

46-GNC (sig)

RECEIVED FEB 06

FORMAT 1

Submit original with signatures + 1 copy + electronic copy to Faculty Senate (Box 7500).
See <http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures/> for a complete description of the rules governing curriculum & course changes.

TRIAL COURSE OR NEW COURSE PROPOSAL

SUBMITTED BY:

Department	Electrical and Comp Engr	College/School	CEM
Prepared by	Jason McNeely	Phone	474-7228
Email Contact	jbmneely@alaska.edu	Faculty Contact	Jason McNeely

1. ACTION DESIRED

(CHECK ONE):

Trial Course

New Course

X

2. COURSE IDENTIFICATION:

Dept

EE

Course #

647

No. of Credits

3

Justify upper/lower division status & number of credits:

Graduate Course. Basic knowledge in electrical engineering, computer engineering, or computer science that would be met through an undergraduate curriculum would be sufficient for enrolment in this course. There will be 3 hours of lecture per week.

3. PROPOSED COURSE TITLE:

Data Compression

4. To be CROSS LISTED?

YES/NO

NO

If yes, Dept:

Course #

(Requires approval of both departments and deans involved. Add lines at end of form for additional required signatures.)

5. To be STACKED?

YES/NO

NO

If yes, Dept:

Course #

Stacked course applications are reviewed by the (Undergraduate) Curricular Review Committee and by the Graduate Academic and Advising Committee. Creating two different syllabi—undergraduate and graduate versions—will help emphasize the different qualities of what are supposed to be two different courses. The committees will determine: 1) whether the two versions are sufficiently different (i.e. is there undergraduate and graduate level content being offered); 2) are undergraduates being overtaxed?; 3) are graduate students being undertaxed? In this context, the committees are looking out for the interests of the students taking the course. Typically, if either committee has qualms, they both do. More info online – see URL at top of this page.

6. FREQUENCY OF OFFERING:

Spring Even-numbered Years

Fall, Spring, Summer (Every, or Even-numbered Years, or Odd-numbered Years) — or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING (AY2013-14 if approved by 3/1/2013; otherwise AY2014-15)

Spring 2014

8. COURSE FORMAT:

NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, any core course compressed to less than six weeks must be approved by the core review committee.

COURSE FORMAT:

(check all that apply)

☐

1

☐

2

☐

3

☐

4

☐

5

☒

6 weeks to full semester

OTHER FORMAT (specify)

Mode of delivery (specify lecture, field trips, labs, etc)

Lectures

9. CONTACT HOURS PER WEEK:

3

LECTURE hours/weeks

☐

LAB hours/week

☐

PRACTICUM hours/week

Note: # of credits are based on contact hours. 800 minutes of lecture=1 credit. 2400 minutes of lab in a science course=1 credit. 1600 minutes in non-science lab=1 credit. 2400-4800 minutes of practicum=1 credit. 2400-8000 minutes of internship=1 credit. This must match with the syllabus. See <http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures/guidelines-for-computing/> for more information on number of credits.

OTHER HOURS (specify type)

10. COMPLETE CATALOG DESCRIPTION including dept., number, title, credits, credit distribution, cross-listings and/or stacking (50 words or less if possible):

Example of a complete description:

FISH F487 W, O Fisheries Management**3 Credits Offered Spring**

Theory and practice of fisheries management, with an emphasis on strategies utilized for the management of freshwater and marine fisheries. *Prerequisites: COMM F131X or COMM F141X; ENGL F111X; ENGL F211X or ENGL F213X; ENGL F414; FISH F425; or permission of instructor. Cross-listed with NRM F487. (3+0)*

EE 647 Data Compression**3 Credits Offered Spring Even-numbered Years**

Study of algorithms and techniques that reduce information storage and transmission requirements. Both lossless and lossy techniques will be studied including: Huffman coding, arithmetic coding, image compression, and transform techniques. *Prerequisites: ES 201 or CS 201 or equivalent.*

11. COURSE CLASSIFICATIONS: Undergraduate courses only. Consult with CLA Curriculum Council to apply S or H classification appropriately; otherwise leave fields blank.

H = Humanities

S = Social Sciences

Will this course be used to fulfill a requirement for the baccalaureate core? **If YES, attach form.**

YES:**NO:**

If YES, check which core requirements it could be used to fulfill:

O = Oral Intensive, **Format 6**W = Writing Intensive, **Format 7**Natural Science, ("X" for Core)
Format 8**11.A Is course content related to northern, arctic or circumpolar studies? If yes, a**
added in the printed Catalog, and flagged in Banner.**"snowflake" symbol will be****YES****NO****12. COURSE REPEATABILITY:**

Is this course repeatable for credit?

YES**NO****X**

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).

How many times may the course be repeated for credit?

TIMES

If the course can be repeated for credit, what is the maximum number of credit hours that may be earned for this course?

CREDITS

If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?

CREDITS**13. GRADING SYSTEM:** Specify only one. Note: Later changing the grading system for a course constitutes a Major Course Change.**LETTER:****X****PASS/FAIL:****RESTRICTIONS ON ENROLLMENT (if any)****14. PREREQUISITES****ES 201 or CS 201 or equivalent**

These will be required before the student is allowed to enroll in the course.

15. SPECIAL RESTRICTIONS, CONDITIONS**16. PROPOSED COURSE FEES****\$**

Has a memo been submitted through your dean to the Provost for fee approval?

Yes/No**17. PREVIOUS HISTORY**

Has the course been offered as special topics or trial course previously?

Yes/No**YES**

If yes, give semester, year, course #, etc.:

Spring 2012, EE 693, "Data Compression"

18. ESTIMATED IMPACT

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

This course would require a classroom and be a part of the instructor's normal faculty teaching workload.

19. LIBRARY COLLECTIONS

Have you contacted the library collection development officer (kljensen@alaska.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No

☐

Yes

☒

Contacted Karen Jensen on 8/31/2011 during first course offering. Quoted from original format 1A: "Inquired about resources and possibility of textbook purchase for reference in the library. Response from Karen later that day indicated resources are available, but textbooks are typically not purchased and kept in the library."

20. IMPACTS ON PROGRAMS/DEPTS

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

None

21. POSITIVE AND NEGATIVE IMPACTS

Please specify **positive and negative** impacts on other courses, programs and departments resulting from the proposed action.

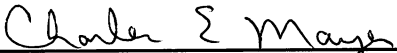
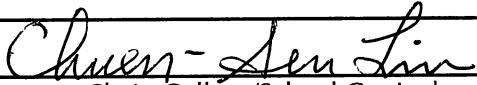

This course would build on the Computer Engineering program and also be valuable to Electrical Engineering students as well. This course complements (as a in depth look) into a component of some of the EE Data Communication courses as well (EE 463 for example). I foresee no negative impacts of this course.

JUSTIFICATION FOR ACTION REQUESTED

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. Use as much space as needed to fully justify the proposed course.

This course will introduce students to an often overlooked area in engineering and computer science that is used in practically all data devices today – reduction of size of data. Even though it is commonplace in today's technology, students often do not have the opportunity to study it via regular course offerings. Also, both Electrical Engineering and Computer Science graduate students will be able to take this course, since it applies directly to both fields, and has the potential to aid in starting collaborative research across the two departments.

APPROVALS: Add additional signature lines as needed.

	Date	1/24/13
Signature, Chair, Program/Department of: E C E		
	Date	1/30/13
Signature, Chair, College/School Curriculum Council for:		
	Date	2/1/13
Signature, Dean, College/School of: CEN		

Offerings above the level of approved programs must be approved in advance by the Provost.

	Date	
Signature of Provost (if above level of approved programs)		

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

	Date	
Signature, Chair		
Faculty Senate Review Committee: ___Curriculum Review ___GAAC		
___Core Review ___SADAC		

ADDITIONAL SIGNATURES: (As needed for cross-listing and/or stacking)

	Date	
Signature, Chair, Program/Department of:		
	Date	
Signature, Chair, College/School Curriculum Council for:		
	Date	
Signature, Dean, College/School of:		

EE 693

Data Compression

Tentative Syllabus – Spring 2014

COURSE INFORMATION

- Instructor:** Dr. Jason McNeely, Duckering 227
Office Phone: 474-7228
Email: jbmneely@alaska.edu
Office Hours: **TBA**
(You may also schedule an appointment or just drop by. The best way to reach me outside of office hours is via email.)
- Lectures:** MWF TBA
Location: DUCK TBA
- Credits:** 3
- Prerequisites:** ES 201 or CS 201 or equivalent
- Textbook:** *Introduction to Data Compression, 4th Edition*, Khalid Sayood. Morgan Kaufmann, 2012. ISBN 9780124157965 (Required)
- References:** Other reference materials may be posted electronically on Blackboard during this course.
- Methodology:** Lectures will be supplemented with relevant homework which may include small programming assignments to reinforce concepts. Acceptable programming languages will be C, C++, or MATLAB. Quizzes and exams will assess the theoretical components. A project may be required near the end of the semester. Blackboard will be used for electronic material posting.

COURSE DESCRIPTION

This course will introduce both lossy and lossless compression techniques. Entropy and measuring information will be introduced first. Following that, lossless compression techniques such as, but not limited to, Huffman coding and arithmetic coding will be covered. Lossy compression techniques for data and images will be covered as well. Methods to measure the performance of both lossless and lossy compression schemes, such as compression ratio, peak-signal-to-noise-ratio, etc, will be used. Data compression is an aspect of Computer and Electrical Engineering, as well as Computer Science that is important but given little coverage in courses.

Students enrolling in this course need to have at least one semester of programming in a language such as C++ or MATLAB in order to complete assignments. Also, it is expected that basic math skills have already been learned. We will briefly review in class (if necessary) any basic fundamentals as needed (such as logarithms and matrix manipulations). For those with hardware experience, final projects could be geared as a hardware implementation rather than software.

The catalog course description reads as follows:

Study of algorithms and techniques that reduce information storage and transmission requirements. Both lossless and lossy techniques will be studied including: Huffman coding, arithmetic coding, image compression, and transform techniques.

COURSE GOALS/OUTCOMES

Students taking this course will be able to:

- Goals:
 - Understand and apply the idea of entropy
 - Understand and use types of lossless compression
 - Understand and use various types of lossy compression
- Outcomes:
 - Be able to determine the performance of a particular compression technique
 - Be able to Choose an ideal compression technique based on the type of source data
 - Have an understanding of some state-of-the-art techniques
 - Be able to analyze compression techniques
 - Be able to write code to implement a given compression technique

IMPORTANT DATES (2012..WILL NEED TO UPDATE DATES TO 2014)

Thursday January 19:	First day of classes
Friday February 3:	Last day to drop the class (course does not appear on academic record)
March 12-16:	Spring break (no classes)
Friday March 23:	Last day to withdraw ('W' appears on academic record)
Friday April 27:	UAF SpringFest (no classes)
Friday May 4:	Last day of classes
May 7-10:	FINAL EXAMS

TENTATIVE SCHEDULE(2012..WILL NEED TO UPDATE DATES TO 2014)

Lecture	Date	Sections	Topics
1	January 20	Chapter 1	Lossless and Lossy Compression and Performance
2	January 23	2.1-2.3 [2.2.1]	Information Theory and Modeling
3	January 25	2.4	Lossless Codes
4	January 27	2.5-2.8	Algorithmic Information Theory and Minimum Descr. Length
5	January 30	3.1-3.2 [3.3]	Huffman Coding and Lengths
6	February 1	3.4	Adaptive Huffman Codes
7	February 3	3.5-3.6	Golomb Coding and Rice Coding
8	February 6	3.7	Tunstall Codes
9	February 8	3.8-3.10	Applications
10	February 10	4.1-4.3	Introduction to Arithmetic Codes
11	February 13	4.4	Generating a Binary Code
12	February 15	4.5-4.8	Compare: Huffman Vs Arithmetic
13	February 17		EXAM I REVIEW
	February 20		EXAM I
14	February 22	5.1-5.3	Introduction to Dictionary Techniques
15	February 24	5.4	Adaptive Dictionary: LZ77/LZ78
16	February 27	5.5-5.7	Applications
17	February 29	6.1-6.3.1	Context Based Compression Introduction
18	March 2	6.3.2-6.3.4	Prediction with Partial Match
19	March 5	6.4 [6.5-6.8]	Burrow-Wheeler Transform
20	March 7	7.1-7.2	Introduction to Lossless Image Compression and Old JPEG
21	March 9	7.3	CALIC
	March 12-16		SPRING BREAK
22	March 19	7.4	JPEG-LS
23	March 21	7.5 [7.6-7.9]	Multiresolution
	March 23		EXAM II
24	March 26	8.1-8.3 [8.4-8.8]	Lossy Coding and Distortion
25	March 28	9.1-9.3	Quantization
26	March 30	9.4	Uniform Quantization
27	April 2	9.5 [9.6-9.9]	Adaptive Quantization
28	April 4	12.1-12.3.2	Mathematical Review (Vectors)

29	April 6	12.3.3-12.3.6	Subspace and Basis Vectors
30	April 9	12.4-12.5 [12.6+]	Fourier (Briefly)
31	April 11	13.1-13.2	Introduction to Transform Coding
32	April 13	13.3	The Transform
33	April 16	13.4	KLT, DCT, DST, DWHT
34	April 18	13.5	Quantization
35	April 20	13.6	Application: JPEG Compression
36	April 23	17	Various Topics
37	April 25	18.1-18.4	Video Compression Intro
38	April 30	18.11	H.264 Video Compression
	May 2		Project Presentations
	May 4		Project Presentations

Alternate shading for each chapter

Sections in brackets will be skipped

42 Class Meetings = 38 Lectures + 2 Exams + 2 Presentation days

Final Exam will be on: TBA at TBA O'clock.

COURSE POLICIES

E-mail

Each student is expected to regularly check his or her **alaska.edu email address**. This address will be used for class correspondence - announcements, homework problems clarifications, etc. If you are not using the official UAF email address, please forward it to your address of choice.

Attendance

Class attendance is highly recommended. Material not in the text may be introduced at random intervals and occasional quizzes are part of your grade. If you miss a class, lecture slides and other handouts are available on Blackboard or can be obtained from the instructor. If you are late, please enter without disrupting the class.

Homework

Homework problems will typically be due one week after assigned. No late homework will be accepted without a valid excuse and prior arrangement.

You are expected to work independently (even if you work in study groups). The work you hand in should be your own effort. Any student whose work is copied from another student may receive a zero grade for the assignment. If you have questions about a homework problem outside of the instructor's or TA's office hours, please feel free to contact them by e-mail. Homework assignments are expected to be neat and legible. The grader is not obligated to decode scribbles; illegible answers will be assumed to be wrong.

Quizzes

You can expect to have a short quiz given as often as every week. Quizzes will typically cover the material from the previous week or two. The material for quizzes will include lectures, homework, reading assignments. Unless otherwise stated, quizzes will be **"closed book"**. Quizzes cannot be made up if missed.

Exams

There will be two exams. No makeup exams will be given except for documented extenuating circumstances. If you can anticipate an absence (work commitments, intercollegiate sports), talk to your instructor before the exam to make arrangements. If the absence is unexpected (illness, family or personal difficulties), please inform your instructor at the earliest possible opportunity.

STUDENTS WITH DISABILITIES

Students with learning or other disabilities who may need classroom accommodations are encouraged to make an appointment with the Office of Disability Services (208 WHIT, Phone # 474-5655). Please meet with me during office hours so that we can collaborate with the Office of Disability Services to provide the appropriate accommodations and supports to assist you in meeting the goals of the course.

GRADING

Homework	15%
Quizzes	15%
Exams	25%
Final Exam	25%
Final Project	20%

Plus/Minus grading will be used.

Projects will be graded based on completion, analysis, and brief presentation. If the project chosen becomes too large to manage, you are advised to break it into manageable parts a complete a part in order to get results for a grade.

PLAGIARISM

As a UAF student, you are subject to UAF's Honor Code:

"Students will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations.

Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses and other reports. No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors.

Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion."

ATTACH COMPLETE SYLLABUS (as part of this application). The guidelines are online:

<http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/uaf-syllabus-requirements/>

The Faculty Senate curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items are missing or unclear, the proposed course (or changes to it) may be denied.

SYLLABUS CHECKLIST FOR ALL UAF COURSES

During the first week of class, instructors will distribute a course syllabus. Although modifications may be made throughout the semester, this document will contain the following information (as applicable to the discipline):

1. Course information:

☐ Title, ☐ number, ☐ credits, ☐ prerequisites, ☐ location, ☐ meeting time
(make sure that contact hours are in line with credits).

2. Instructor (and if applicable, Teaching Assistant) information:

☐ Name, ☐ office location, ☐ office hours, ☐ telephone, ☐ email address.

3. Course readings/materials:

☐ Course textbook title, ☐ author, ☐ edition/publisher.
☐ Supplementary readings (indicate whether ☐ required or ☐ recommended) and
☐ any supplies required.

4. Course description:

☐ Content of the course and how it fits into the broader curriculum;
☐ Expected proficiencies required to undertake the course, if applicable.
☐ Inclusion of catalog description is *strongly* recommended, and
☐ Description in syllabus must be consistent with catalog course description.

5. ☐ Course Goals (general), and (see #6)

6. ☐ Student Learning Outcomes (more specific)

7. Instructional methods:

☐ Describe the teaching techniques (eg: lecture, case study, small group discussion, private instruction, studio instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.).

8. Course calendar:

☐ A schedule of class topics and assignments must be included. Be specific so that it is clear that the instructor has thought this through and will not be making it up on the fly (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). You may call the outline Tentative or Work in Progress to allow for modifications during the semester.

9. Course policies:

☐ Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.

10. Evaluation:

☐ Specify how students will be evaluated, ☐ what factors will be included, ☐ their relative value, and ☐ how they will be tabulated into grades (on a curve, absolute scores, etc.) ☐ Publicize UAF regulations with regard to the grades of "C" and below as applicable to this course. (Not required in the syllabus, but may be a convenient way to publicize this.)

Faculty Senate Meeting #171:

<http://www.uaf.edu/uafgov/faculty-senate/meetings/2010-2011-meetings/#171>

11. Support Services:

☐ Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

12. Disabilities Services: Note that the phone# and location have been **updated**.

The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials.

☐ State that you will work with the Office of Disabilities Services (208 WHITAKER BLDG, 474-5655) to provide reasonable accommodation to students with disabilities. 8/1/2012