I. **Roll Call**
   () Arlene Schmuland () Anthony Paris () Peter Olsson () Hsing-Wen Hu
   () Cindy Knall () Dennis Drinka () Clayton Trotter () Sam Thiru
   () Jervette Ward () FS at Large () FS at Large () FS at Large
   () FS CAS

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

III. **Approval of Meeting Summary** (pg. 2-3)

IV. **Administrative Reports**
   A. Associate Dean of the Graduate School David Yesner
   B. University Registrar Lora Volden
   C. GAB Chair Arlene Schmuland

V. **Program/Course Action Request - Second Readings**
   Chg ANTH A615 Advanced Applied Anthropology (stacked with ANTH A415)
   (3 cr)(3+0)(pg. 4-13)
   Add ANTH A654 Advanced Culture and Ecology (stacked with ANTH A454)(3 cr)(3+0)(pg. 14-29)
   Chg AE A603 Arctic Engineering (stacked with AE A403)(3 cr)(3+0)(pg. 30-37)

VI. **Program/Course Action Request - First Readings**
   Chg AE A681 Frozen Ground Engineering (3 cr)(3+0)(pg. 38-41)
   Chg AE A682 Ice Engineering (3 cr)(3+0)(pg. 42-45)
   Chg AE A683 Arctic Hydrology and Hydraulic Engineering (3 cr)(3+0)(pg. 46-49)
   Chg AE A684 Arctic Utility Distribution (3 cr)(3+0)(pg. 50-53)
   Chg AE A685 Arctic Mass and Heat Transfer (3 cr)(3+0)(pg. 54-57)
   Add AE A686 Arctic Engineering Project (3 cr)(0+9)(pg. 58-61)
   Chg AE A689 Cold Regions Pavement Design (3 cr)(3+0)(pg. 62-65)
   Chg BIOL A662 Advanced Virology (Stacked with BIOL A462)(3 cr)(3+0)(pg. 66-77)

VII. **Old Business**

VIII. **New Business**

IX. **Informational Items and Adjournment**
   A. **Credit Hour Review Process:** In response to a new NWCCU policy on credit hours, an AY14 subcommittee of the UAB and GAB recommended a process to review class scheduling practices relative to approved CAR/CCG credit hours. In Fall 2014 UAA ran a pilot, which focused on traditional face-to-face offerings. After filtering for apparent face-to-face delivery, a total of 143 course sections were sent to the colleges for review. Findings and Actions: Most of the courses integrated nontraditional components, such as a practicum or 0-credit lab, and were found to be in compliance. Sixteen sections were rescheduled to meet the required contact hours. Departments will revise the curriculum documents for nine courses in order to reflect current practice.
Graduate Academic Board

September 26, 2014
ADM 204
9:30 to 11:30

I. Roll Call
(x) Arlene Schmuland (x) Anthony Paris (x) Peter Olsson (x) Hsing-Wen Hu
(x) Cindy Knall (x) Dennis Drinka (x) Clayton Trotter (x) Sam Thiru
(e) Jervette Ward () FS at Large () FS at Large () FS at Large
() FS CAS
(x) David Yesner
() Lora Volden
(x) Scheduling and Publications

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

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

IV. Administrative Reports
A. Associate Dean of the Graduate School David Yesner (pg. 5)
   Encouraged members to refer to their calendars and confirm if moving the January 9th and 23rd
   meetings to January 16th and 30th to accommodate the Provost Search Committee on January 9th
   and Faculty Senate Spring Forum on January 23rd.
   Update on the CIM Curriculum Workflow and a request for feedback.
   Question to the board on what the committee should be doing in order to evaluate and update the
   Curriculum Handbook.

B. Graduate Student

C. University Registrar Lora Volden

D. GAB Chair Arlene Schmuland
   Encouraged members to refer to their calendars and confirm if moving the January 9th and 23rd
   meetings to January 16th and 30th to accommodate the Provost Search Committee on January 9th
   and Faculty Senate Spring Forum on January 23rd.
   Update on the CIM Curriculum Workflow and a request for feedback.
   Question to the board on what the committee should be doing in order to evaluate and update the
   Curriculum Handbook.

V. Program/Course Action Request - First Readings
Add STAT A602 Advanced Scientific Sampling (stacked with STAT A402)(3 cr)(3+0)(pg. 6-12)
Add STAT A603 Advanced Regression Analysis (stacked with STAT A403)(3 cr)(3+0)(pg. 13-18)
Add STAT A604 Advanced Analysis of Variance (stacked with STAT A404)(3 cr)(3+0)(pg. 19-24)
Add STAT A607 Advanced Time Series Analysis (stacked with STAT A407)(3 cr)(3+0)(pg. 25-32)
Add STAT A608 Advanced Multivariate Statistics (stacked with STAT A408)(3 cr)(3+0)(pg. 33-40)
All STAT courses are waive first, approve for second

Chg Master of Arts, Anthropology (pg. 41-49)
Waive first, approve for second

Chg ANTH A615 Advanced Applied Anthropology (stacked with ANTH A415)
   (3 cr)(3+0)(pg. 50-59)
Accepted for first reading

Add ANTH A654 Advanced Culture and Ecology (stacked with ANTH A454)(3 cr)(3+0)(pg. 60-76)
Accepted for first reading

Add ANTH A664 Advanced Culture and Globalization (stacked with ANTH A464)
   (3 cr)(3+0)(pg. 77-93)

Dlt ANTH A683 Zooarchaeology (stacked with ANTH A483)(4 cr)(3+2)(pg. 94-95)
Dlt ANTH A685 Advanced Human Osteology (stacked with ANTH A485)(4 cr)(3+2)(pg. 96-97)
Dlt ANTH A686 Advanced Applied Human Osteology (stacked with ANTH A486)
   (3 cr)(3+0)(pg. 98-99)

ANTH A664-A686 are waive first, approve for second

Chg Master of Science, Arctic Engineering (pg. 100-105)
Waive first, approve for second
Add   Prefix, Arctic Engineering (pg. 106-107)
Waive first, approve for second

Chg   AE A603     Arctic Engineering (stacked with AE A403)(3 cr)(3+0)(pg. 108-115)
Accepted for first reading

All AE courses are postponed until October 10th meeting
Chg   AE A681     Frozen Ground Engineering (3 cr)(3+0)(pg. 116-119)
Chg   AE A682     Ice Engineering (3 cr)(3+0)(pg. 120-123)
Chg   AE A683     Arctic Hydrology and Hydraulic Engineering (3 cr)(3+0)(pg. 124-127)
Chg   AE A684     Arctic Utility Distribution (3 cr)(3+0)(pg. 128-131)
Chg   AE A685     Arctic Mass and Heat Transfer (3 cr)(3+0)(pg. 132-135)
Add   AE A686     Arctic Engineering Project (3 cr)(0+9)(pg. 136-139)
Chg   AE A689     Cold Regions Pavement Design (3 cr)(3+0)(pg. 140-143)

VI. Old Business

VII. New Business
   A. Review of Graduate Academic Board Draft Goals (pg. 144)
      Approved

VIII. 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>1b. Division</th>
<th>1c. Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS CAS</td>
<td>ASSC Division of Social Science</td>
<td>Anthropology</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>ANTH</td>
<td>A615</td>
<td>N/A</td>
<td>3</td>
<td>(Lecture + Lab) (3+0)</td>
</tr>
</tbody>
</table>

#### 6. Complete Course Title

**Advanced Applied Anthropology**

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

#### 7. Type of Course

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

#### 8. Type of Action:

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

If a change, mark appropriate boxes:

- [ ] Prefix
- [ ] Credits
- [ ] Title
- [ ] Grading Basis
- [x] Course Description
- [ ] Test Score Prerequisites
- [ ] Automatic Restrictions
  - [ ] Class
  - [ ] Level
  - [ ] Major
  - [ ] General Education Requirement
  - [ ] Other
- [ ] Course Number
- [ ] Contact Hours
- [ ] Repeat Status
- [ ] Cross-Listed/Stacked
- [ ] Course Prerequisites
- [ ] Co-requisites
- [ ] Registration Restrictions
- [ ] General Education Requirement

#### 9. Repeat Status No

- [x] # of Repeats
- [ ] Max Credits

<table>
<thead>
<tr>
<th>10. Grading Basis</th>
<th>11. Implementation Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-F</td>
<td>From: Spring/2015</td>
</tr>
<tr>
<td>P/NP</td>
<td>To: Fall/9999</td>
</tr>
<tr>
<td>NG</td>
<td></td>
</tr>
</tbody>
</table>

#### 12. Cross Listed with

- [ ] ANTH A415

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

**Impacted Program/Course**

<table>
<thead>
<tr>
<th>Date of Coordination</th>
<th>Chair/Coordinator Contacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/31/2013</td>
<td>Paul White</td>
</tr>
</tbody>
</table>

**Initiator Name (typed):** Sally Carraher

**Initiator Signed Initials:**

**Date:**

#### 13b. Coordination Email

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

**Date:** 10/31/2013

#### 13c. Coordination with Library Liaison

**Date:** 10/31/2013

#### 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)

Evaluate and integrate theory, methods, and history of applied anthropology in the United States, and for social justice in Alaska. Special Note: Students will conduct a team research project with local community institutions, thereby developing leadership, management skills, and commitments to civic engagement. Additional work is required for Graduate Students.

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

undergraduate cultural anthropology course with a minimum grade of C.

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

16c. Automatic Restriction(s)

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

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

Graduate standing

17. [x] Mark if course has fees

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

### Justification for Action

Updating course description and classroom approach to keep up with innovative teaching strategies being used for similar courses at other universities. Updating prerequisites to ensure students have taken Cultural Anthropology.

**Initiator (faculty only)**

Sally Carraher

**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**
UNIVERSITY OF ALASKA ANCHORAGE
COURSE CONTENT GUIDE

I. Date of initiation: October, 2013

II. A. College or school: CAS
   B. Course title: Applied Anthropology
   C. Course prefix: ANTH
   D. Course number: A615
   E. Credits and Contact hours: 3.0 credits, 3+0 contact hours
   F. Grading: A-F
   G. Stacking: ANTH A415
   H. Implementation Date: Spring 2015
   I. Course description: Evaluate and integrate theory, methods, and history of applied anthropology in the United States, and for social justice in Alaska. Special Note: Students will conduct a team research project with local community institutions, thereby developing leadership, management skills, and commitments to civic engagement. Additional work is required for Graduate Students.
   J. Course prerequisites: Undergraduate cultural anthropology course with a minimum grade of C.
   K. Registration restrictions: none
   L. Course fee: No

III. Course activities/teaching methods:
    Course will be offered every other academic year. Each time course is offered, the instructor will have identified a local client and research project, and the main research focus/question for the class to work on as a team. Students work collaboratively with the client to identify specific research questions, project timeline, project data collection methods (i.e. open or structured interviews, focus groups, questionnaire surveys, oral histories, life histories, archival research), and develop project deliverables for the client (i.e. a final report, a web site, pamphlets, public presentation, community education materials). Through this approach, students learn through personal experience how to actually do applied anthropological research with an emphasis on promoting social justice in Alaska. In addition to providing educational materials about the theory, methods, and history of applied anthropology, the instructor serves as a facilitator and mediator for students and the project client.

IV. Course level justification
    This course is designed to fulfill the 600 level course-work requirement of graduate students for the applied track MA, although students in the general anthropology MA track may also take the course. This course requires students to develop commitments to civic engagement by applying anthropological methods and theoretical perspectives to research for a community client. The course structure requires high-level critical and
reflexive thinking, organizational skills, working as part of a team, qualitative and quantitative analysis, and effective written and oral communication skills. As a stacked course with undergraduates at the 400-level, ANTH A615 is designed to develop leadership and management skills as graduate students serve as project managers to guide and oversee undergraduate students in research planning, data collection and analysis, and co-authored writing assignments.

V. Instructional goals and student learning outcomes:
The instructor will perform the following tasks before instruction begins:
- Serve as a project facilitator and a mediator between students the client.
- Identify a client (person, community group, or organization) in the Anchorage/Mat-Su area before the start of the semester, and work with the client to identify the main research topic and people who will be involved in the project (i.e. interviewees).
- Obtain IRB and any other necessary approvals/licenses before the start of the semester, as well as project funding (if needed).

A. The instructor will:
1. Explain the core concepts, historical developments, methods employed, and major results of applying anthropological theory and method to the understanding and amelioration of sociocultural problems or challenges in Alaska, the US, and worldwide.
2. Identify and discuss the major subfields in applied anthropology, and the kinds of employment available in each related to one’s educational achievement and experience.
3. Explain the ethical principles required of applied and practicing anthropologists, proving illustrations of both appropriate and unethical activity in the field.

B. Student learning outcomes:

<table>
<thead>
<tr>
<th>Student learning outcome</th>
<th>Assessment measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explore and synthesize the core concepts, historical developments, methods and results of applying anthropological theory and method to sociocultural problems.</td>
<td>Writing assignments, student research journals, graded notes from class discussion and research project planning</td>
</tr>
<tr>
<td>2. Integrate knowledge of the development, activities appropriate to, and notable results of applied anthropology into class research and activities.</td>
<td>Writing assignments, student research journals, graded notes from class discussion and research project planning, completing IRB modules.</td>
</tr>
</tbody>
</table>
3. Critically reflect on the ethical principles adhered to in this field.  
   Writing assignments, student research journals, graded notes from class discussion and research project planning

4. Gain experience and competency in types of methods commonly used in applied anthropology.  
   Writing assignments, student research journals, and review of student self-evaluations

5. Gain experience in research design, implementing, and analyzing data with an applied anthropological focus; and in the development and dissemination of research deliverables to a client.  
   Database and project reports developed for the client, co-authored writing assignments, Writing assignments, student research journals, review of student self-evaluations

6. Work effectively as part of a team.  
   Co-author on writing assignments, graded notes from class discussion and research project planning.

7. Gain experience as project managers to assist the instructor with mentoring undergraduate research and writing; and oversee aspects of project completion.  
   Performance as mentors to undergraduates and as project managers evaluated based research journal entries and instructor’s observations during class activities

VI. Topical course outline:
1. Introduction and overview; distinction between basic and applied anthropological research
2. History and kinds of applied anthropology, globally, in the US, and with a special emphasis on Alaska
3. Ethics in applied research and practice
4. Method and theory in applied anthropology:
   a. Ethnography, participant observation, key-informant interviewing, oral and life histories, qualitative analyses
   b. Focus groups, questionnaire surveys, quantitative analyses
5. Applied anthropological research design and process:
   a. Identifying core research problem and developing specific research questions to answer the problem
   b. Time management and troubleshooting
   c. Project management
   d. Population sampling techniques
   e. Designing research instruments (surveys, interviews)
   f. Storing, organizing, coding, and analyzing data
   g. Writing research dissemination materials for clients and public audiences
VII. Suggested texts:

VIII. Bibliography:
A. Classical literature:

B. Recent literature:
1a. School or College
AS CAS

1b. Division
ASSC Division of Social Science

1c. Department
Anthropology

2. Course Prefix
ANTH

3. Course Number
A415

4. Previous Course Prefix & Number
N/A

5a. Credits/CEUs
3

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

6. Complete Course Title
Applied Anthropology

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
- Automatic Restrictions
- Class Level
- College Major
- Other

9. Repeat Status No # of Repeats Max Credits

10. Grading Basis
☒ A-F ☐ P/NP ☐ NG

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

12. ☐ Cross Listed with
☒ Stacked with ANTH A615

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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<th>Date of Coordonation</th>
<th>Chair/Coordinator Contacted</th>
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</thead>
<tbody>
<tr>
<td>1. BA/BS Anthropology</td>
<td>10/31/2013</td>
<td>Paul White</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Initiator Name (typed): Sally Carraher
Initiator Signed Initials: ___________ Date: ___________

13b. Coordination Email
Date: 10/31/2013
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison
Date: 10/31/2013

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)
Explores theory, methods, and history of applied anthropology in the United States, with an emphasis on social justice in Alaska. Special Note: Students will conduct a team-based local research project through engagement with community institutions, thereby learning the methods of applying anthropology to solve contemporary sociocultural issues and problems.

16a. Course Prerequisite(s) (list prefix and number or test code and score)
ANTH A202, minimum grade of C

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

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

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

17. ☐ Mark if course has fees

18. ☐ Mark if course is a selected topic course

19. Justification for Action
Updating course description and classroom approach to keep up with innovative teaching strategies being used for similar courses at other universities. Updating prerequisites to ensure students have taken Cultural Anthropology (ANTH A202).

Initiator (faculty only) Sally Carraher
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
UNIVERSITY OF ALASKA ANCHORAGE
COURSE CONTENT GUIDE

I. Date of initiation: October, 2013
II. A. College or school: CAS
   B. Course title: Applied Anthropology
   C. Course prefix: ANTH
   D. Course number: A415
   E. Credits and Contact hours: 3.0 credits, 3+0 contact hours
   F. Grading: A-F
   G. Stacking: ANTH A615
   H. Implementation Date: Spring 2015
I. Course description: Explores theory, methods, and history of applied anthropology in the United States, with an emphasis on social justice in Alaska. Special Note: Students will conduct a team-based local research project through engagement with community institutions, thereby learning the methods of applying anthropology to solve contemporary sociocultural issues and problems.
J. Course prerequisites: ANTH A202, minimum grade of C.
K. Registration restrictions: none
L. Course fee: No

III. Course activities/teaching methods:
    Course will be offered every other academic year. Each time course is offered, the instructor will have identified a local client and research project, and the main research focus/question for the class to work on as a team. Students work collaboratively with the client to identify specific research questions, project timeline, project data collection methods (i.e. open or structured interviews, focus groups, questionnaire surveys, oral histories, life histories, archival research), and develop project deliverables for the client (i.e. a final report, a web site, pamphlets, public presentation, community education materials). Through this approach, students learn through personal experience how to actually do applied anthropological research with an emphasis on promoting social justice in Alaska. In addition to providing educational materials about the theory, methods, and history of applied anthropology, the instructor serves as a facilitator and mediator for students and the project client.

IV. Course level justification
    This course is designed to fulfill the requirements of students in their upper-division course-work for the major, building from analysis, writing, literature review, and presentations skills gained in Tier I and II GER courses. Particularly, this course requires students to develop commitments to civic engagement by applying anthropological methodologies and theoretical perspectives through conducting real research for a community client. The structure of this course requires high-level critical and reflexive thinking,
organizational skills, working as part of a team, qualitative and quantitative analysis, and effective written and oral communication skills.

V. Instructional goals and student learning outcomes:
A. The instructor will:
   1. Explain the core concepts, historical developments, methods employed, and major results of applying anthropological theory and method to the understanding and amelioration of sociocultural problems or challenges in Alaska, the US, and worldwide.
   2. Identify and discuss the major subfields in applied anthropology, and the kinds of employment available in each related to one’s educational achievement and experience.
   3. Explain the ethical principles required of applied and practicing anthropologists, proving illustrations of both appropriate and unethical activity in the field.
   4. Serve as a project facilitator and a mediator between students and the client.
   5. Identify a client (person, community group, or organization) in the Anchorage/Mat-Su area before the start of the semester, and work with the client to identify the main research topic and people who will be involved in the project (i.e. interviewees).
   6. Obtain IRB and any other necessary approvals/licenses before the start of the semester, as well as project funding (if needed).

B. Student learning outcomes: The student will

<table>
<thead>
<tr>
<th>Student learning outcome</th>
<th>Assessment measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Explore and synthesize the core concepts, historical developments, methods and results of applying anthropological theory and method to sociocultural problems.</td>
<td>Writing assignments, student research journals, graded notes from class discussion and research project planning</td>
</tr>
<tr>
<td>2. Integrate knowledge of the development, activities appropriate to, and notable results of applied anthropology into class research and activities.</td>
<td>Writing assignments, student research journals, graded notes from class discussion and research project planning</td>
</tr>
<tr>
<td>3. Critically reflect on the ethical principles adhered to in this field.</td>
<td>Writing assignments, student research journals, graded notes from class discussion and research project planning</td>
</tr>
<tr>
<td>4. Gain experience and competency in types of</td>
<td>Writing assignments, student research journals, and review of</td>
</tr>
</tbody>
</table>
methods commonly used in applied anthropology.

<table>
<thead>
<tr>
<th>5. Gain experience in designing, carrying out, and analyzing anthropological research with an applied focus; and in the development and dissemination of research deliverables to a client.</th>
<th>Writing assignments, student research journals, review of student self-evaluations</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Work effectively as part of a team.</td>
<td>Co-authored writing assignments, graded notes from class discussion and research project planning, and review of student self-evaluations</td>
</tr>
</tbody>
</table>

VI. Topical course outline:
1. Introduction and overview; distinction between basic and applied anthropological research
2. History and kinds of applied anthropology, globally, in the US, and with a special emphasis on Alaska
3. Ethics in applied research and practice
4. Method and theory in applied anthropology:
   a. Ethnography, participant observation, key-informant interviewing, oral and life histories, qualitative analyses
   b. Focus groups, questionnaire surveys, quantitative analyses
5. Research design and process:
   a. Identifying core research problem and developing specific research questions to answer the problem
   b. Time management and troubleshooting
   c. Population sampling techniques
   d. Designing research instruments (surveys, interviews)
   e. Storing, organizing, coding, and analyzing data
   f. Writing research dissemination materials for clients and public audiences

VII. Suggested texts:

VIII. Bibliography:
A. Classical literature:

B. Recent literature:

1a. School or College
AS CAS

1b. Division
ASSC Division of Social Science

1c. Department
Anthropology

2. Course Prefix
ANTH

3. Course Number
A654

4. Previous Course Prefix & Number
N/A

5a. Credits/CEUs
3

5b. Contact Hours
(3+0)

6. Complete Course Title
Advanced Culture and Ecology

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 ☐ Course Number ☐ Contact Hours ☐ Repeat Status ☐ Grading Basis ☐ Cross-Listed/Stacked ☐ Course Description ☐ Course Prerequisites ☐ Test Score Prerequisites ☐ Co-requisites ☐ Other Restrictions ☐ Grade Requirement ☐ General Education Requirement ☐ Repeat Status ☐ Grading Basis ☐ Co-requisites

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

10. Grading Basis
☒ A-F ☐ P/NP ☐ NG

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

12. ☐ Cross Listed with
☐ Stacked with ANTH A454
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>Date of Coordination</th>
<th>Chair/Coordinator Contacted</th>
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<tbody>
<tr>
<td>Anthropology MA</td>
<td>10/20/2013</td>
<td>Paul White</td>
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Initiator Name (typed): Diane K. Hanson
Initiator Signed Initials: ______________
Date: __________________

13b. Coordination Email
Date: 10/31/2013
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison
Date: 10/31/2013

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)
Apply ecological concepts to human societies; impacts of environmental change on human societies, and impacts of human societies on environments; ethnoecology and traditional ecological knowledge of indigenous communities; values of nature among Western and non-Western societies; and political ecology in relation to the juxtaposition of indigenous peoples within contemporary nation-states.

16a. Course Prerequisite(s) (list prefix and number or test code and score)
Undergraduate course in cultural anthropology required with a minimum C grade

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

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

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

17. ☒ Mark if course has fees

18. ☐ Mark if course is a selected topic course

19. Justification for Action
Graduate students have need for a course in ecological anthropology that reflects both Western and non-Western (indigenous) approaches to human-environment interaction.
<table>
<thead>
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<th>Date</th>
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<th>Dean/Director of School/College</th>
<th>Date</th>
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<tr>
<th>Department Chair</th>
<th>Date</th>
<th>□ Approved</th>
<th>□ Disapproved</th>
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<tr>
<th>Undergraduate/Graduate Academic Board Chair</th>
<th>Date</th>
<th>□ Approved</th>
<th>□ Disapproved</th>
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<thead>
<tr>
<th>College/School Curriculum Committee Chair</th>
<th>Date</th>
<th>□ Approved</th>
<th>□ Disapproved</th>
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</tbody>
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15
I. Date of Initiation Date:       Fall 2013

II. Course Information
A. College:    College of Arts and Sciences
B. Course Prefix  ANTH
C. Course Number  A654
D. Number of Credits  3
E. Contact Hours  3+0
F. Course Title:    Advanced Studies in Culture and Ecology
G. Grading Basis:    A-F
H. Implementation Date   Spring 2015
I. Course Description: Apply ecological concepts to human
societies; impacts of environmental change
on human societies, and impacts of human
societies on environments; ethnoecology
and traditional ecological knowledge of
indigenous communities; values of nature
among Western and non-Western societies;
and political ecology in relation to the
juxtaposition of indigenous peoples within
contemporary nation-states.

J. Status of Course Relative to a
   Degree or Certificate Program: Elective in the MA Anthropology
K. Course Fees:    No
L. Registration Restrictions: Graduate Standing
M. Stacking  ANTH A454

III. Course Activities
In a lecture and discussion format, information will be presented concerning the diversity
of ways in which human societies adapt and have adapted to their natural environments
and have transformed those environments, from prehistory to the present, in global
perspective.

IV. Course Evaluation
Evaluation procedures are at the discretion of the instructor and will be discussed at the
first class meeting of the semester. Students will be evaluated on all class content and
assigned readings. Evaluation vehicles will include (but are not limited to) examinations,
research papers, student journals/reflections, student questions on readings, and class
discussions. The requirement for research papers differentiates the undergraduate
(A454) and graduate (A654) versions of this course.

V. Course Justifications:
A. Justification for new course: this course will provide graduate students with
information on human-environmental relationships, including key concepts of
resilience and sustainability, as well as traditional ecological knowledge and
indigenous environmental perspectives, that are critical to graduate education in anthropology.

VI. Instructional Goals and Defined Outcomes

A. Instructional Goals. The Instructor will:

1. Present fundamental ecological concepts and their relationship to human societies
2. Discuss human adaptations from a variety of cultural perspectives
3. Describe the impacts of environmental changes on human societies, and of human societies on their environments
4. Relate the traditions of environmental anthropology and their perspectives on human/environment interactions
5. Present Western and Non-western (Indigenous) perspectives on ecological knowledge

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

<table>
<thead>
<tr>
<th>Student Learning Outcomes:</th>
<th>Assessment Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Apply fundamental ecological concepts to human societies</td>
<td>Examinations, student journals/reflections from class discussions, graded daily questions</td>
</tr>
<tr>
<td>2. Analyze the impacts of environmental change on human societies and the impacts of human societies on environments through human history</td>
<td>Examinations, student journals/reflections from class discussions, graded daily questions</td>
</tr>
<tr>
<td>3. Explain the various traditions in anthropology and their approaches to understanding human/environment interactions</td>
<td>Examinations, student journals/reflections from class discussions, graded daily questions</td>
</tr>
<tr>
<td>4. Interpret different approaches of societies to nature, and the differences and similarities between indigenous environmental knowledge and that of contemporary Western societies</td>
<td>Examinations, student journals/reflections from class discussions, graded daily questions</td>
</tr>
</tbody>
</table>

VII. Topical Outline:

I. Introduction
II. Environmental Anthropology Overview
   a. Development and Branches of Environmental Anthropology
   b. Steward’s Cultural Ecology
   c. Beyond Boundaries in Cultural Ecology
   d. Ethnoecology
   e. System Approaches in Environmental Anthropology

III. Fundamentals of Ecology and Human Biological Ecology
   a. Principles of Cultural Ecology
   b. Human Adaptive Strategies
      i. Hunting and Gathering
      ii. Origins of Food Production/Horticulture
      iii. Pastoralism/Intensive Agriculture
      iv. Modern Models

IV. Population & Environment

V. Development & Urbanization

VI. Political Ecology
   a. Politics of Knowledge
   b. Knowing the Environment
   c. Biodiversity
   d. Managing the Environment
   e. Gender, Feminism, & Environment
   f. Politics of Global Environmentalism

VII. Indigeneity & the Environment
   a. Traditional Ecological Knowledge
   b. Indigenousness & Environmentalism
   c. Indigenous Rights

VIII. Contemporary Issues in Environmental Anthropology
   a. Health & Environment
   b. Climate Change
   c. Consumption & Globalization

Suggested Textbooks:


**VIII. Bibliography:**


*Classic References

**Sources that illustrate historic development of the field
Course Action Request
University of Alaska Anchorage
Proposal to Initiate, Add, Change, or Delete a Course

1a. School or College  
AS CAS

1b. Division  
ASSC Division of Social Science

1c. Department  
Anthropology

2. Course Prefix  
ANTH

3. Course Number  
A454

4. Previous Course Prefix & Number  
ANTH A354

5a. Credits/CEUs  
3

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

6. Complete Course Title  
Culture and Ecology

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  ☒ Course Number  ☐ Contact Hours  ☐ Repeat Status  ☐ Grading Basis  ☐ Cross-Listed/Stacked

☐ Title  ☐ Course Description  ☐ Course Prerequisites  ☐ Co-requisites  ☐ Test Score Prerequisites  ☐ Registration Restrictions

☐ Other Restrictions  ☐ General Education Requirement  ☐ Class  ☐ Level  ☐ College  ☐ Major

☒ Other CCG (please specify)

9. Repeat Status No  # of Repeats  Max Credits

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

11. Implementation Date  
From: Spring/2015  To: Fall/9999

12. Cross Listed with  
Stacked  with ANTH A654  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>
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<tr>
<th>Impacted Program/Course</th>
<th>Date of Coordination</th>
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</thead>
<tbody>
<tr>
<td>1. Integrative Capstone (Tier 3 GER), p. 87 2012-13 catalog</td>
<td>10/31/2013</td>
<td>Faculty List Serv</td>
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<td>3.</td>
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</table>

Initiator Name (typed): Diane K. Hanson  Initiator Signed Initials: _________  Date: ______________

13b. Coordination Email  
Date: 10/31/2013  
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison  
Date: 10/31/2013

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)  
Examines anthropological approaches to the relationships between cultural and ecological systems. Explores culture as an adaptive system and the role of various cultural subsystems in different adaptations. Applies ecological concepts to human societies; impacts of environmental change on human societies, and impacts of human societies on environments; ethnoecology and traditional ecological knowledge of indigenous communities; values of nature among Western and non-Western societies; and political ecology in relation to the juxtaposition of indigenous peoples within contemporary nation-states.

16a. Course Prerequisite(s)  (list prefix and number or test code and score)  
ANTH A202 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  
This capstone course has been taught at the advanced undergraduate level for the past several years, and its movement to the 400 level reflects its content level as a capstone course in Anthropology.
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</table>
I. Date of Initiation Date: Fall 2013

II. Course Information
A. College: College of Arts and Sciences
B. Course Prefix: ANTH
C. Course Number: A454
D. Number of Credits: 3
E. Contact Hours: 3+0
F. Course Title: Culture and Ecology
G. Grading Basis: A-F
H. Implementation Date: Spring 2015
I. Course Description: Examines anthropological approaches to the relationships between cultural and ecological systems. Explores culture as an adaptive system and the role of various cultural subsystems in different adaptations. Applies ecological concepts to human societies; impacts of environmental change on human societies, and impacts of human societies on environments; ethnoecology and traditional ecological knowledge of indigenous communities; values of nature among Western and non-Western societies; and political ecology in relation to the juxtaposition of indigenous peoples within contemporary nation-states.

J. Status of Course Relative to a GER Integrative Capstone Degree or Certificate Program:
   GER Integrative Capstone
   BA Anthropology capstone
   BS Anthropology capstone
   BS Environment and Society, Society and Environment emphasis
   Minor, Environmental Studies, List B
   BS Natural Sciences, Environmental Sciences option, Social Sciences list

K. Course Fees: No
L. Course Prerequisite: ANTH A202, minimum grade of C
M. Stacking: ANTH A654

III. Course Activities
In a lecture and discussion format, information will be presented concerning the diversity of ways in which human societies adapt and have adapted to their natural environments and have transformed those environments, from prehistory to the present, in global perspective.
IV. Course Justifications:

A. Justification of course level: This course contains advanced content; it is a synthetic course requiring specialized knowledge.

B. Justification for capstone status: This course integrates general knowledge about human cultural adaptations to produce a synthetic but detailed understanding of the long-term history of human-environmental relations, including both environmental impacts on human societies and vice versa, as well as an understanding of distinctions between Western and non-Western approaches to ecological knowledge and values of nature, and a consideration of the ecological circumstances of indigenous peoples embedded within contemporary nation-states.

V. Instructional Goals and Defined Outcomes

A. Instructional Goals. The Instructor will:

1. Present fundamental ecological concepts and their relationship to human societies
2. Discuss human adaptations from a variety of cultural perspectives
3. Describe the impacts of environmental changes on human societies, and of human societies on their environments
4. Relate the traditions of environmental anthropology and their perspectives on human/environment interactions
5. Present Western and non-Western (indigenous) perspectives on ecological knowledge

A. Student Learning Outcomes and Assessment Measures. The Student will:

<table>
<thead>
<tr>
<th>Student Learning Outcomes:</th>
<th>Assessment Measures</th>
<th>Integrative Capstone Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Apply fundamental ecological concepts to human societies</td>
<td>Examinations, student journals/reflections from class discussions, graded daily questions</td>
<td>Knowledge integration, critical thinking</td>
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<tr>
<td>2. Analyze the impacts of environmental change on human societies and the impacts of human societies on environments through human history</td>
<td>Examinations, student journals/reflections from class discussions, graded daily questions</td>
<td>Critical thinking, information literacy, knowledge integration,</td>
</tr>
<tr>
<td>3. Explain the various</td>
<td>Examinations, student</td>
<td>Critical thinking,</td>
</tr>
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traditions in anthropology and their approaches to understanding human/environment interactions

journals/reflections from class discussions, graded daily questions

information literacy, knowledge integration

4. Interpret different approaches of societies to nature, and the differences and similarities between indigenous environmental knowledge and that of contemporary Western societies

Examinations, student journals/reflections from class discussions, graded daily questions

Critical thinking, information literacy, knowledge integration

VI. Topical Outline:

A. Introduction
B. Environmental Anthropology Overview
   a. Development and Branches of Environmental Anthropology
   b. Steward’s Cultural Ecology
   c. Beyond Boundaries in Cultural Ecology
   d. Ethnoecology
   e. System Approaches in Environmental Anthropology
C. Fundamentals of Ecology and Human Biological Ecology
   a. Principles of Cultural Ecology
   b. Human Adaptive Strategies
      i. Hunting and Gathering
      ii. Origins of Food Production/Horticulture
      iii. Pastoralism/Intensive Agriculture
      iv. Modern Models
D. Population & Environment
E. Development & Urbanization
F. Political Ecology
   a. Politics of Knowledge
   b. Knowing the Environment
   c. Biodiversity
   d. Managing the Environment
   e. Gender, Feminism, & Environment
   f. Politics of Global Environmentalism
G. Indigeneity & the Environment
   a. Traditional Ecological Knowledge
b. Indigenousness & Environmentalism
c. Indigenous Rights

H. Contemporary Issues in Environmental Anthropology
   a. Health & Environment
   b. Climate Change
   c. Consumption & Globalization

VII. Suggested Textbooks:


VIII. Bibliography:


*Classic References

**Sources that illustrate historic development of the field
1a. School or College
EN SOENGR

1b. Division
No Division Code

1c. Department
Civil Engineering

2. Course Prefix
AE

3. Course Number
A603

4. Previous Course Prefix & Number
CE A603

5a. Credits/CEUs
3

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

6. Complete Course Title
Arctic Engineering

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
☐ Course Prerequisites
☐ Co-requisites
☐ Registration Restrictions

9. Repeat Status No
# of Repeats
Max Credits

10. Grading Basis
☒ A-F
☐ P/NP
☐ NG

11. Implementation Date
semester/year
From: Fall/2015
To: 99/9999

12. Cross Listed with
☒ Stacked with
AE A403

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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<th>Catalog Page(s) Impacted</th>
<th>Date of Coordination</th>
<th>Chair/Coordinator Contacted</th>
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<tr>
<td>MS of Arctic Engineering</td>
<td>336</td>
<td>1/24/2014</td>
<td>Hannele Zubeck</td>
</tr>
<tr>
<td>BS of Engineering, EE/ME</td>
<td>280, 261</td>
<td>12/6/2013</td>
<td>Jeff Hoffman/Jens Munk</td>
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Initiator Name (typed): Hannele Zubeck
Initiator Signed Initials: _________ Date:________________

13b. Coordination Email
Date: 2/4/2014
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison
Date: 10/3/2014

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)
Introduces students to a broad spectrum of engineering challenges unique to cold regions. Discusses physical principles and practical data collection methods, analyses, designs, and construction methods. Students gain a working knowledge of cold regions engineering problems and modern solutions as a basis for more detailed study. Students must submit a research paper. Special note: Graduate standing with a baccalaureate degree in engineering. No previous credit for CE/AE A403.

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)

17. ☒ Mark if course has fees
☐ Standard Engineering Fee

18. ☒ Mark if course is a selected topic course

19. Justification for Action
For identity and assessment purposes, the key graduate courses of the Arctic Engineering program are being given the Arctic Engineering prefix.

Initiator (faculty only)
Hannele Zubeck
Initiator (TYPE NAME)

☐ Approved
☐ Disapproved

Dean/Director of School/College
Date

Undergraduate/Graduate Academic
Date

Board Chairperson
Date

Provost or Designee
Date
UNIVERSITY OF ALASKA ANCHORAGE
COURSE CONTENT GUIDE

I. Initiation Date: February 20, 2014

II. Course Information
A. College: College of Engineering
B. Course Title: Arctic Engineering
C. Course Subject/Number: AE A603
D. Credit Hours: 3.0
E. Contact: 3+0
F. Grading Information: A-F
G. Course Description: Introduces students to a broad spectrum of engineering challenges unique to cold regions. Discusses physical principles and practical data collection methods, analyses, designs, and construction methods. Students gain a working knowledge of cold regions engineering problems and modern solutions as a basis for more detailed study. Students must submit a research paper. Special note: Graduate standing with a baccalaureate degree in engineering. No previous credit for CE/AE A403.

H. Status of course relative to degree or certificate program:
   Applies to the MS program in Arctic Engineering, and BS program in Engineering, with Mechanical and Electrical concentrations.

I. Lab Fees: Standard Engineering Fee
J. Coordination: UAA/CoEng/CE faculty list serves
K. Course Prerequisites: NA
L. Registration Restrictions: NA

III. Course Activities

Faculty presentations, homework assignments, exams, class discussions and activities relating to course’s term paper conference.

IV. Evaluation

Evaluation procedures are at the discretion of the instructor and will be disclosed during the first class in the semester. Students will be evaluated on homework assignments, exams and term paper.

V. Course Level Justification

Presentations and reading will include advanced scientific and engineering topics that require a background in math and science equivalent to that obtained in a bachelor’s degree in engineering.
VI. Course Outline

- Global Perspectives and Climate Change
- Units of Measure and Heat Transfer
- Ice Engineering
- Snow Engineering
- Frozen Ground Engineering
- Arctic Roads
- Arctic Buildings
- Arctic Utilities
- Arctic Construction
- Mechanical and Electrical Engineering Issues in Cold Regions
- Winter Safety and Survival
- Presenting research results

VII. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will
   1. Introduce the students to a variety of Arctic Engineering issues and prepare them for further study in each topic in the course outline.
   2. Provide students with understanding and skills to evaluate the effects of ice, snow and freezing temperatures on the design and construction of arctic buildings and infrastructure.
   3. Provide students with understanding and skills to include climate variation conditions in arctic design.
   4. Provide students with understanding and skills to calculate basic heat transfer and moisture migration in buildings.
   5. Explain how to prepare conference papers.

B. Student Learning Outcomes. After successful completion of the course, the students will be able to:

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Include climate variation considerations in arctic designs.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>2. Conduct basic heat transfer calculations with an ability to convert units of measure.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>3. Evaluate the effects of ice and snow on arctic infrastructure.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>4. Evaluate the effects of ground freezing on foundations and roads.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>5. Evaluate the effects of freezing air temperatures and snow on building design.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>6. Avoid design failures of arctic utilities due to arctic conditions.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
</tbody>
</table>
7. Evaluate the effects of arctic conditions on construction, winter safety and survival. | Homework assignments, exams and term paper.

8. Use psychrometric chart and calculate moisture migration in structures. | Homework assignments, exams and term paper.

9. Evaluate the effects of arctic conditions to electrical engineering projects. | Homework assignments, exams and term paper.

10. Author papers that are professional quality | Term paper.

VIII. Suggested Text

No suggested text. References are drawn from the professional literature and equivalent online sources of technical information, such as data from the NOAA's National Climatic Data Center and manuals from the ERDC/CRREL USA Corps of Engineers (e.g. 2002. *Engineering and Design: Ice Engineering*. U.S. Army Corps of Engineers Engineer Manual 1110-2-1612.)

IX. Bibliography and Resources

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

1a. School or College
EN SOENGR

1b. Division
No Division Code

1c. Department
Civil Engineering

2. Course Prefix
AE

3. Course Number
A403

4. Previous Course Prefix & Number
CE A403

5a. Credits/CEUs
3

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

6. Complete Course Title
Arctic Engineering

Abbreviated Title for Transcript (30 character)
Arctic Engineering

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
☐ Text Score Prerequisites
☐ Co-requisites
☐ Other Restrictions
☐ Registration Restrictions

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

10. Grading Basis
☐ A-F
☐ P/NP
☐ NG

11. Implementation Date
Semester/year
From: Spring/2015
To: 99/9999

12. Cross Listed with
☐ Stacked with AE A603

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>
</tr>
</thead>
<tbody>
<tr>
<td>BS of Civil Engineering</td>
<td>254</td>
<td>1/24/2014</td>
<td>Osama Abaza</td>
</tr>
<tr>
<td>BS of Construction Management</td>
<td>223</td>
<td>2/4/2014</td>
<td>Jeffrey Callahan</td>
</tr>
<tr>
<td>BS of Engineering, EE/ME</td>
<td>260, 261</td>
<td>12/6/2013</td>
<td>Jens Munk/Jeff Hoffman</td>
</tr>
</tbody>
</table>

Initiator Name (typed): Hannele Zubeck
Initiator Signed Initials: __________
Date: __________

13b. Coordination Email
Date: 2/4/2014
submitted to Faculty Listserv: (uac-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison
Date: 2/4/2014

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)
Introduces students to a broad spectrum of engineering challenges unique to cold regions. Discusses physical principles and practical data collection methods, analyses, designs, and construction methods. Students gain a working knowledge of cold regions engineering problems and modern solutions as a basis for more detailed study.

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)
☒ Class
☐ Level

16e. Registration Restriction(s) (non-codable)
Junior or senior standing in an accredited undergraduate program in engineering or construction management.

17. ☒ Mark if course has fees
Standard Engineering fee

18. ☐ Mark if course is a selected topic course

19. Justification for Action
For identity and assessment purposes, the key graduate courses of the Arctic Engineering program are being given the Arctic Engineering prefix.

Initiator (faculty only) Hannele Zubeck
Initiator (TYPE NAME)

☐ Approved
☐ Disapproved

Dean/Director of School/College
Date

Undergraduate/Graduate Academic Board Chairperson
Date

Provost or Designee
Date
UNIVERSITY OF ALASKA ANCHORAGE
COURSE CONTENT GUIDE

I. Initiation Date: February 20, 2014

II. Course Information
A. College: College of Engineering
B. Course Title: Arctic Engineering
C. Course Subject/Number: AE A403
D. Credit Hours: 3.0
E. Contact: 3+0
F. Grading Information: A-F
G. Course Description: Introduces students to a broad spectrum of engineering challenges unique to cold regions. Discusses physical principles and practical data collection methods, analyses, designs, and construction methods. Students gain a working knowledge of cold regions engineering problems and modern solutions as a basis for more detailed study.
H. Status of course relative to degree or certificate program:
   Applies to the BS programs in Civil Engineering, Engineering with Mechanical and Electrical Engineering concentrations, and Construction Management.
I. Lab Fees: Standard Engineering Fee
J. Coordination: UAA/CoEng/CE faculty list serves
K. Course Prerequisites: NA
L. Registration Restrictions: Junior or senior standing in an accredited undergraduate program in engineering or construction management.

III. Course Activities
Faculty presentations, homework assignments, exams and class discussions.

IV. Evaluation
Evaluation procedures are at the discretion of the instructor and will be disclosed during the first class in the semester. Students will be evaluated on homework assignments and exams.
V. Course Level Justification

Presentations and reading will include advanced scientific and engineering topics that require a background in math and science equivalent to that of upper class standing in engineering or construction management programs.

VI. Course Outline

- Global Perspectives and Climate Change
- Units of Measure and Heat Transfer
- Ice Engineering
- Snow Engineering
- Frozen Ground Engineering
- Arctic Roads
- Arctic Buildings
- Arctic Utilities
- Arctic Construction
- Mechanical and Electrical Engineering Issues in Cold Regions
- Winter Safety and Survival

VII. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will:
   1. Introduce the students to a variety of Arctic Engineering issues and prepare them for further study in each topic in the course outline.
   2. Provide students with understanding and skills to evaluate the effects of ice, snow and freezing temperatures on the design and construction of arctic buildings and infrastructure.
   3. Provide students with understanding and skills to include climate variation conditions in arctic design.
   4. Provide students with understanding and skills to calculate basic heat transfer and moisture migration in buildings.
B. Student Learning Outcomes. After successful completion of the course, the students will be able to:

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Include climate variation considerations in arctic designs.</td>
<td>Homework assignments and exams</td>
</tr>
<tr>
<td>2. Conduct basic heat transfer calculations with an ability to convert units of measure.</td>
<td>Homework assignments and exams</td>
</tr>
<tr>
<td>3. Evaluate the effects of ice and snow on arctic infrastructure.</td>
<td>Homework assignments and exams</td>
</tr>
<tr>
<td>4. Evaluate the effects of ground freezing on foundations and roads.</td>
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</tr>
<tr>
<td>8. Use psychrometric chart and calculate moisture migration in structures.</td>
<td>HOMEWORK ASSIGNMENTS AND EXAMS</td>
</tr>
<tr>
<td>9. Evaluate the effects of arctic conditions on electrical engineering projects.</td>
<td>HOMEWORK ASSIGNMENTS AND EXAMS</td>
</tr>
</tbody>
</table>

VIII. Suggested Text

No suggested text. References are drawn from the professional literature and equivalent online sources of technical information, such as data from the NOAA's National Climatic Data Center and manuals from the ERDC/CRREL USA Corps of Engineers (e.g. 2002. Engineering and Design: Ice Engineering. U.S. Army Corps of Engineers Engineer Manual 1110-2-1612.)

IX. Bibliography and Resources

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>EN SOENGR</th>
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<tbody>
<tr>
<td>1b. Division</td>
<td>No Division Code</td>
</tr>
<tr>
<td>1c. Department</td>
<td>Civil Engineering</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Course Prefix</th>
<th>AE</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Course Number</td>
<td>A681</td>
</tr>
<tr>
<td>4. Previous Course Prefix &amp; Number</td>
<td>CE A681</td>
</tr>
<tr>
<td>5a. Credits/CEUs</td>
<td>3</td>
</tr>
<tr>
<td>5b. Contact Hours (Lecture + Lab)</td>
<td>(3+0)</td>
</tr>
</tbody>
</table>

6. Complete Course Title
Frozen Ground Engineering
Frozen Ground Engineering
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  ☐ Course Number  ☐ Credits  ☐ Title  ☐ Grading Basis
☐ Cross-Listed/Stacked  ☐ Course Description  ☐ Test Score Prerequisites  ☐ Course Prerequisites
☐ Co-requisites  ☐ Registration Restrictions  ☐ Other Restrictions
☐ Class  ☐ College  ☐ Major  ☐ Level
☐ 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: Spring/2015 To: 99/9999

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>
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<th>Catalog Page(s) Impacted</th>
<th>Date of Coordination</th>
<th>Chair/Coordinator Contacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. MS of Arctic Engineering</td>
<td>336</td>
<td>1/24/2014</td>
<td>Hannele Zubeck</td>
</tr>
<tr>
<td>2. MS of Civil Engineering</td>
<td>NA</td>
<td>1/24/2014</td>
<td>Osama Abaza</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Initiator Name (typed): Hannele Zubeck Initiator Signed Initials: _________ Date:________________

13b. Coordination Email
Date: 2/4/2014
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison
Date: 2/4/2014

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)
Introduces students to physical, thermal and mechanical properties of frozen soils, frost action, heat flow in soils, thaw behavior of frozen ground, foundations in frozen ground, construction ground freezing, pavement design, earthwork, and field investigations for frozen ground.

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, with a baccalaureate degree in engineering, or upper class standing in an accredited undergraduate program in engineering.

17. ☒ Mark if course has fees CoEng fee

18. ☐ Mark if course is a selected topic course

19. Justification for Action
For identity and assessment purposes, the key graduate courses of the Arctic Engineering program are being given the Arctic Engineering prefix. Prerequisite removal: current prerequisite limits the attendance to Civil Engineers only.

Initiator (faculty only)
Hannele Zubeck
Initiator (TYPE NAME)

Initiator (faculty only) Date
Disapproved
Disapproved
Disapproved
Disapproved

Dean/Director of School/College
Date

Undergraduate/Graduate Academic
Date

Board Chairperson
Date

Provost or Designee
Date
I. Initiation Date:  February 20, 2014

II. Course Information
A. College: College of Engineering
B. Course Title: Frozen Ground Engineering
C. Course Subject/Number: AE A681
D. Credit Hours: 3.0
E. Contact: 3+0
F. Grading Information: A-F
G. Course Description: Introduces students to physical, thermal and mechanical properties of frozen soils, frost action, heat flow in soils, thaw behavior of frozen ground, foundations in frozen ground, construction ground freezing, pavement design, earthwork, and field investigations for frozen ground.
H. Status of course relative to degree or certificate program: Applies to the MS programs in Arctic Engineering.
I. Lab Fees: CoEng fee
J. Coordination: UAA/CoEng/CE faculty list serves
K. Course Prerequisites: NA
L. Registration Restrictions: Graduate standing, with a baccalaureate degree in engineering, or upper class standing in an accredited undergraduate program in engineering.

III. Course Activities

Faculty presentations, homework assignments, exams, class discussions and activities relating to course’s term paper conference.

IV. Evaluation

Evaluation procedures are at the discretion of the instructor and will be disclosed during the first class in the semester. Students will be evaluated on homework assignments, exams and term paper.

V. Course Level Justification

Presentations and reading will include advanced scientific and engineering topics that require a background in math and science equivalent to that obtained in a bachelor’s degree in engineering.
VI. Course Outline

- Introduction to Frozen Ground
- Physical and Thermal Properties of Soils
- Frost Action
- Heat Flow in Soils
- Thaw Behavior of Frozen Ground
- Mechanical Properties of Frozen Soils
- Foundations in Frozen Ground
- Construction Ground Freezing
- Term Paper Conference
- Pavement Design
- Field Investigations and Earthwork
- Presenting research results

VII. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will demonstrate how to
   1. Analyze properties of frozen soils,
   2. Analyze frozen soil's behavior under stress and strain,
   3. Design foundations, earth structures and pavements for frozen ground.
   4. Explain how to prepare conference papers.

B. Student Learning Outcomes. After successful completion of the course, the students
   will be able to:

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Define frozen ground and describe its characteristics.</td>
<td>Homework assignments, exams, term paper.</td>
</tr>
<tr>
<td>2. Assess physical and thermal properties of frozen soils, heat flow and frost heave rates in soils.</td>
<td>Homework assignments, exams, term paper.</td>
</tr>
<tr>
<td>3. Analyze thaw weakening of frozen soils and estimate thaw settlement.</td>
<td>Homework assignments, exams, term paper.</td>
</tr>
<tr>
<td>5. Prevent foundation/pavement failure due to seasonally frozen ground or permafrost.</td>
<td>Homework assignments, exams, term paper.</td>
</tr>
<tr>
<td>6. Identify important issues in earthwork, field investigations, and construction ground freezing project.</td>
<td>Homework assignments, exams, term paper.</td>
</tr>
<tr>
<td>7. Author papers acceptable for publication.</td>
<td>Term paper.</td>
</tr>
</tbody>
</table>

VIII. Suggested Text

IX. Bibliography and Resources

4. Journal of Cold Regions Engineering, ASCE Press, Reston, VA.
### 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>EN SOENG</th>
<th>1b. Division</th>
<th>No Division Code</th>
<th>1c. Department</th>
<th>Civil Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2. Course Prefix</strong></td>
<td>AE</td>
<td><strong>3. Course Number</strong></td>
<td>A682</td>
<td><strong>4. Previous Course Prefix &amp; Number</strong></td>
<td>CE A682</td>
</tr>
<tr>
<td><strong>5a. Credits/CEUs</strong></td>
<td>3</td>
<td><strong>5b. Contact Hours</strong></td>
<td>(Lecture + Lab)</td>
<td>(3+0)</td>
<td></td>
</tr>
<tr>
<td><strong>6. Complete Course Title</strong></td>
<td>Ice Engineering</td>
<td><strong>7. Type of Course</strong></td>
<td>Academic</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Abbreviated Title for Transcript (30 character)</strong></td>
<td>Ice Engineering</td>
<td><strong>8. Type of Action:</strong></td>
<td>Add or Change or Delete</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>9. Repeat Status No</strong></td>
<td># of Repeats</td>
<td>Max Credits</td>
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</tr>
<tr>
<td><strong>10. Grading Basis</strong></td>
<td>A-F</td>
<td>P/NP</td>
<td>NG</td>
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<tr>
<td><strong>11. Implementation Date</strong></td>
<td>Semester/year</td>
<td>From: Spring/2015 To: 99/9999</td>
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<td></td>
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<tr>
<td><strong>12. Cross Listed with</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td><strong>13a. Impacted Courses or Programs:</strong></td>
<td>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 <a href="http://www.uaa.alaska.edu/governance">www.uaa.alaska.edu/governance</a>.</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td><strong>Impact Program/Course</strong></td>
<td>Catalog Page(s) Impacted</td>
<td>Date of Coordination</td>
<td>Chair/Coordinator Contacted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Arctic Engineering MS Program</td>
<td>NA</td>
<td>337</td>
<td>1/24/2014</td>
<td>Hannele Zubeck</td>
<td></td>
</tr>
<tr>
<td>2. Civil Engineering MS Program</td>
<td>NA</td>
<td>337</td>
<td>1/24/2014</td>
<td>Osama Abaza</td>
<td></td>
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<tr>
<td>3.</td>
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<td></td>
<td></td>
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<tr>
<td><strong>Initiator Name (typed):</strong></td>
<td>Hannele Zubeck</td>
<td><strong>Initiator Signed Initials:</strong></td>
<td>Date:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>13b. Coordination Email</strong></td>
<td>Date: 2/4/2014</td>
<td><strong>13c. Coordination with Library Liaison</strong></td>
<td>Date: 2/4/2014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>submitted to Faculty Listserv:</td>
<td>(<a href="mailto:uaa-faculty@lists.uaa.alaska.edu">uaa-faculty@lists.uaa.alaska.edu</a>)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>14. General Education Requirement</strong></td>
<td>Mark appropriate box:</td>
<td>Oral Communication</td>
<td>Written Communication</td>
<td>Quantitative Skills</td>
<td>Humanities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fine Arts</td>
<td>Social Sciences</td>
<td>Natural Sciences</td>
<td>Integrative Capstone</td>
</tr>
<tr>
<td><strong>15. Course Description</strong> (suggested length 20 to 50 words)</td>
<td>Introduces students to factors governing design of engineering works contending with the presence of ice. Including fundamental ice properties, ice processes, ice navigation and control of ice in channels, structural and non-structural ice control measures, ice jams, bearing capacity of floating ice sheets, ice forces on riverine, and ocean structures.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>16a. Course Prerequisite(s) (list prefix and number)</strong></td>
<td>NA</td>
<td><strong>16b. Test Score(s)</strong></td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>16c. Co-requisite(s) (concurrent enrollment required)</strong></td>
<td>N/A</td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td><strong>16d. Other Restriction(s)</strong></td>
<td>College</td>
<td>Major</td>
<td>Class</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>16e. Registration Restriction(s) (non-codable)</strong></td>
<td>Graduate standing, with a baccalaureate degree in engineering, or upper class standing in an accredited undergraduate program in engineering, having completed a mechanics of materials course with a minimum grade of C.</td>
<td></td>
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</tr>
<tr>
<td><strong>17. Mark if course has fees</strong></td>
<td>CoEng fee</td>
<td><strong>18. Mark if course is a selected topic course</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>19. Justification for Action</strong></td>
<td>For identity and assessment purposes, the key graduate courses of the Arctic Engineering program are being given the Arctic Engineering prefix.</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Initiator (faculty only) Hannele Zubeck**

<table>
<thead>
<tr>
<th>Initiator (TYPE NAME)</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approved</td>
<td>Disapproved</td>
</tr>
<tr>
<td>Disapproved</td>
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**Dean/Director of School/College**

<table>
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<th>Date</th>
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**Undergraduate/Graduate Academic**

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**Board Chairperson**

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<tr>
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**Provost or Designee**

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<th>Date</th>
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<tbody>
<tr>
<td>Approved</td>
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</table>
I. Initiation Date: February 20, 2014

II. Course Information
A. College: College of Engineering
B. Course Title: Ice Engineering
C. Course Subject/Number: AE A682
D. Credit Hours: 3.0
E. Contact: 3+0
F. Grading Information: A-F
G. Course Description: Introduces students to factors governing design of engineering works contending with the presence of ice. Including fundamental ice properties, ice processes, ice navigation and control of ice in channels, structural and non-structural ice control measures, ice jams, bearing capacity of floating ice sheets, ice forces on riverine, and ocean structures.

H. Status of course relative to degree or certificate program:
Applies to the MS program in Arctic Engineering.

I. Lab Fees:
CoEng fee

J. Coordination:
UAA/CoEng/CE faculty list serves

K. Course Prerequisites:
None

L. Registration Restrictions:
Graduate standing, with a baccalaureate degree in engineering, or upper class standing in an accredited undergraduate program in engineering, having completed a mechanics of materials course with a minimum grade of C.

III. Course Activities
Faculty presentations, homework assignments, exams, class discussions and activities relating to course’s term paper conference.

IV. Evaluation
Evaluation procedures are at the discretion of the instructor and will be disclosed during the first class in the semester. Students will be evaluated on homework assignments, exams and term paper.

V. Course Level Justification
Presentations and reading will include advanced scientific and engineering topics that require a background in math and science equivalent to that obtained in a bachelor’s degree in engineering.
VI. Course Outline

A. Physical Ice Properties and Processes
B. River, Lake, and Sea Ice
C. Ice Navigation and Control of Ice in Channels
D. Structural and Non-structural Ice control Measures
E. Ice Jam Processes and Classification
F. Ice Jam Data Collection, Hydraulics, and Mitigation
G. Bearing Capacity of Floating Ice Sheets
H. Ice Forces on Structures and Related Processes
I. Construction of Ice Roads and Bridges
J. Presenting research results

VII. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will present materials, lead discussions, and assign exercises intended to give students ability to
1. Analyze properties of lake, river, and sea ice.
2. Predict behavior of ice under natural conditions.
3. Evaluate ice forces on engineering structures.
4. Design ice roads and bridges.
5. Evaluate bearing capacity of ice sheets.
6. Predict other ice effects pertinent to safety and efficiency of human endeavors in cold regions.
7. Explain how to prepare conference papers.

B. Student Learning Outcomes. After successful completion of the course, the students will be able to:

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Analyze properties of lake, river, and sea ice.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>2. Predict behavior of ice under natural conditions.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>3. Predict ice forces on engineering structures.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>4. Design ice roads and bridges.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>5. Evaluate bearing capacity of ice sheets.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>6. Design ice control and ice jam mitigation measures.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>7. Predict other ice effects pertinent to safety and efficiency of human endeavors in cold regions.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>8. Author papers acceptable for publication.</td>
<td>Term paper.</td>
</tr>
</tbody>
</table>
VIII. Suggested Text:


IX. Bibliography and Resources

### Course Action Request

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

#### 1. School or College  
**EN SOENGR**

#### 2. Course Prefix  
**AE**

#### 3. Course Number  
**A683**

#### 4. Previous Course Prefix & Number  
**CE A683**

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

#### 6. Complete Course Title  
Arctic Hydrology and Hydraulic Engineering  
Arctic Hydrology/Hydraulic Eng

#### 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  
- semester/year
  - From: Spring/2015  
  - To: 99/9999

#### 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.

<table>
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<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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</thead>
<tbody>
<tr>
<td>Arctic Engineering MS Program</td>
<td>337</td>
<td>1/24/2014</td>
<td>Hannele Zubeck</td>
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<tr>
<td>AEST MS Program</td>
<td>335</td>
<td>1/24/2014</td>
<td>Rob Lang</td>
</tr>
</tbody>
</table>

#### 13b. Coordination Email  
- Date: 2/4/2014
  - submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

#### 13c. Coordination with Library Liaison  
- Date: 2/4/2014

#### 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)  
Introduces students to aspects of hydrology and hydraulics unique to engineering problems of the North. Although emphasis is placed on Alaskan conditions, information from Canada and other circumpolar countries is included.

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

#### 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, with a baccalaureate degree in engineering or physical science, or upper class standing in an accredited undergraduate program in engineering, having completed a water resources course with a minimum grade of C.

#### 17. Mark if course has fees SCoEng fee  

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

#### 19. Justification for Action  
For identity and assessment purposes, the key graduate courses of the Arctic Engineering program are being given the Arctic Engineering prefix.

---

**Initiator Name (typed): Hannele Zubeck**  
Initiator Signed Initials: __________  
Date: __________

**Date:** __________

**Submitter of Request:**

**Chair/Coordinator Contacted:**

**Date:** __________

**Submitter of Request:**

**Chair/Coordinator Contacted:**

**Date:** __________

**Submitter of Request:**

**Chair/Coordinator Contacted:**

**Date:** __________

**Submitter of Request:**

**Chair/Coordinator Contacted:**

**Date:** __________

---

**Initiator (faculty only)**

Hannele Zubeck

Initiator (TYPE NAME)

- Approved
- Disapproved

**Dean/Director of School/College**

- Approved
- Disapproved

**Undergraduate/Graduate Academic**

- Approved
- Disapproved

**Board Chairperson**

- Approved
- Disapproved

**Provost or Designee**

- Approved
- Disapproved

---

46
I. **Initiation Date:**
February 20, 2014

II. **Course Information**

A. **College:** College of Engineering
B. **Course Title:** Arctic Hydrology and Hydraulic Engineering
C. **Course Subject/Number:** AE A683
D. **Credit Hours:** 3.0
E. **Contact Time:** 3+0
F. **Grading Information:** A-F
G. **Course Description:** Introduces students to aspects of hydrology and hydraulics unique to engineering problems of the North. Although emphasis is placed on Alaskan conditions, information from Canada and other circumpolar countries is included.

H. **Status of course relative to degree or certificate program:**
Applies to in Arctic Engineering MS program and Applied Environmental Science and Technology MS program.

I. **Lab Fees:** CoEng fee
J. **Coordination:** UAA/CoEng/CE faculty list serves
K. **Course Prerequisites:** NA
L. **Registration Restrictions:** Graduate standing, with a baccalaureate degree in engineering or physical science, or upper class standing in an accredited undergraduate program in engineering, having completed a water resources course with a minimum grade of C.

III. **Course Activities**

Faculty presentations, homework assignments, exams, class discussions and activities relating to course’s term paper conference.

IV. **Evaluation**

Evaluation procedures are at the discretion of the instructor and will be disclosed during the first class in the semester. Students will be evaluated on homework assignments, exams and term paper.
V. Course Level Justification

Presentations and reading will include advanced scientific and engineering topics that require a background in math and science equivalent to that obtained in a bachelor’s degree in engineering.

VI. Outline

A. Review
   1. Units of measure, static fluid behavior, and basics of fluid flow
   2. Principles of dynamic fluid behavior and fundamentals of open channel flow
   3. Fundamentals of hydrology and river hydraulics
B. Ice in hydrologic and hydraulic systems
   1. Ice formation in turbulent and quiescent water
   2. Evolution of river ice
   3. River ice jams overview
   4. Ice jam force balance
C. Modeling river flows with ice effects
   1. Use of the U.S. Army Corps of Engineers Hydrologic Engineering Center’s River Analysis System program (HEC-RAS) to model river flows with ice of known thickness and roughness
   2. Using HEC-RAS for wide rivers with ice jams
   3. Using HEC-RAS to estimate ice jam flood levels
D. Effects of snow on Arctic Hydrology
   1. Snow properties
   2. Snowmelt hydrology

VII. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will demonstrate how to
   1. Employ hydrology and hydraulics fundamentals and related physical principles in cold regions.
   2. Consider cold regions natural conditions and engineering challenges, with particular regard to lakes and streams of the north
   3. Use associated specialized language and units of measure.
   4. Locate, interpret, and apply public information about cold regions precipitation, streamflow, and related physical conditions.
   5. Apply fundamental principles to solve common cold regions hydraulic engineering problems.
   6. Explain how to prepare conference papers.

B. Student Learning Outcomes. Upon completion of the course, the students will be able to:
<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Recognize natural conditions and engineering challenges that are unique to rivers and streams in cold regions.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>2. Interpret associated specialized language and units of measure.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>3. Locate, interpret, and apply public information about cold regions hydrology and related physical conditions.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>4. Apply physical principles for specialized solutions to cold regions hydraulic engineering problems, including:</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>a. Prediction of river ice growth and decay,</td>
<td></td>
</tr>
<tr>
<td>b. Analysis of river ice hydraulics,</td>
<td></td>
</tr>
<tr>
<td>c. Prediction of ice jams and design of mitigation measures,</td>
<td></td>
</tr>
<tr>
<td>d. Simulation of river flow and water level changes, including effects of ice, using HEC-RAS, and</td>
<td></td>
</tr>
<tr>
<td>e. Prediction and analysis of snow properties and snowmelt effects on stream flow.</td>
<td></td>
</tr>
<tr>
<td>5. Author papers acceptable for publication.</td>
<td>Term paper.</td>
</tr>
</tbody>
</table>

VIII. Suggested Text

Although no text is required, students are encouraged to download the following free manual from the U.S. Army Corps of Engineers:


IX. Bibliography and Resources

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<thead>
<tr>
<th>1a. School or College</th>
<th>EN SOENG</th>
<th>1b. Division</th>
<th>No Division Code</th>
<th>1c. Department</th>
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<td>3. Course Number</td>
<td>A684</td>
<td>4. Previous Course Prefix &amp; Number</td>
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<td>☐ CEU</td>
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<td>☐ P/NP</td>
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<td>semester/year</td>
<td>From: Spring/2015</td>
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<td>List any programs or college requirements that require this course.</td>
<td>Please type into fields provided in table. If more than three entries, submit a separate table. A template is available at <a href="http://www.uaa.alaska.edu/governance">www.uaa.alaska.edu/governance</a>.</td>
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<td>337</td>
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<td>14. General Education Requirement</td>
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<td>Written Communication</td>
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<td>Social Sciences</td>
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<td>Natural Sciences</td>
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<tr>
<td>15. Course Description (suggested length 20 to 50 words)</td>
<td>Introduces students to physical principles and current practices associated with the planning and design of safe, efficient, and affordable water supply, fire protection, wastewater collection and disposal, and solid waste disposal works in cold regions, with a view toward conditions in rural Arctic Alaska.</td>
<td></td>
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<td>16a. Course Prerequisite(s) (list prefix and number)</td>
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<td>16e. Registration Restriction(s) (non-codable)</td>
<td>Graduate standing, with a baccalaureate degree in engineering or physical science, or upper class standing in an accredited undergraduate program in engineering, having completed a water resources course with a minimum grade of C.</td>
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<td>17. ☑ Mark if course has fees SCoEng</td>
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<td>18. ☑ Mark if course is a selected topic course</td>
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<td>19. Justification for Action</td>
<td>For identity and assessment purposes, the key graduate courses of the Arctic Engineering program are being given the Arctic Engineering prefix.</td>
<td></td>
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<table>
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<th>Initiator Signed Initials:</th>
<th>Date:</th>
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<tr>
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<table>
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<tr>
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<td>Hannele Zubeck</td>
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UNIVERSITY OF ALASKA ANCHORAGE
COURSE CONTENT GUIDE

I. Initiation Date: February 20, 2014

II. Course Information
A. College: College of Engineering
B. Course Title: Arctic Utility Distribution
C. Course Subject/Number: AE A684
D. Credit Hours: 3.0
E. Contact: 3+0
F. Grading Information: A-F
G. Course Description: Introduces students to physical principles and current practices associated with the planning and design of safe, efficient, and affordable water supply, fire protection, wastewater collection and disposal, and solid waste disposal works in cold regions, with a view toward conditions in rural Arctic Alaska.
H. Status of course relative to degree or certificate program: Applies to the MS programs in Arctic Engineering
I. Lab Fees: CoEng fee
J. Coordination: UAA/CoEng/CE faculty list serves
K. Course Prerequisites: NA
L. Registration Restrictions: Graduate standing, with a baccalaureate degree in engineering, or upper class standing in an accredited undergraduate program in engineering, having completed a water resources course with a minimum grade of C.

III. Course Activities
Faculty presentations, homework assignments, exams, class discussions and activities relating to course’s term paper conference.

IV. Evaluation
Evaluation procedures are at the discretion of the instructor and will be disclosed during the first class in the semester. Students will be evaluated on homework assignments, exams and term paper.

V. Course Level Justification
Presentations and reading will include advanced scientific and engineering topics that require a background in math and science equivalent to that obtained in a bachelor’s degree in engineering.
VI. Course Outline

A. Overview of Cold Regions Utilities
B. Planning and Project Development
C. Frozen Ground – Foundations for Utilities
D. Thermal Considerations
E. Water Sources and Development
F. Water Treatment
G. Water Storage
H. Water Distribution
I. Wastewater Collection, Treatment and Disposal
J. Presenting research results

VII. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. Instructors will present materials, lead discussions, and assign exercises to teach students how to
   1. Plan and design safe, efficient, and affordable water supply, fire protection, wastewater collection and disposal, and solid waste disposal methods in cold regions.
   2. Prepare conference papers.

B. Student Learning Outcomes. After successful completion of the course, the students will be able to:

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Use physical properties, mathematics, analytical methods and specialized language necessary for solving water and wastewater system design and analysis problems encountered in cold regions.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>2. Identify and summarize governing processes associated with freezing and thawing phenomena.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>3. Locate, interpret, and apply public information about cold regions physical conditions and engineering variables.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>4. Determine foundation and support conditions and common designs for water and wastewater infrastructure, including piles, post and pad, and frozen foundation designs.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>5. Author papers acceptable for publication.</td>
<td>Term paper.</td>
</tr>
</tbody>
</table>

VIII. Suggested Text:

IX. Bibliography and Resources

3. Journal of Cold Region Engineering, ASCE Press, Reston, VA.
Course Action Request
University of Alaska Anchorage
Proposal to Initiate, Add, Change, or Delete a Course

1a. School or College
EN SOENGR

1b. Division
No Division Code

1c. Department
Civil Engineering

2. Course Prefix
AE

3. Course Number
A685

4. Previous Course Prefix & Number
ME A685

5a. Credits/CEUs
3

5b. Contact Hours
(3+0)

6. Complete Course Title
Arctic Mass and Heat Transfer

Abbreviated Title for Transcript (30 character)
Arctic Mass and Heat Transfer

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
☐ Other Restrictions
☐ Other CCG (please specify)
☐ Course Number
☐ Contact Hours
☐ Repeat Status
☐ Cross-Listed/Stacked
☐ Test Score Prerequisites
☐ Co-requisites
☐ Registration Restrictions
☐ Class
☐ Level
☐ College
☐ Major

9. Repeat Status No
# of Repeats
Max Credits

10. Grading Basis
☑ A-F
☐ P/NP
☐ NG

11. Implementation Date
semester/year
From: Spring/2015 To: 99/9999

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>
</tr>
</thead>
<tbody>
<tr>
<td>1. Arctic Engineering MS Program</td>
<td>336</td>
<td>1/24/2014</td>
<td>Hannele Zubeck</td>
</tr>
<tr>
<td>2. Engineering BS Program ME</td>
<td>261</td>
<td>12/6/2013</td>
<td>Jeff Hoffman</td>
</tr>
</tbody>
</table>

13b. Coordination Email
Date: 2/4/2014
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison
Date: 2/4/2014

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)
Introduces principles of heat and mass transfer with special emphasis on application to problems encountered in the Arctic, such as ice and frost formation, permafrost, condensation, and heat loss in structures.

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

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, with a baccalaureate degree in engineering, or upper class standing in an accredited undergraduate program in engineering, having completed a thermodynamics course with a minimum grade of C.

17. ☐ Mark if course has fees CoEng fee

18. ☐ Mark if course is a selected topic course

19. Justification for Action
For identity and assessment purposes, the key graduate courses of the Arctic Engineering program are being given the Arctic Engineering prefix.

Initiator Name (typed): Hannele Zubeck
Initiator Signed Initials: __________ Date: __________

Initiator (faculty only) Hannele Zubeck
Initiator (TYPE NAME)

Disapproved
Department Chairperson Date

Approved
Undergraduate/Graduate Academic Board Chairperson Date

Disapproved
Provost or Designee Date
**UNIVERSITY OF ALASKA ANCHORAGE**  
**COURSE CONTENT GUIDE**

I. **Initiation Date:**  
February 20, 2014

II. **Course Information**

A. College: College of Engineering  
B. Course Title: Arctic Heat and Mass Transfer  
C. Course Subject/Number: AE A685  
D. Credit Hours: 3.0  
E. Contact Time: 3+0  
F. Grading Information: A-F  
G. Course Description: Introduces principles of heat and mass transfer with special emphasis on application to problems encountered in the Arctic, such as ice and frost formation, permafrost, condensation, and heat loss in structures.  
H. Status of course relative to degree or certificate program:  
Applies to the Arctic Engineering MS program and Engineering BS program in Mechanical Engineering concentration.  
I. Lab Fees: CoEng fee  
J. Coordination: UAA/SOE/CE faculty list serves  
K. Course Prerequisites: NA  
L. Registration Restrictions: Graduate standing, with a baccalaureate degree in engineering, or upper class standing in an accredited undergraduate program in engineering, having completed a thermodynamics course with a minimum grade of C.

III. **Course Activities**

Faculty presentations, homework assignments, exams, class discussions and activities relating to course’s term paper conference.

IV. **Evaluation**

Evaluation procedures are at the discretion of the instructor and will be disclosed during the first class in the semester. Students will be evaluated on homework assignments, exams and term paper.

V. **Course Level Justification**

Presentations and reading will include advanced scientific and engineering topics that require a background in math and science equivalent to that obtained in a bachelor’s degree in engineering.
VI. Outline

A. Information collection
B. Regional temperature data
C. Physical properties of construction materials
D. Zone refining
E. Fundamentals of heat transfer
F. Temperature distribution in soils
G. Temperature measurement
H. Foundation design in cold regions
I. Heat transfer in structures
J. Heat and mass transfer in buried pipelines, roads, and utilidors
K. Presenting research results

VII. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will demonstrate how to:
   1. Apply hydrology and hydraulics fundamentals and related physical principles.
   2. Apply physical properties, mathematics including calculus, and analytical methods necessary for solving heat and mass transfer problems encountered in cold regions.
   3. Identify governing processes associated with freezing and thawing phenomena in cold regions.
   4. Use specialized language and units of measure for heat and mass transfer in cold climates.
   5. Locate, interpret, and apply public information about cold regions physical conditions and engineering.
   6. Apply governing principles to solve common cold regions engineering problems,
   7. Apply heat and mass transfer problem solving techniques to analyze roads, buildings, pipelines, and utilidors under cold climate conditions.
   8. Prepare conference papers.

B. Student Learning Outcomes. After successful completion of the course, the students will be able to:

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Determine and summarize the mathematical and physical properties governing heat and mass transfer in cold climates.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>2. Interpret and apply associated specialized language and units of measure.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>3. Gather specialized scientific and engineering public information about cold regions physical conditions.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>4. Apply fundamental physical principles in solving common cold regions engineering problems.</td>
<td>Homework assignments, exams and term paper.</td>
</tr>
<tr>
<td>5. Predict temperature variations in soils based upon</td>
<td>Homework assignments, exams and</td>
</tr>
</tbody>
</table>
climatic and physical soil data. term paper.

6. Determine temperature profiles in structure walls, roof, and foundations. Homework assignments, exams and term paper.

7. Predict moisture content and mass flow rates in structures. Homework assignments, exams and term paper.

8. Determine soil freeze and thaw rates associated with buried pipelines and utilidors. Homework assignments, exams and term paper.

9. Author papers acceptable for publication. Term paper.

VIII. Suggested Text


Additional supplemental material will be gathered as needed from public information sources, such as data from the NOAA's National Climatic Data Center.

IX. Bibliography and Resources

## 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>EN SOENGR</th>
<th>1b. Division</th>
<th>No Division Code</th>
<th>1c. Department</th>
<th>Civil Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Course Prefix</td>
<td>AE</td>
<td>3. Course Number</td>
<td>A686</td>
<td>4. Previous Course Prefix &amp; Number</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5a. Credits/CEUs</td>
<td>3</td>
<td>5b. Contact Hours</td>
<td>(Lecture + Lab)</td>
</tr>
</tbody>
</table>

### 6. Complete Course Title
**Arctic Engineering Project**  
Arctic Engineering Project  
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  
- [ ] Credits  
- [ ] Title  
- [ ] Grading Basis  
- [ ] Course Description  
- [ ] Test Score Prerequisites  
- [ ] Other Restrictions  
- [ ] Contact Hours  
- [ ] Repeat Status  
- [ ] Cross-Listed/Stacked  
- [ ] Co-requisites  
- [ ] Registration Restrictions

### 9. Repeat Status No  
- [ ] # of Repeats  
- [ ] Max Credits 3

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

### 11. Implementation Date
- [ ] semester/year

- [ ] From: Spring/2015  
- [ ] To: 99/9999

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

### 13b. Coordination Email
- [ ] Date: 2/4/2014  
- [ ] submitted to Faculty Listserv: [uaa-faculty@lists.uaa.alaska.edu](mailto:uaa-faculty@lists.uaa.alaska.edu)

### 13c. Coordination with Library Liaison
- [ ] Date: 2/4/2014

### 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)
Culminating project for MS Arctic Engineering student. The project is arranged among the advisor, graduate advisory committee and student to solve a practical cold regions engineering problem.

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

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

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

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

### 16e. Registration Restriction(s) (non-codable)
Graduate standing in Arctic Engineering with a completion of minimum of 9 graduate Arctic Engineering credits.

### 17. Mark if course has fees CoEng fee
- [ ]

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

### 19. Justification for Action
For identity and assessment purposes, the key graduate courses of the Arctic Engineering program are being given the Arctic Engineering prefix. This course is added, since the students are currently taking CE A686 Civil Engineering Project.

- [ ] Approved  
- [ ] Disapproved

**Initiator (faculty only)**  
Hannele Zubeck  
Initiator (TYPE NAME)

- [ ] Approved  
- [ ] Disapproved

**Undergraduate/Graduate Academic**

- [ ] Approved  
- [ ] Disapproved

**Board Chairperson**

- [ ] Approved  
- [ ] Disapproved

**Provost or Designee**

- [ ] Approved  
- [ ] Disapproved

**Dean/Director of School/College**

- [ ] Approved  
- [ ] Disapproved

**Department Chairperson**

- [ ] Approved  
- [ ] Disapproved

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UNIVERSITY OF ALASKA ANCHORAGE
COURSE CONTENT GUIDE

I. Initiation Date: February 20, 2014

II. Course Information
A. College: College of Engineering
B. Course Title: Arctic Engineering Project
C. Course Subject/Number: AE A686
D. Credit Hours: 3.0
E. Contact: 0+9
F. Grading Information: A-F
G. Course Description: Culminating project for MS Arctic Engineering student. The project is arranged among the advisor, graduate advisory committee and student to solve a practical cold regions engineering problem.
H. Status of course relative to degree or certificate program: Applies to the MS program in Arctic Engineering
I. Lab Fees: CoEng fee
J. Coordination: UAA/CoEng/CE faculty list serves
K. Course Prerequisites: NA
L. Registration Restrictions: Graduate standing in Arctic Engineering with a completion of minimum of 9 graduate Arctic Engineering credits.

III. Course Activities
A. Weekly work includes conducting literature review, designing experiments (if applicable), describing methodology (if applicable), conducting experiments or conducting modeling (if applicable), analyzing results, formulating conclusions, providing recommendations for future research and implementation.
B. Student project proposal that is reviewed by the graduate advisory committee.
C. Student project report that is reviewed by the graduate advisory committee.
D. Student project report with incorporated edits/comments from the graduate advisory committee.

IV. Evaluation
Evaluation procedures are at the discretion of the instructor and will be disclosed during the first class in the semester. Students will be evaluated on project proposal and project report.

V. Course Level Justification
A. The course will involve application of engineering and scientific knowledge and skills typical of graduate engineering students.
B. Students are required to accomplish a project demonstrating their command of the principles and skills introduced in the graduate program (MSAE). Significant responsibility for critical thinking and interpretation of technical information will fall on the student at a level commonly associated with graduate education.

VI. Course Outline

The course will be conducted as individual research, and includes the following items that the student submits to the advisory committee:

A. Project Proposal to be approved by the graduate advisory committee.
B. Project Report to be reviewed by the graduate advisory committee. The report should consist of introduction, literature review, methodology (if applicable), results, conclusions, recommendations, and references.
C. Final Project Report incorporating suggestions and improvements as prescribed by reviewers.

VII. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will:
   1. Provide students with understanding and skills how to create a concise project proposal with a relevant background, problem statement, hypothesis and scope of work.
   2. Provide students with skills to formulate appropriate outline for reports.
   3. Provide students with understanding on the clarity, accuracy, precision, relevance, depth, breadth, logic, significance and fairness required for engineering research reports.
   4. Prepare students to professional engineering reports.

B. Student Learning Outcomes. After successful completion of the course, the students will be able to:

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Formulate engineering research proposals.</td>
<td>Project proposal</td>
</tr>
<tr>
<td>2. Formulate appropriate research methodology.</td>
<td>Proposal and report</td>
</tr>
<tr>
<td>3. Conduct literature reviews and collect information pertinent to the research topics.</td>
<td>Project report</td>
</tr>
<tr>
<td>4. Comprehend the clarity, accuracy, precision, relevance, depth, logic, significance and fairness required for engineering research reports.</td>
<td>Project report</td>
</tr>
<tr>
<td>5. Author professional engineering reports.</td>
<td>Project report</td>
</tr>
</tbody>
</table>

VIII. Suggested Text: NA
IX. Bibliography and Resources

5. *Journal of Cold Regions Engineering*, ASCE Press, Reston, VA.
Course Action Request  
University of Alaska Anchorage  
Proposal to Initiate, Add, Change, or Delete a Course

1a. School or College  
EN SOENGR

1b. Division  
No Division Code

1c. Department  
Civil Engineering

2. Course Prefix  
AE

3. Course Number  
A689

4. Previous Course Prefix & Number  
CE A689

5a. Credits/CEUs  
3

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

6. Complete Course Title  
Cold Regions Pavement Design  
Cold Regions Pavement Design  
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

9. Repeat Status No  # of Repeats  Max Credits  

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

11. Implementation Date  
semester/year  
From: Spring/2015  To: 99/9999

12. ☐ Cross Listed 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.  

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<th>Catalog Page(s) Impacted</th>
<th>Date of Coordination</th>
<th>Chair/Coordinator Contacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Master of Science Arctic Engineering</td>
<td>337</td>
<td>1/24/2014</td>
<td>Hannele Zubeck</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Initiator Name (typed): Hannele Zubeck  
Initiator Signed Initials:  
Date: 

13b. Coordination Email  
Date: 2/4/2014  
submitted to Faculty Listserv: (uaa-faculty@lists.uaa.alaska.edu)

13c. Coordination with Library Liaison  
Date: 2/4/2014

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)  
Topics include design, maintenance and rehabilitation of pavement structures in cold regions where frost, snow and ice threaten expected service life.

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

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, with a baccalaureate degree in engineering, or upper class standing in an accredited undergraduate program in engineering, having completed a transportation engineering course with a minimum grade of C.

17. ☒ Mark if course has fees CoEng fee

18. ☐ Mark if course is a selected topic course

19. Justification for Action  
For identity and assessment purposes, the key graduate courses of the Arctic Engineering program are being given the Arctic Engineering prefix.

Initiator (faculty only)  
Hannele Zubeck  
Initiator (TYPE NAME)

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

☐ Approved  
☐ Disapproved  
Undergraduate/Graduate Academic  
Date

☐ Approved  
☐ Disapproved  
Board Chairperson  
Date

☐ Approved  
☐ Disapproved  
Provost or Designee  
Date
I. **Initiation Date:**

February 20, 2014

II. **Course Information**

A. **College:** College of Engineering  
B. **Course Title:** Cold Regions Pavement Design  
C. **Course Subject/Number:** AE A689  
D. **Credit Hours:** 3.0  
E. **Contact:** 3+0  
F. **Grading Information:** A-F  
G. **Course Description:** Topics include design, maintenance and rehabilitation of pavement structures in cold regions where frost, snow and ice threaten expected service life.

H. **Status of course relative to degree or certificate program:** Applies to the MS program in Arctic Engineering  
I. **Lab Fees:** CoEng fee  
J. **Coordination:** UAA/CoEng/CE faculty list serves  
K. **Course Prerequisites:** NA  
L. **Registration Restrictions:** Graduate standing, with a baccalaureate degree in engineering, or upper class standing in an accredited undergraduate program in engineering, having completed a transportation engineering course with a minimum grade of C

III. **Course Activities**

Faculty presentations, homework assignments, exams, class discussions and activities relating to course’s term paper conference.

IV. **Evaluation**

Evaluation procedures are at the discretion of the instructor and will be disclosed during the first class in the semester. Students will be evaluated on homework assignments, exams and term paper.

V. **Course Level Justification**

Presentations and reading will include advanced scientific and engineering topics that require a background in math and science equivalent to that obtained in a bachelor’s degree in engineering.
VI. Course Outline

- Cold regions pavements
- Pavement environment
- Calculation of engineering parameters
- Pavement deterioration modes
- Soil investigation and material testing
- Design approaches
- Mix design of bound layers
- Pavement structural design
- Maintenance and rehabilitation
- Pavements on permafrost
- Presenting research results

VII. Instructional Goals and Student Learning Outcomes

A. Instructional Goals. The instructor will demonstrate how to:
1. Apply factors and calculate engineering parameters for pavement design in cold regions.
2. Analyze failure modes of pavements.
3. Plan for site investigation and material testing.
4. Compare alternatives for design and maintenance strategies.
5. Design pavement surfaces and structures.
6. Plan maintenance operations, select rehabilitation techniques and seasonal load restrictions.
7. Design pavements in a permafrost environment.

B. Student Learning Outcomes. After successful completion of the course, the students will be able to:

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Assessment Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Analyze factors affecting pavement design in cold regions.</td>
<td>Homework assignments, exams, term paper.</td>
</tr>
<tr>
<td>2. Analyze failure modes of pavements under the effects of traffic, environmental stresses and the combination of the two.</td>
<td>Homework assignments, exams, term paper.</td>
</tr>
<tr>
<td>3. Manage site investigations and material testing.</td>
<td>Homework assignments, exams, term paper.</td>
</tr>
<tr>
<td>4. Evaluate alternatives for design and maintenance techniques, strategies and their financial impacts.</td>
<td>Homework assignments, exams, term paper.</td>
</tr>
<tr>
<td>5. Manage and perform pavement designs in cold regions.</td>
<td>Homework assignments, exams, term paper.</td>
</tr>
<tr>
<td>6. Author papers acceptable for publication.</td>
<td>Term paper.</td>
</tr>
</tbody>
</table>
VIII. Suggested Text


IX. Bibliography and Resources

**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</td>
<td>Biological 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>BIOL</td>
<td>A662</td>
<td>N/A</td>
<td>3</td>
<td>(3+0)</td>
</tr>
</tbody>
</table>

6. **Complete Course Title**  
Advanced Virology

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

**7. Type of Course**  
- [x] 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**  
- semester/year  
  From: Fall/2015  
  To: Fall/9999

12. **Cross Listed with**  
- [x] Stacked with BIOL A462

**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).

<table>
<thead>
<tr>
<th>Impacted Program/Course</th>
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**Initiator Name (typed):** Khrys Duddleston  
**Initiator Signed Initials:** _________  
**Date:**________________

13b. **Coordination Email**  
Date: 6Jan14

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

13c. **Coordination with Library Liaison**  
Date: 6Jan14

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 concepts in human virology, an in-depth focus on cell and molecular biology of virus structures, viral life cycles, interactions with host cells, immune responses and disease pathogenesis. Viral genomics, evolution, emergence, and advanced experimental methods for analyzing virus genome sequences will be discussed.

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

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

16c. **Automatic Restriction(s)**
- [ ] College  
- [ ] Major  
- [ ] Class  
- [ ] Level

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

17. **Mark if course has fees**  

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

19. **Justification for Action**  
Update of CAR and CCG, change in pre-requisites

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**Initiator (faculty only)**  
Khrys Duddleston  
**Initiator (TYPE NAME):** ____________  
**Date:**________________

**Initiator (faculty only)**  
Khrys Duddleston  
**Initiator Signed Initials:** _________  
**Date:**________________

© 2015 University of Alaska Anchorage  
66
I. Date of Initiation: Spring 2014

II. Curriculum Action Request
   A. College: College of Arts and Sciences
   B. Course Prefix: BIOL
   C. Course Number: A662
   D. Number of Credits: 3
   E. Contact Hours: 3+0
   F. Course Title: Advanced Virology
   G. Grading Basis: A-F
   H. Implementation Date: Fall 2015
   I. Cross-listed/Stacked: BIOL A462
   J. Course Description: Advanced concepts in human virology, an in-depth focus on cell and molecular biology of virus structures, viral life cycles, interactions with host cells, immune responses and disease pathogenesis. Viral genomics, evolution, emergence, and advanced experimental methods for analyzing virus genome sequences will be discussed.
   K. Course Prerequisites: N/A
   L. Course Co-requisites: N/A
   M. Other Restrictions: N/A
   N. Registration Restrictions: Graduate Standing
   O. Course Fees: No

III. Instructional Goals and Student Learning Outcomes
   A. Instructional Goals. The instructor will:
      1. Present an integrated synthesis of concepts in modern virology, focused on molecular analyses of virus genomes, proteins, virion structures, virus-host interactions, viral life cycles, and experimental methods in virology.
      2. Discuss how genetics, molecular and cell biology of virus replication is critical for understanding of pathogenesis of viral diseases in humans, including disease processes on the cellular level, immune responses, viral evasion of immunity, and the development of vaccines.
      3. Conceptualize virus genomes and how they contribute to evolution and emergence of viruses, and facilitate student use of analytical and bioinformatics methods to understand virus genome sequences.
      4. Facilitate student learning of current, prescient topics in virology by guided discussion of select scientific literature and recent biotechnological advancements that impact understanding of viruses.
      5. Guide graduate student learning of advanced concepts from recent virology research modeled from the primary scientific literature.
B. Student Learning Outcomes and Assessment Measures

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<th>Student Learning Outcomes: Upon completion of this course, the student will be able to:</th>
<th>Assessment Measures</th>
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<td>1. Apply basic principles of cell biology, molecular biology, and genetics to describe virus genomes, structures, replication, gene expression, host cell interactions, and life cycles at molecular and cellular levels.</td>
<td>Written assignments, quizzes, and examinations</td>
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<td>2. Analyze, summarize and critically discuss virus genes, virus genomes, virulence factors, immune responses to viruses, and pathogenesis of viral diseases in humans.</td>
<td>Written assignments, quizzes, and examinations</td>
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<td>3. Synthesize biological concepts involved in virus emergence and evolution, and describe molecular methods for characterizing viral genomes and disease processes.</td>
<td>Written assignments, quizzes, and examinations</td>
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<tr>
<td>4. Develop scientific analytical skills by molecular analysis of virus genomes and protein structures, including bioinformatics approaches, and by analyzing select primary and secondary scientific literature.</td>
<td>Written assignments, research paper assignment, multimedia assignment, group discussion, and examinations</td>
</tr>
<tr>
<td>5. Integrate and model advanced concepts in virology derived from scientific literature, and develop hypotheses for new research.</td>
<td>Written assignments, research proposal, and literature discussions</td>
</tr>
</tbody>
</table>

IV. Course Level Justification
This course is an advanced interdisciplinary course comparable to graduate level virology courses offered at other universities. Students must synthesize concepts from the scientific literature across disciplines.

V. Topical Course Outline
A. Introduction to virology
   1. Virology is an interdisciplinary study
   2. Virology is an experimental science
   3. Virology is the study of biological systems
B. Case study: group discussion on emergence of a novel virus
C. Integrated biological concepts needed in virology
   1. Genome organization
   2. Molecular biology of eukaryotic DNA replication
   3. Molecular biology of gene expression
   4. Eukaryotic cell cycle
   5. Compartmentalized subcellular structures
   6. Cellular signal transduction
   7. Protein structure and function
D. Virus life cycle
   1. Production of progeny virus
   2. Bacteriophage growth kinetics
3. Experimental methods for measuring viruses during life cycle

E. Virus structures
   1. Virion structures, composition, and functional compartments
   2. Electron microscopy methods for studying virion structures
   3. Virion entry and egress
   4. Structure and function of virion proteins
      a. Receptor-binding proteins
      b. Fusion proteins

F. Virus genomes and replication
   1. Virus classification and families
   2. RNA virus genomes and genes
   3. DNA virus genomes and genes
   4. Virus gene expression
   5. Virus replication strategies
      a. Acute RNA virus infection
      b. Chronic DNA virus infection
      c. Retrovirus infection

G. Immune response to viruses
   1. Innate immune response
   2. Adaptive immune response
   3. Viral evasion of innate and adaptive immune responses
   4. Virus accessory genes in virulence
   5. Molecular basis of vaccination

H. Pathogenesis of viral diseases
   1. Acute respiratory infections
   2. Hemorrhagic fever viruses
   3. HIV/AIDS
   4. Hepatitis viruses and cancer
   5. DNA tumor viruses

I. Viral bioinformatics and genomics
   1. Molecular basis of information flow in biological systems
   2. Bioinformatics for virus sequence analysis
   3. Genomics methods for virus sequencing
   4. Systems biology of virus-host interactions

J. Emerging viruses
   1. Ecology of outbreaks
   2. Vector-borne viruses
   3. Zoonoses – species jumping across the animal:human interface
   4. Epidemiology of emerging infections

K. Current topics in virology
   1. This Week in Virology
      a. Multimedia assignment
      b. Group discussion
   2. Biosecurity of highly pathogenic viruses
   3. Vaccines
      a. Antigenicity
      b. Efficacy
      c. Vaccination controversies
   4. Antiviral drugs
      a. Mechanisms of action
      b. Drug resistance
5. Synthetic viruses in biotechnology

L. Graduate level synthesis and modeling of advanced concepts in virology
   1. Discussion of primary scientific literature
      a. Multimedia assignment
      b. Group discussion
      c. Graduate student journal article discussion
   2. Research proposal to address gap in knowledge in virology

VI. Suggested Texts


Readings from primary literature and review articles from scientific journals, for example:
- New England Journal of Medicine
- Nature
- The Lancet
- PLoS Pathogens
- mBio
- Science
- Emerging Infectious Diseases

VII. 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>
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<th>4. Previous Course Prefix &amp; Number</th>
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<th>5b. Contact Hours (Lecture + Lab)</th>
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<th>15. Course Description (suggested length 20 to 50 words)</th>
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<td>[BIOL A242 and BIOL A252] with minimum grade of C</td>
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| 16d. Registration Restriction(s) (non-codable) |

| 17. Mark if course has fees | 18. Mark if course is a selected topic course |

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<th>19. Justification for Action</th>
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Changing pre-requisites to better reflect need for course.

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I. Date of Initiation: Spring 2014

II. Curriculum Action Request
A. College: College of Arts and Sciences
B. Course Prefix: BIOL
C. Course Number: A462
D. Number of Credits: 3
E. Contact Hours: 3+0
F. Course Title: Virology
G. Grading Basis: A-F
H. Implementation Date: Fall 2015
I. Cross-listed/Stacked: BIOL A662
J. Course Description: Concepts in human virology, with an introduction to cell and molecular biology of virus structures, viral life cycles, interactions with host cells, immune responses and disease pathogenesis. Discusses viral genomics, evolution, emergence, and advanced experimental methods for analyzing virus genome sequences.
K. Course Prerequisites: [BIOL A242 and BIOL A252] with minimum grade of C.
L. Course Co-requisites: N/A
M. Other Restrictions: N/A
N. Registration Restrictions: N/A
O. Course Fees: No

III. Instructional Goals and Student Learning Outcomes
A. Instructional Goals. The instructor will:
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### IV. Course Level Justification

This course builds upon required pre-requisites in cell biology and genetics and requires students to synthesize concepts across disciplines.

### V. Topical Course Outline

A. Introduction to virology
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      b. Efficacy
      c. Vaccination controversies
   4. Antiviral drugs
      a. Mechanisms of action
      b. Drug resistance
   5. Synthetic viruses in biotechnology
VI. Suggested Texts


Excerpts from primary literature and review articles from scientific journals, for example:
- New England Journal of Medicine
- Nature
- The Lancet
- PLoS Pathogens
- mBio

VII. Bibliography


