.

VII. Topical Course Outline

Course outline will vary by topics selected.

Example from existing course - GEOL A665 - Isotope Geochemistry

1. Law of Radioactivity
2. Radioactive Decay Modes
3. Isotope geochronometers
4. Methods of Dating
5. Applications of Radioactive Isotopes to Environmental Problems
6. Principles of stable isotope geochemistry
7. Isotope fractionation
8. Equilibrium effects
9. Kinetic effects
10. Biological fractionation
11. Trace metal isotopes
12. Isotopes of other elements

VII. Suggested Text(s)

Texts will vary depending on the topic of the course.

Example from Isotope Geochemistry above:


IX. Bibliography

References will vary depending on the selected topic.

Example from Isotope Geochemistry above.


1a. School or College
    AS CAS

1b. Division
    AMSC Division of Math Science

1c. Department
    Geological Sciences

2. Course Prefix
    GEOL

3. Course Number
    A490

4. Previous Course Prefix & Number
    none

5a. Credits/CEUs
    1-4

5b. Contact Hours (Lecture + Lab)
    (1-4+0)

6. Complete Course Title
    Advanced Topics in Geology

Abbreviated Title for Transcript (30 character)

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

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

If a change, mark appropriate boxes:

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

9. Repeat Status Yes
    # of Repeats 2
    Max Credits 12

10. Grading Basis
    ☒ A-F
    ☐ P/NP
    ☐ NG

11. Implementation Date
    semester/year
    From: Spring/2013
    To:

12. ☐ Cross Listed with
    ☐ Stacked with GEOL A690

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.

<table>
<thead>
<tr>
<th>Impact Program/Course</th>
<th>Catalog Page(s) Impact</th>
<th>Date of Coordination</th>
<th>Chair/Coordinator Contacted</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
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</tbody>
</table>

Initiator Name (typed): Kristine J Crossen

Initiator Signed Initials: ___________ Date: ___________

13b. Coordination Email
    Date: 10-8-12
    submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison
    Date: 10-8-12

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)
    Detailed study of selected topics in geology. Special note: May be repeated twice for a maximum of 12 credits with change of topic.

16a. Course Prerequisite(s) (list prefix and number)
    GEOL A221

16b. Test Score(s)

16c. Co-requisite(s) (concurrent enrollment required)

16d. Other Restriction(s)
    ☐ College Major ☐ Class Level

16e. Registration Restriction(s) (non-codable)

17. ☒ Mark if course has fees

18. ☒ Mark if course is a selected topic course

19. Justification for Action
    Designed as 400-level undergraduate course. Course takes advantage of the expertise of resident faculty, visiting faculty and community professionals. Current issues and topics not normally taught on a scheduled basis will be offered under this heading.

Initiator (faculty only)

Kristine J Crossen

Initiator (TYPE NAME) Date

Dean/Director of School/College Date

Undergraduate/Graduate Academic Date

Board Chairperson

Provost or Designee Date
Course Content Guide  
University of Alaska Anchorage  
Department of Geological Sciences  

GEOL A490  
Advanced Topics in Geology

I. Date of Initiation: Spring 2013

II. Course Information:
   A. College or School: College of Arts and Sciences
   B. Course Title: Advanced Topics in Geology
   C. Course Subject/Number: GEOL A490
   D. Credit Hours: 1-4
   E. Contact time: (1-4 + 0)
   F. Grading Information: A-F
   G. Course Description: Detailed study of selected topics in geology. Special note: May be repeated twice for a maximum of 12 credits with change of topic.
   H. Status of course relative to degree program: May be used as upper-division elective to satisfy Geological Sciences major or minor.
   I. Course Attributes: Applies toward upper division requirement for Geological Sciences major or minor.
   J. Lab fees: yes
   K. Coordination: UAA faculty list serve
   L. Course Prerequisites: GEOL A221

III. Instructional Goals and Student Learning Outcomes:
   A. Instructional Goals. The instructor will:
      1) Convey the geological concepts to the study of the particular topic.
      2) Demonstrate the applications of the selected topic to solving geologic problems and problems related to environmental sciences or other areas of interest.
      3) Guide students to utilize their problem solving skills to understand both the principles and applications of the selected geologic topic.

   B. Student Learning Outcomes. The students will:
      1) Apply the principles of the selected topic to geologic, environmental, and other appropriate fields of study. Assessment: exams.
      2) Analyze recent literature and examples of modern applications of geological studies. Assessment: literature reviews.
      3) Develop research skills by participating in original research projects with their peers. Assessment: professional presentation.
IV. Course Activities

The course consists of lectures, discussions, and small group collaboration facilitated by the instructor.

V. Methods of Assessment:

Students will be evaluated based on homework assignments, exams, presentations, reports, and analysis, discussion, and synthesis of professional literature and the design and completion of research projects. Grades will be determined according to the syllabus of the individual instructor.

VI. Course Level Justification

Designed for Geological Science majors as an elective undergraduate course comparable to 400-level offerings at other universities. Designed to provide flexibility to offer and teach innovative senior-level lecture courses on a developmental basis. Such courses are essential to the student’s ability to succeed and integrate content with other 400-level courses in geological sciences.

VII. Topical Course Outline

Course outline will vary by topics selected.

Example from existing course - GEOL A465 - Isotope Geochemistry

1. Law of Radioactivity
2. Radioactive Decay Modes
3. Isotope geochronometers
4. Methods of Dating
5. Applications of Radioactive Isotopes to Environmental Problems
6. Principles of stable isotope geochemistry
7. Isotope fractionation
8. Equilibrium effects
9. Kinetic effects
10. Biological fractionation
11. Trace metal isotopes
12. Isotopes of other elements
VIII. Suggested Text(s)

Texts will vary depending on the topic of the course.

**Example from Isotope Geochemistry above:**


IX. Bibliography

References will vary depending on the selected topic.

**Example from Isotope Geochemistry above.**


