

HSU Academic Program Criteria

Academic Program in Environmental Resource Engineering

I. The Vision for Humboldt State University (Limit: 2 pages) [15%]

Describe up to 5 curricular or co-curricular features of the program that are consistent with the Vision of HSU, and indicate which aspect(s) of the Vision align with that particular feature. Please provide sufficient information such that an individual unfamiliar with your program will clearly understand the feature's relevance.

The mission of the ERE program is to prepare engineers to solve complex environmental resources problems. This mission is accomplished by educating engineering students to be leaders that will sustain, restore and protect natural resources in a variety of socio-political and economic settings. This mission is consistent with the Vision of HSU and activities within or associated with the ERE curriculum align very well with HSU Vision Statement items 1, 2, 4, 7, and 8. Vision Statement items 5 and 6 are included in many activities of the department but not as explicitly.

The ERE curriculum emphasizes practical, service-learning experience with real-world projects and clients at all course levels. Whenever possible, these projects serve under-privileged or under-funded local entities and non-profit groups to assist in problem solving, grant development or initiate projects. The table on the next page describes some recent course projects and summarizes their alignment with the HSU Vision Statement.

In addition to course work, the ERE Department and its students also participate in extra-curricular activities that promote environmental resources engineering awareness and interaction with the local, national and international community to develop solutions to environmental problems. For example the Renewable Energy Student Union has raised approximately \$100,000 in the last year towards the implementation of regional renewable energy projects. Similarly, the Engineers Without Borders club won the 2008 EWB Domestic Humanitarian Award (\$1,000) for the design and construction of an educational, scale-model Ram pump, which pumps water without an external energy source.

Programs affiliated with the ERE Department, such as the Schatz Energy Research Center (SERC) and the Arcata Marsh and Wildlife Sanctuary (AMWS) affirm, the ERE Department's commitment and alignment with almost all components of HSU's Vision Statement.

Summary of Recent, Typical Service-Learning Course Projects

Course *	Project Description	Clients	Vision Statement Alignment
ENGR 492 Spring '08	Preliminary design of a low-cost bio-digester gas meter for measuring green house gas offset credits.	International Renewable Resources Institute-Mexico	1, 2, 4, 6, 7, 8
ENGR 492 Spring '07	Feasibility study and engineering design of micro-hydroelectric systems on tributaries to the lower Klamath River.	Yurok Tribe	1, 2, 4, 6, 7, 8
ENGR 475 Fall '06	Design of a renewable energy power system for an off-grid environmental education center. A modified version of the student design has been installed.	Smith River Alliance land trust organization	1, 2, 4, 7, 8
ENGR 477 Spring '05	Design of a solar thermal radiant floor heating system for a highly energy efficiency building.	Local businessman Helmut Remorz	1, 2, 4, 8
ENGR 451	Feasibility analysis and conceptual facility design for the Orick wastewater treatment facility.	Community of Orick, Redwood National Park	1, 2, 4, 7, 8
ENGR 448 Spring '03	Preliminary design of a juvenile fish ladder for Freshwater Creek at Freshwater Park	Humboldt County National Marine Fisheries Service	1, 2, 4, 7, 8
ENGR 351 Fall '08	Preliminary Water Quality Assessment for Campbell Ck and Gannon Slough	City of Arcata	1, 2, 4, 7, 8
ENGR 215	S07 – Design and construction of Interactive Energy Efficiency Displays S08 – Eco-Hostel Cottage Designs	Redwood Coast Energy Authority Humboldt Bay Center for Sustainable Living	1, 2, 4, 7, 8
ENGR 115	Webpage development (project assigned every semester)	CCAT Arcata Educational Farm Potowat Arcata Marsh & Wildlife Sanctuary	1, 2, 4, 7, 8

* Course Titles

- ENGR 492 – Capstone Design Project (Required course)
- ENGR 475 – Renewable Energy Power Systems (Elective course)
- ENGR 477 – Solar Thermal Engineering (Elective course)
- ENGR 451 – Water & Wastewater Treatment Engineering (Elective course)
- ENGR 448 – River Hydraulics (Elective course)
- ENGR 351 – Water Quality & Environmental Health (Required course)
- ENGR 215 – Intro to Design (Required course)
- ENGR 115 – Intro to Environmental Science & Engineering (Required course)

II. Demand (Limit: 1.5 pages per option, not including tables) [20%]

A. Internal demand for the degree program and courses in the degree program

I. Headcount Data

Major Academic Year (Fall/Spring) Average Headcount Summary Majors_overview_ERE report generated: 16-APR-08									
Major Code	Major Description	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07	AY 07/08
ERE	Environmental Resources Engr	183	167	171	175	180	169	179	219
Total		183	167	171	175	180	169	179	219

Second Majors by Academic Year (exclusive of primary majors) Majors_overview_ERE report generated: 16-APR-08									
Major Code	Major Description	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07	AY 07/08
ERE	Environmental Resources Engr	0	0	1	1	2	2	3	1
Total		0	0	1	1	2	2	3	1

Minors enrolled AY Average in Appropriate Technology minors_enrolled_AT report generated: 06-MAR-08								
CLASS	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07	AY 07/08
Frosh	1	0	1	2	0	1	0	2
Soph	3	3	2	2	6	0	2	1
Jr	4	5	4	7	4	6	2	4
Sr	21	16	12	16	15	12	12	8
	29	24	18	26	24	19	15	15

Majors by Sex and Ethnicity									
Majors_overview_ERE report generated: 16-APR-08									
SEX	Ethnicity	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07	AY 07/08
Female	Asian	4	3	0	0	2	1	2	2
	Black	1	1	1	1	0	0	0	0
	Hispanic	3	1	4	5	3	3	7	6
	Native Amer	1	1	0	0	2	1	0	2
	White	34	27	28	28	29	28	32	36
	Other	2	4	4	4	4	3	5	10
	Unknown	6	6	8	9	10	6	4	6
sum		50	42	44	46	49	42	49	61
Male	Asian	7	6	7	4	4	3	4	4
	Black	1	1	3	2	1	2	2	4
	Hispanic	10	11	11	7	7	6	6	6
	Native Amer	4	3	4	6	5	4	2	2
	Pacific Is	1	0	0	0	1	1	1	1
	White	91	79	84	84	88	82	84	96
	Other	3	3	2	4	5	7	9	23
	Unknown	18	22	18	24	22	24	25	24
sum		134	125	128	129	132	127	131	158

Environmental Resources Engr (with options) Degrees Awarded (incl. primary and second majors)								
degrees_awarded_B_ERE report generated: 25-JUN-08								
MAJOR	AY 99/00	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07
Environmental Resources Engr	41	34	25	38	19	27	21	21
Sum	41	34	25	38	19	27	21	21

Environmental Resources Engr Degrees Awarded by Sex and Ethnicity (incl. primary and second majors)

degrees_awarded_B_ERE report generated: 25-JUN-08

SEX	Ethnicity	AY 99/00	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07
Female	Asian	1	0	1	0	0	1	0	1
	Black	1	0	0	0	0	0	0	0
	Hispanic	0	1	0	0	0	1	0	0
	Native Amer	0	0	1	0	0	0	0	0
	White	14	7	4	11	5	3	4	3
	Other	0	1	0	0	1	2	0	1
	Unknown	1	0	1	1	0	1	2	0
sum		17	9	7	12	6	8	6	5
Male	Asian	0	1	0	2	0	1	1	1
	Black	0	1	0	0	0	0	1	0
	Hispanic	1	0	1	2	3	2	0	2
	Native Amer	0	0	2	1	0	0	1	0
	White	21	20	12	19	8	14	10	11
	Other	1	0	1	0	0	0	0	0
	Unknown	1	3	2	2	2	2	2	2
sum		24	25	18	26	13	19	15	16

Minors Awarded by Year in Appropriate Technology

minors_awarded_AT report generated: 25-JUN-08

MINOR	AY 99/00	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07
Appropriate Technology	7	11	8	6	8	9	9	7

2. FTES by Course Code

FTES taken in Engineering classes by Majors (AY 02/03 - AY 07/08)								
course_ftes_smry_ENGR report generated: 30-JUN-08								
SUBJ	Course level	Student Major	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07	AY 07/08
ENGR	Lower-div	Environmental Resources Engr	23.1	21.9	20.1	18.7	21.7	30.6
		Environmental Science	6.6	7.5	6.8	6.3	5.1	5.0
		Biology	.3	.1	.1	1.1	1.2	1.7
		Undeclared	2.2	1.2	2.6	2.0	1.4	1.7
		Physics	.2	.4	.4	.7	1.1	1.2
	Sub-total		37.8	34.8	36.0	35.4	36.3	46.0

FTES taken in Engineering classes by Majors (AY 02/03 - AY 07/08)								
course_ftes_smry_ENGR report generated: 30-JUN-08								
SUBJ	Course level	Student Major	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07	AY 07/08
ENGR	Upper-div	Environmental Resources Engr	41.3	52.5	58.2	56.0	50.3	52.8
		Environmental Science	9.1	9.9	7.7	3.6	5.0	3.2
		Environmental Systems (Engr)-Grad	1.0	.3	1.0	2.4	3.4	.8
		IS-INTL- International Studies	.0	.6	.1	.0	.2	.5
		Undeclared	.7	1.3	.4	.5	.2	.4
	Sub-total		61.2	75.9	80.3	71.7	65.2	61.8

FTES taken in Engineering classes by Majors (AY 02/03 - AY 07/08)								
course_ftes_smry_ENGR report generated: 30-JUN-08								
SUBJ	Course level	Student Major	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07	AY 07/08
ENGR	All Levels	Environmental Resources Engr	66.3	75.3	80.1	75.2	72.4	84.2
		Environmental Science	16.0	17.7	14.6	9.9	10.1	8.2
		Environmental Systems (Engr)-Grad	2.0	1.5	1.8	4.1	5.7	2.4
		Undeclared	3.0	2.5	3.0	2.5	1.7	2.1
		Env Systems (Intl Dev Tech)-Grad	9.7	4.8	7.7	4.4	4.8	2.1
Total			110.5	116.0	125.2	112.3	108.1	113.9

3. Service to other HSU program/options

Document other HSU programs/options (including, GE) with required coursework from your program

Other HSU program/option name	Courses required Course number (units)	Restricted elective courses. Course number (units)
Area B GE – Upper Division	-----	ENGR 305 (3); ENGR 308 (3)
Environmental Science – Energy & Climate Option	ENGR 305 (3); ENGR 308 (3); ENGR 331 (3)	-----
Environmental Science – Environ Policy option	-----	ENGR 308 (3)
Environ Systems MS – Energy, Envir & Society option	ENGR 532 (4); ENGR 533 (4); ENGR 535 (4)	-----
Environ Systems MS –Envir Resources Engr option	ENGR 501 (4); ENGR 521 (3)	-----
Appropriate Tech – Minor	ENGR 114 (2); ENGR 305 (3); ENGR 308 (3)	-----
Physics BS – Applied Physics option	-----	ENGR 330 (3)
Computer Science	-----	ENGR 225 (3)
Watershed Mgmnt minor	-----	ENGR 313 (4)
Water Resources Policy minor	-----	ENGR 448 (3)
Womens Studies – Women & the Environ option	-----	ENGR 305 (3); ENGR 308 (3)

4. Comment on the internal demand **FOR EACH OPTION** of the Major. Explain any significant changes in internal program demand over past 7 years. Provide any additional relevant information of internal demand.

Environmental Resources Engr

Environmental Resources Engineering (ERE) is the only undergraduate degree offered by the ERE Department so does not compete with other options within the major for internal demand. The ERE major is also a high-unit, rigid degree program due to requirements for accreditation by the Accrediting Board for Engineering and Technology (ABET). Thus, internal demand for ERE as a second major is low as indicated in the table on page 3.

Internal demand for ERE courses is driven primarily by the number of ERE majors. Since AY 05/06, ERE majors have been increasing steadily, increasing the demand for ERE major courses.

None of the ENGR courses included in the Appropriate Technology minor can be used to meet degree requirements for the ERE BS degree so these courses are not influenced by the number of ERE majors. The increase in ERE majors mirrors an increase in engineering students nationwide and is expected to continue because job market projections for environmental engineers are extremely favorable for the next decade. Recent Fall 08 headcount for ERE majors is 259, an increase of 40 students over the AY 07/08 average of 219.

Appropriate Technology

Appropriate Technology is not a program option in ERE but a minor that requires three engineering courses (8-units): ENGR 114, ENGR 305, and ENGR 308. The other 12-units for the minor are in Political Science (8-units) and Sociology (4-units). ENGR 305 and 308 are upper-level Area B GE courses and are also required courses in the Environmental Science Energy and Climate Option (ENGR 305) and Environmental Policy Option (ENGR 308). The only course the ERE Department must provide for the Appropriate Technology minor is ENGR 114. However, ENGR 114, a 2-unit CR/NC course, is also one possible pre-requisite for ENGR 305. Appropriate Technology minors comprise very few of the total student enrollment in ENGR 114, 305, and 308. Thus, the cost of providing courses for the minor is low.

B. External demand for “graduates” from the program

Environmental Resources Engr

Projected demand for environmental resources engineering is very high over the next decade. The State of California labor analysis estimates that positions will increase 25% from 2006-2016 with an average of 260 job openings per year (source: <http://www.labormarketinfo.edd.ca.gov/>). The State of California predictions are consistent with those of the US Department of Labor. Nationally, environmental engineering is predicted to grow much faster than average (25%) over the 2006-2016 projection decade (source: <http://stats.bls.gov/oco/ocos027.htm#outlook>).

In addition, the State of California has a recognized shortage of engineers and in December 2007 Governor Schwarzenegger issued a proposal stating "*California needs more engineers to achieve the improvements to our roads, schools and other infrastructure that voters envisioned when they passed the Strategic Growth Plan bonds last year,*" said Governor Schwarzenegger. "*As my*

administration works to deliver these improvements better, faster and for less through Performance Based Infrastructure, we must also ensure that our colleges and universities can attract and graduate the best and brightest engineers to build the Golden State." The proposal recognizes that the state faces a shortfall of 40,000 engineers by 2014 and the proposal's goal is to add 20,000 to 24,000 engineers to the state workforce (Source: <http://gov.ca.gov/index.php?/press-release/8389/>). The proposal seeks additional funds for engineering education and preparation for engineering education for K-12, community colleges, and the UC and CSU systems.

In areas related to clean energy technology and climate change mitigation, job growth is expected to be especially rapid over the next 10 to 15 years. Annual growth in the global solar and wind energy sectors has averaged 25-30% over the past decade, and growth trends in other clean energy fields have also been very positive. In California, The California Climate Action Team, an expert group assembled by Governor Schwarzenegger, estimated that over 80,000 new jobs would be created in the state by 2020 in fields related to clean energy technology and climate change mitigation

(http://www.climatechange.ca.gov/climate_action_team/reports/2006report/2006-04-03_FINAL_CAT_REPORT_EXECSUMMARY.PDF). Job creation is expected to be especially rapid in this area following implementation of the California Global Warming Solutions Act of 2006 (AB-32). Key provisions of the Act that would further stimulate such job creation go into effect in 2011. Beyond California, our graduates have similarly positive possibilities. Seventeen other U.S. states, including Oregon and Washington, have also adopted climate change mitigation legislation that is expected to result in significant clean energy job growth trends in the coming years

(http://www.pewclimate.org/what_s_being_done/in_the_states/emissionstargets_map.cfm).

Appropriate Technology

The Appropriate Technology minor is not intended to provide career opportunities independent of a student's major degree program. However, the minor can compliment many majors and is of particular value to students wishing to pursue careers in public policymaking or community development. It can also be useful for students wishing to volunteer for the Peace Corps or other development work. For those wishing to design and develop technological systems professionally, the minor is not an adequate substitute for a major in Environmental Resource Engineering, Applied Technology, or a related field.

III. Program Quality (Limit: 6 pages, not including tables) [30%]

A. Students

1. For undergraduate programs

Environmental Resources Engr (with options) Mean GWPE Scores (incl. primary and second majors)								
degrees_awarded_B_ERE report generated: 25-JUN-08								
MAJOR	AY 99/00	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07
Environmental Resources Engr	16.1	15.9	15.7	15.8	16.6	17.2	16.9	16.3
Overall	16.1	15.9	15.7	15.8	16.6	17.2	16.9	16.3

Provide evidence indicative of program quality related to student learning (e.g., patterns of student achievements in discipline-specific contexts such as special honors or awards, publications, presentations; passing rates on professional examinations; proportion of students who are admitted to graduate school and/or employed in a disciplinary field; and so on – as appropriate for your discipline).

Environmental engineering students intending to become licensed Professional Engineers must pass the Fundamentals of Engineering (FE) exam administered by the California Board for Professional Engineers and Land Surveyors. After passing the FE, graduates must work under the supervision of a licensed professional engineer for three years before sitting for the Professional Engineering (PE) exam. The table below summarizes enrolled ERE student performance on recent FE exams.

Exam Date	ERE Students Taking Exam	ERE Students Passing Exam	ERE FE Pass Rate	National FE Pass Rate
Apr 2004	11	9	82%	69%
Apr 2005	14	12	86%	85%
Apr 2006	18	14	78%	70%
Apr 2007	15	14	93%	84%
Apr 2008	9	7	78%	86%

The job market for ERE graduates is strong so most graduates choose to enter the work force upon completion of the ERE degree. Over 90% of recent ERE graduates are employed in environmental engineering or a very closely related field, such as green building construction and design. Those graduates that choose to continue their education in graduate school are also

quite successful. Over a dozen former ERE students have completed doctorates and are employed at Universities throughout the US including University of Texas, Austin (2 ERE grads), University of Massachusetts, Amherst (2 ERE grads), HSU (3 ERE grads), Smith College, Baylor University, BYU, UC Merced, Northern Arizona University, University of Nevada-Reno and Texas Tech. Currently, former ERE undergraduates are pursuing doctorates at institutions such as UC Davis, UCLA, and University of Texas, Austin.

ERE students, with mentorship from ERE faculty, have an excellent record of achievement in research and design competitions. A consistent example is the performance of ERE students in the Mathematical Contest in Modeling (MCM) sponsored by The Consortium for Mathematics and its Applications (COMAP). One or two teams of three ERE students compete each year in the four-day contest and several teams have won the highest honors (top 5 of ~800 international teams). ERE teams routinely achieve Meritorious or Honorable Mention rankings indicating that they have performed better than all but 15% of the entered teams.

Additional examples from AY 2007-2008 include:

- A seven member ERE graduate and undergraduate team won Honorable Mention in the US EPA's People, Prosperity and Plant (P3) Sustainability Design Competition. Students used a \$10,000 competition grant to finance their project.
- Engineers without Borders- HSU (an ERE student club) won \$1000 for the 2008 Domestic Humanitarian award from EWB-USA.
- ERE undergraduates made 2 presentations at the American Geophysical Union's annual meeting in December 2007. Cameron Bracken presented his REU research conducted at the University of Colorado, Boulder. Amelia Dillon, Lucas Siegfried and William Smith presented a poster of their research completed under the supervision of Profs. Lang and Cashman.

B. Faculty

1. *Provide evidence of teaching effectiveness and commitment to continuous improvement of teaching. Include, for example, engagement in professional development for teaching (including around campus themes on learning outcomes and diversity, and on accessibility training), program approaches to ensure quality, and/or recognitions, honors, and awards for excellence in the classroom as appropriate for your program.*

ERE Professor Charles Chamberlin was honored as HSU Outstanding Professor in 1994/1995.

ERE Professor Margaret Lang was nominated by ERE students for Outstanding Professor in 2003/2004.

From 2002 - 2005 ERE faculty, Cashman and Eschenbach received and implemented a National Science Foundation grant to redesign two introductory courses, ENGR 115 Introduction to Environmental Science and Engineering and ENGR 215 Introduction to Design. Multiple new pedagogical approaches were built into these courses including Just-in-Time Teaching (JiTT) techniques that require students to investigate material before covering the topic in lecture and Studio Teaching, which uses short lectures interspersed with hands-on practice of the lecture topic. These methods have been adopted by other faculty teaching these courses. The methods were also shared with HSU faculty via an on campus workshop and poster sessions and are used in several ERE courses.

Cashman and Eschenbach have lead workshops at national engineering education meetings on managing teams in engineering classrooms as well as infusing feminist pedagogy in engineering education. Cashman and Eschenbach, along with 3 co-presenters, received the 2004 Helen Plants Award for best non-traditional presentation at the Frontiers in Education conference. Many ERE classes, including the Capstone Design Project class, require students to work in teams, and utilize and respect the strength and differences between teammates.

The ERE department also participates in the Freshman Interest Groups (FIGs) bringing a cohort of ERE freshman into the program together. Recently, the NSF funded Scientific Leadership Scholars (SLS) program has brought this concept to a new level. The SLS program members, many of whom are Native American or first generation college students, take courses together including a weekly seminar and participate in service learning projects each year of their academic career.

In addition to classroom and extracurricular activities, several ERE faculty focus their research efforts on engineering education. Recent presentations and publications in this area are provided here as examples:

Eschenbach, E A, Conklin, M H (2008) WATERS– Integrating Science and Education Through the Development of an Education & Outreach Program that Engages Scientists, Students and Citizens Eos Trans. AGU, 88(52), Fall Meet. Suppl., Abstract H13A-0956, December 10-14, San Francisco, CA.

Ammoussou, G.A., and Cashman, E. (2006). The Science of Design: A Multidisciplinary Research Experience for Undergraduates at Humboldt State University, Proceedings of the 36th ASEE/IEEE Frontiers in Education Conference, October, San Diego, CA, IEEE Catalog number: 06CH37781C ISBN: 1-4244-0257-3.

Waller, A., Reilly D., Cashman, E., Eschenbach, E., and Lord S. (2006). Classroom Border Crossings: Incorporating Feminist and Liberative Pedagogies into your CSET Classroom, Workshop presented at the 35th ASEE/IEEE Frontiers in Education Conference, October, Indianapolis, IN, IEEE Catalog number: 05CH37667C ISBN: 0-7803-9078-4.

2. *Evidence of faculty engagement in scholarship/creative activities and service. (Express as a percentage of full-time or FERP faculty members **affiliated with the program**. For example, if 9 of 10 faculty affiliated with your program gave a paper at a professional meeting in 04/05, then enter 9/10 = 90%.)*

Scholarship/Creative Activities/Service	05/06	06/07	07/08
At least one peer-reviewed publication or creative product	53%	53%	53%
At least one funded grant or contract related to scholarship	84%	74%	53%
Invited participant or leader of workshops, expert panels, or task forces	53%	63%	53%
At least one presentation (paper, poster, exhibition, etc.) given at a professional society meeting	63%	74%	63%
Professional service activities at a regional or national level	74%	53%	84%
Service on at least one university or college-level committee (at least 1 hour/wk avg.)	53%	63%	53%

3. *Provide explanations of the data above and/or descriptions of the patterns of faculty engagement in scholarly and/or creative activities and service as appropriate for your program.*

The Scholarship/Creative Activities/Services table above accounts for the efforts of nine full-time and one FERP faculty. Over the three-year period summarized above, only one full-time faculty member did not appear in each category during at least one of the three years. ERE faculty participation in scholarship and University service is consistent with faculty balancing their efforts in scholarship and service.

4. *Provide evidence for faculty mentoring of students. Include, for example, approaches to advising, directed study or research, and/or clubs or student professional chapters that involve faculty mentorship.*

ERE faculty provide students multiple opportunities for mentoring their professional development outside of the classroom through professional and service project-oriented clubs, and the possibility of directed study and research projects. Sample results from directed study and research projects were described above in Section III.A.1.

To engage in directed study or research projects, ERE students may propose research projects to a faculty sponsor. If an ERE faculty member agrees to work with the student, the student can receive up to 3-units credit upon successful completion of the project through ENGR 498 or 499. If the proposed project has a design component and the student completes a satisfactory project design report, ENGR 498 can replace one of the required upper-division ENGR design electives.

ERE students can also choose to participate in any of the following student professional chapter clubs:

Environmental Resources Engineering Student Association (ERESA) - ERESA raises funds for student events, organizes student social activities, provides financial assistance for tutoring and works with all other engineering clubs. ERESA is the HSU student chapter of the American Society of Civil Engineers.

Society of Women Engineers (SWE) – The Society of Women Engineers mission is to stimulate women to achieve their full potential in careers as engineers and leaders, and demonstrate the

value of diversity. SWE plans events that inspire young girls to become involved in science and math.

Engineers Without Borders – EWB’s mission is to provide technical assistance to communities worldwide who have self-identified needs associated with improving their quality of life. EWB works on both local and international projects, and the EWB student chapter works with the local EWB professional chapter on joint projects.

Renewable Energy Student Union – The Renewable Energy Student Union (RESU) initiates and organizes renewable energy related activities for the Environmental Resources Engineering program. RESU draws members from the both undergraduate ERE students and environmental systems graduate students.

5. Other evidence of quality indicators related to faculty that may not be listed elsewhere, including, for example, faculty diversity within the program.

The ERE faculty has gender diversity similar to its student body (31% female faculty compared to approximately 35% female students over the last 6 years) and much greater than the national average for engineering faculty (reported as 9.5% in the latest available survey conducted by the National Center for Education Statistics in 2004). The large differences between HSU percentages and the national averages for engineering are strongly influenced by the fact that environmental engineering attracts more female students than all engineering disciplines except bioengineering (source: <http://www.engtrends.com/IEE/0703B.php>).

C. Curriculum (differentiate by option, if appropriate)

1. Writing and oral communication learning outcomes

Describe how written and oral communication skills are included in your program.

Developing strong written and oral communication in ERE graduates is a major program objective for the department. In response to internal program assessment, feedback from employers and alumni, and ABET accreditors, ERE introduced formal instruction in technical writing into a required junior-level course, ENGR 326, in 2000. Students receive intensive instruction on technical writing and feedback on approximately eight, 5-10 page laboratory reports and intermediate drafts of their course project report. In addition to ENGR 326, ERE students also receive formal instruction in written or oral communication in the required courses listed below.

Course	Type of Instruction	Oral, Written or Both
ENGR 115	Memos, Email	Written
ENGR 215	Technical Design Reports and Presentations	Both
ENGR 325	Technical Reports	Written
ENGR 331	Laboratory Reports	Written
ENGR 410	Memos, Environmental Impact Statements, Presentations	Both
ENGR 492	Technical Design Reports and Presentations	Both

Technical communication is assessed by the ERE department in the required, culminating course, ENGR 492 – Capstone Design Project. ERE faculty and practicing engineers evaluate the technical presentations (both oral and poster presentations are required) made by the students and the written technical reports. The ERE department does not believe that the GWPE is a relevant evaluation tool for technical writing and does not use, or intend to use it, for assessment.

2. Assessment

Provide 2 examples of how you have used results of assessment of your program's student learning outcomes to adapt, enhance, or affirm your program's curriculum.

The ERE department assesses a number of student learning outcomes through the required Capstone Design Project course and the Senior Exit Interview. The ERE Senior Exit Interview is administered to all graduating seniors as a requirement of the Capstone Design Project course.

Recent outcomes that were assessed include:

- the ability of graduating seniors to make technical presentations and
- the ability of graduating students to design systems, components, processes and procedures to meet specified objectives

These outcomes were assessed using a scoring rubric completed by ERE faculty and outside professionals evaluating the student presentations and reports. The results from the assessment showed that the students are meeting the outcomes for design but more detailed assessment was needed to differentiate technical presentation abilities. The scoring rubric and evaluation procedures were modified for Fall 2008 to collect the additional information.

3. Accreditation (if applicable)

If the program is accredited, describe the need for this accreditation and its impact on the quality and composition of the curriculum of the program.

The ERE program is accredited by the Accreditation Board for Engineering and Technology (ABET). ABET accreditation requires programs to include the body of knowledge recognized as defining a particular engineering discipline. ABET accreditation is needed for ERE graduates to pursue licensure as Professional Engineers. Employers expect graduates with an environmental engineering to be eligible for licensure. Without a Professional Engineering license career opportunities, especially for environmental engineers with only a BS degree, are limited. ABET accreditation enhances program quality by requiring programs to maintain assessment processes and undergo external peer-review on an approximately 6-year cycle.

4. Relevance and innovation

Provide evidence through examples that demonstrate a curriculum that is relevant, innovative, forward looking, responsive to changing trends, and equips students to function in a diverse, global context.

The ERE curriculum and degree requirements are modified as necessary in response to changing environmental issues and emerging technologies. Course content is regularly reviewed and modified by ERE instructors. Modifications are also made in response to reviews by the ERE Advisory Committee and student feedback via the Senior Exit Interview. The ERE Advisory Committee is an 11-member committee comprised of professional practitioners, outside academics, and ERE alumni that evaluate and make recommendations on curricular and other departmental matters at their annual meeting.

Specific examples include:

- Adding air quality to the ENGR 115 course content to meet ABET requirement.
- Improving technical communication within the program in response to alumni surveys collected as part of our ABET outcomes assessment.
- Modifying the ERE curriculum to include a capstone design class in response to ABET recommendations.
- Instructing students using up-to-date, state of the practice software tools in upper-division design courses.
- Providing AutoCAD in ERE computer labs based on feedback from the student exit interviews.
- Maintaining dual boot computer labs (First on campus).
- Providing wireless access in ERE computer labs (First on campus).

5. Interactions between graduate and undergraduate programs (if applicable)

If this is a graduate program, what opportunities for undergraduates result (or are lost) by virtue of the graduate program.

Two Environmental Systems MS programs, the Energy, Environment and Society option and the ERE option, regularly interact with the ERE undergraduate program. Many opportunities result for ERE undergraduates as a result of this interaction including:

- ERE undergraduate students are hired as student assistants on research projects.
- Graduate students participate in ERE student professional clubs.
- When eligible, graduate students work with undergraduate students on national design competitions. As an example a graduate/undergraduate team won the 2005 National Hydrogen Association's design contest for a hydrogen fueling station. Their design was the preliminary design for HSU's recently dedicated Hydrogen Fueling Station.
- ERE undergraduates also have the opportunity to take upper-division courses that are cross-listed Grad/Undergrad courses gaining direct exposure to graduate-level course work and the graduate school experience.

The ERE department did not identify any opportunities lost to undergraduates because of the presence of the graduate programs.

6. Program uniqueness

If your program provides unique educational opportunities or course content that is found at few or no other CSU institutions, please describe this uniqueness.

Environmental Resources Engr

The very unique aspect of the Environmental Resources Engineering department is its emphasis on engineering applied to natural resources. Conventional environmental engineering is focused on pollution control and prevention. An example of this unique focus is that Humboldt State's environmental resources engineering degree has included renewable energy system design since the early 1980's. This topic is not generally included in environmental engineering programs and no other similar programs exist in the CSU system.

7. Opportunities for undergraduate scholarship/creative activities/service

Estimate the percentage of your undergraduate majors that participate in scholarship/creative activities/professionally-related service, and provide some illustrative examples of such activities. Can students receive academic credit for these activities and have them counted toward undergraduate major requirements?

All ERE students participate in directed service learning through service learning projects in required ERE courses. A sampling of these projects is described in the Table on p. 2 of this report.

Many students also get the opportunity to work on faculty research projects or volunteer at SERC. SERC and ERE faculty research projects employed more than 20 ERE undergraduate students either full- or part-time during AY 2007-2008 or Summer 2008.

ERE students may also initiate independent study by proposing research projects to a faculty sponsor. If an ERE faculty member agrees to work with the student, the student can receive up to 3-units credit upon successful completion of the project through ENGR 498 or 499.

D. Affiliations/Equipment/Facilities/Environment

1. Affiliations

Some academic programs are affiliated with on-campus or off-campus centers, units or institutes that bring important benefits to programs. For any such center/unit/institute, please provide (1) the name of such center/unit/institute, and very brief descriptions of (2) the purpose of the center/unit/institute, (3) the nature of your program's affiliation with the center/unit/institute, and (4) the benefits accruing to your program/major from your affiliation with this center/unit/institute. Units/centers/institutes may be public (HSU, CSU, local, state, federal) or private.

The ERE program benefits from affiliations with two prominent centers the Schatz Energy Research Center (SERC) on campus and the Arcata Marsh and Wildlife Sanctuary (AMWS) off campus.

SERC director, Peter Lehman, and co-directors, Charles Chamberlin and Arne Jacobson, are also ERE faculty and most of the SERC staff are ERE alumni. SERC offers continual support to the ERE program by providing part-time employment, funding and research opportunities to ERE students, both graduate and undergraduate. During AY 07/08, SERC provided full- or part-time support to 8 graduate students and 8 undergraduate students. During the summer, SERC typically employs 2-3 undergraduate ERE students as full-time interns. SERC also maintains a docent program which offers interested ERE students a means to interact with SERC and participate in SERC educational and community outreach activities.

The Arcata Marsh and Wildlife Sanctuary (AMWS) is operated by the City of Arcata and was designed by an interdisciplinary team of Fisheries, Wildlife and Engineering professors in addition to the city engineers. AMWS affiliation with the ERE department is formalized through

an allocation of laboratory space and annual grant funding from the City of Arcata for directed projects to study the performance of the constructed wetlands treatment system, and evaluate and propose treatment process improvements. Professor Emeritus Robert Gearheart and Professor Brad Finney supervise graduate and undergraduate ERE student research on improving wastewater treatment and constructed wetland performance at the AMWS. This relationship also supports and facilitates course projects in water quality, water and wastewater treatment, and ecological restoration for both graduate and undergraduate ERE students.

2. Facilities and resources

Provide a brief listing of your most important facilities, equipment and information/library resources, and describe the degree to which the current facilities, equipment and information/library resources affect program quality.

The most important ERE facilities are the laboratory facilities on the bottom floor of Science D, the Thermodynamics/Teaching Laboratory in Jenkins Hall Room 214 and the new ERE Department home on the first floor of Harry Griffith Hall. Unfortunately, none of these laboratory facilities are state of the art. The Thermodynamics Laboratory in Jenkins Hall, Room 214 is only partially functional because, even though it was established in 2000, it is still missing appropriate gas and vacuum lines and the vent hood, purchased at that time, has yet to be installed.

3. Unique local and regional environment

Describe how the program takes advantage of the unique local or regional social, cultural and/or natural environment available to students and faculty at HSU. (Do not include items listed under D1.)

The natural resources emphasis of the ERE program benefits greatly from the local and regional opportunities to study natural systems and engineering design at the interface between human infrastructure and natural systems. Several examples include:

1. ERE hydrology and hydraulics courses include the study of, and direct measurements in, natural systems as well as man-made systems.
2. Renewable energy system design courses have a myriad of installed systems to visit due to remote locations and communities requiring off-grid or reliable, back-up power systems.
3. Engineered Natural Treatment Systems and distributed water and wastewater treatment systems, a significant focus of ERE faculty in water and wastewater treatment, are prevalent and very appropriate technology for the region providing opportunities for study and design of these systems for ERE students.

IV. Investments, Revenues, and Efficiencies (Response Limit: 2 pages of narrative, not including tables) [20%]

A. Program Investments

1. Program Investment – Degree Requirements

Enter the total number of required course units (as listed in the catalog) for this academic program, and then the number of required course units for this academic program that are from the primary course code associated with your program. Provide a total for each option if appropriate.

Student Units

Total required Program SCUs	133	Required Program SCUs in the primary Course Code	64
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Weighted Teaching Units (WTU's)

Total the number of WTUs required to teach 1 section of each of the required courses in the program. If there are lists of restricted electives (e.g., take 1 of the following 3 courses), then choose a representative course from the list. For required S-factor courses, estimate the typical number of WTU's assigned to a faculty member who teaches the course. Again, differentiate by option if appropriate.

Total Required Program WTUs	157.3	Required Program WTUs in the primary Course Code	82
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2. Program investment – by Minimum Weighted Teaching Units required to offer coursework so students can make reasonable progress toward their degree.

Total WTU in Course Code	WTU for GE and service to other academic Programs	WTU for Major Option 1	WTU for Major Option 2	WTU for Major Option 3
380.5	41.2	339	N/A	N/A

Box 2 above (WTU for GE and service to other academic programs) represents:

- 27.2 WTU for ENGR 114, 305, 308, and additional 115 labs to accommodate Environmental Science majors;
- 14 WTU for 500-level ENGR courses not associated with a 400-level course (i.e., courses offered for the ESER, ESES, and ESID graduate programs—not required for ERE majors).

Total WTU in Course Code: Sum up the total number of WTU that were used to teach courses in the primary course code associated with your academic program over the past two academic years. Exclude remedial courses.

Service to GE and other Academic Programs: Enter the total number of WTU that were used over the past 2 years to meet service demands imposed by students outside the major. (In other word, if 8 sections of Egyptology 301 have been offered over the past 2 years, but if 2 sections over the past 2 years would have been sufficient for the Egyptology majors, then count 6 sections of Egyptology, and the associated WTU, in this category.)

WTU for Major Option (s): Sum up the non-service WTU for the set of courses in the course code associated with your program that you would need to offer over a two year period to accommodate progress toward degree for your program students.

Notes: 1) In programs with multiple options, courses common to the multiple options should be included in all options. Hence the entries to the right of the "Total" entry will not sum to the total. 2) Do not pro-rate WTU's by the percentage of students in a particular section of a course that are majors. Include the course in the count if it must be offered during a 2-year period for students to make progress toward their degree. The 4-year major plan for Freshmen may be useful.

3. Program Investments – by staff allocations.

Estimate the percent of departmental expenditures for staff positions that can be attributed to this academic program. Provide an explanation, as appropriate.

	Major Program
Percents of Staff FTE	95%

Staff FTE

ENGINEERING	1/31/2004		1/31/2005		1/31/2006		1/31/2007		1/31/2008	
	Count	Sum	Count	Sum	Count	Sum	Count	Sum	Count	Sum
R05									1	0.50
R07	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00
R09	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00
Total	2	2.00	2	2.00	2	2.00	2	2.00	3	2.50

Very little staff FTE, approximately 5%, is spent on the graduate programs because graduate student administration occurs through the Graduate Coordinator for the Environmental Systems program which is housed in the Math Department.

4. Program Investments – Other annual costs.

Provide dollar estimates for other program costs by the following categories. Annualize periodic costs (equipment purchases or facilities upgrades) as necessary. Include an explanation, if appropriate. Do not include costs for commonly used items (smart classrooms, faculty workstations, etc.).

Category	Estimated Cost
Equipment (including maintenance)	\$26,500
Instructional Supplies	\$13,000
Temporary Help (graders, lab assistants, GA's, etc.)	\$18,800

Estimates in these categories are based on:

- 1) Equipment is the yearly average for the last 3 years (2005/06, 2006/07, 2007/08) of equipment purchases. These purchases were made with equipment augments from CNRS plus \$10,000 in program review funds allocated for equipment in 2005/06 and \$7,000 from ERE trust account funds used to match the program review fund in 2005/06.
- 2) Instructional supplies costs are the yearly average for the last 3 years (2005/06, 2006/07, 2007/08). This amount is the CNRS lab fee money allocated to or spent by ERE. None of ERE's annual OE was included because OE used for instructional supplies is negligible.
- 3) Temporary help costs were based on the 2007/2008 ERE year-end cost center spreadsheet prepared by the CNRS Budget Analyst.

5. Program Investments – accreditation

Accreditation affects program costs through direct fees to the accrediting organization, the Accrediting Board for Engineering and Technology (ABET), and occasional additional support to the department for preparation of accreditation reports and data gathering. The ABET annual fees are currently \$1200 and ABET accreditation visits, which occur on a 6-year cycle, costs approximately \$9000. The year prior to an accreditation visit, the CNRS Dean provides additional temporary support equivalent to 1-month full-time ASC I to assist with data gathering and preparation of the ABET self-study report. The ERE Department Chair has historically received an elevated time base in the summer to maintain and complete assessment requirements needed for ABET accreditation but the CNRS Dean recently revoked this support.

B. Gross Revenues

Revenue	05/06	06/07	07/08
Fundraising/donations	\$9,875	\$11,342	\$6,684
Extended Education	\$1,967	\$879	\$1,160
Student fees	\$15,441	\$9,501	\$14,388
Instructionally Related Activities (IRA)	---	---	---
Instructionally-related grants	---	---	---
Grants and contracts to P.I.s	\$305, 248	\$1,063,213	\$908,775
Other revenues	\$43,447	\$9,858	\$18,474

Explanation:

Student Fees include the CNRS lab fee money allocated to ERE.

Grants and Contracts totals were provided by the HSU Sponsored Programs Foundation

Other revenues also include equipment augments from CNRS for program review funds (\$10,000 in 2005/06 only).

Most revenue to the ERE program is used to support and maintain instructional facilities and activities for the ERE undergraduate program. For example, the program review augment of \$10,000 in 2005/2006 was matched with \$7000 of ERE Trust Account funds to replace a 1970's era instrument (a field fluorometer) used in the laboratory section of required engineering courses to teach students how to conduct tracer studies.

The only exception to revenue directly supporting ERE program activities is the revenue generated by the "Grants and Contracts to PIs". This revenue supports faculty research activities and approximately 85% of these funds are generated by and support operating expenses for the

Schatz Energy Research Center projects and staff. The remaining 15% percent of this revenue is generated by ERE faculty not associated with SERC and supports graduate and undergraduate student assistants, and research projects.

C. Efficiency

1. Efficiency – By SFR for course code

Academic Year Averages	Subject	02/03	03/04	04/05	05/06	06/07	07/08
SFR	ENGR	11.61	11.95	12.76	11.12	13.71	15.61
FTEF	ENGR	9.52	9.71	9.81	10.09	7.89	7.30

SFR SUMMARY	02/03	03/04	04/05	05/06	06/07	07/08
AHSS	20.36	22.05	21.94	20.61	21.19	22.91
CNRS	15.66	16.90	17.17	16.04	16.82	18.28
CPS	15.12	16.29	15.68	15.22	20.80	25.33
UNIVERSITY TOTALS	17.28	18.65	18.57	17.52	19.32	21.43

Explain any substantial changes in SFR. Also explain why this SFR differs from the college and/or university SFR. What efforts have been made over the past few years by the program to improve this measure of efficiency? Use the data under part IV.E. as appropriate.

Several factors contribute to the increased SFR shown by the ERE department. The first is reduced course offerings required by the CNRS Dean to cut program costs. These efforts began in earnest in 2005/2006 and have resulted in fewer courses per semester and more students per course. The tables in section E below show these trends which are especially prevalent at the upper division.

Losses of full-time faculty through retirement and sabbatical/DIP leaves have also contributed to the department average SFR in the last two semesters as shown by the significant decreases in FTEF. The ERE department has also experienced increased student enrollment creating larger lower-division courses. This increased enrollment is just beginning to influence SFR.

2. Efficiency – Other views.

The Prioritization Task Force will examine the data given under section IV.A and B in terms of the overall production (e.g. number of majors, number of graduates) in the program. Please comment if appropriate.

D. Budget cut impacts

Indicate how your program has been affected by recent (since 2002-2003) budget cuts that have directly affected resources for your program (faculty, staff, operating expense) and course offerings (class size, reduced course offerings or options for the major.) Refer to the data included under section IV. E. or in the departmental report as appropriate.

The primary impact of budget cuts has been reduced course offerings resulting from reductions in lecturer assignments. The upper-division courses have been more severely affected as seen in the second table in Section E below. Design course offerings have also been limited with possible impacts on time to degree. ERE students must complete three elective design courses to graduate.

E. Additional Data

Course Offerings Profile in Engineering (AY 00/01 - AY 07/08) class_offerings_ENGR report generated: 27-JUN-08								
	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07	AY 07/08
Distinct Courses Enrolled	35	30	29	30	30	30	28	24
Sections Enrolled	51	44	43	42	53	53	45	50
Average Section Enrollment	16	17	18	19	20	17	17	19
Distinct Courses Enrolled in Engineering by Level (AY 00/01 - AY 07/08) class_offerings_ENGR report generated: 27-JUN-08								
Course Level	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07	AY 07/08
Lower-div	5	5	7	6	6	7	7	7
Upper-div	27	23	18	20	20	19	18	15
Graduate	4	3	5	4	4	4	3	2
Total	35	30	29	30	30	30	28	24
Sections Enrolled in Engineering by Level (AY 00/01 - AY 07/08) class_offerings_ENGR report generated: 27-JUN-08								
	AY	AY	AY	AY	AY	AY	AY	AY

Course Level	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08
Lower-div	12	11	12	12	14	17	16	21
Upper-div	36	30	26	26	34	31	25	26
Graduate	4	3	5	5	5	6	4	3
Total	51	44	43	42	53	53	45	50

Avg Section Enrollment in Engineering by Level (AY 00/01 - AY 07/08)
class_offerings_ENGR report generated: 27-JUN-08

Course Level	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07	AY 07/08
Lower-div	23	23	26	24	24	21	20	23
Upper-div	15	15	16	19	20	17	17	17
Graduate	8	9	10	5	8	4	5	7
Total	45	48	51	48	51	42	43	47

FTES in Engineering by Course Level (AY 00/01 - AY 07/08)
class_offerings_ENGR report generated: 27-JUN-08

Course Level	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07	AY 07/08
Lower-div	30.2	30.3	37.8	34.8	36.0	35.4	36.4	46.0
Upper-div	75.7	72.7	61.2	75.9	80.4	71.7	65.2	61.8
Graduate	6.9	5.0	11.5	5.3	8.8	5.1	6.6	6.1
Total	112.8	108.0	110.5	116.0	125.2	112.2	108.1	113.9

NOTE: In the above tables all class sections have 2 or more students enrolled. This is done to minimize the influence of independent student sections. Distinct Courses count each distinct SUBJ/Course-number combination enrolled. All figures are Fall/Spring term averages. Due to the rounding of average Academic Year counts, the various breakouts may not add to the exact same amounts.

Other Class Offering Breakouts

These examine independent study sections, and sections by different modes of instruction. The Lecture-only sections have only a C1 through C6 mode. The Lab/Activity-only sections have only a C7 through C-16 mode. Other modes and combinations contain the remaining modes or combinations of lecture and lab/activity modes.

Other Special breakouts in Engineering (AY 00/01 - AY 07/08)
class_offerings_ENGR report generated: 27-JUN-08

	AY 00/01	AY 01/02	AY 02/03	AY 03/04	AY 04/05	AY 05/06	AY 06/07	AY 07/08
Sections with 1 student enrolled	2	4	4	7	5	7	5	7
Lecture only sections	19	14	13	13	24	24	16	23
Lab/Activity only sections	15	10	11	11	21	18	13	18
Other modes and combinations	18	20	20	19	9	12	16	10

V. Potential (Please complete this section for each option. Limit: 2 pages per option) [15%]

A. Program capacity with existing resources:

1. What is your program's maximum capacity with current resources? Use two metrics to define “capacity”: The number of graduates per year, and the number of FTES generated by courses that are unique to this option, per year.

(Completed by the department)	Graduates per year	FTES in the major option per year
Existing (AY 07/08)	36	114
Maximum capacity with existing resources	40	130

2. If your program is at maximum capacity, proceed to question B. If you have capacity to grow with existing resources, what steps have been taken to increase enrollment? What have been the effects of these steps, and what results are still anticipated?

The ERE program is currently at the capacity of its existing space and faculty resources, and a search for a new faculty member is underway. ERE faculty believe a headcount of 225 - 275 undergraduate students is optimal. The Fall 2008 ERE headcount is 259 students, up from an AY 07/08 average of 219.

The ERE program needs a high number of lower-division students because at least 20% of incoming ERE students change majors. This rate of student loss is common in engineering and other difficult majors. A high number of lower-division students guarantee a sufficient supply of upper-division students to offer a reasonable choice of electives and produce ERE graduates.

B. Opportunities for future growth or substantial curricular changes

1. What opportunity does the program have for future expansion? Provide evidence for your response.

The ERE major’s headcount is currently increasing (from 179 in AY 06/07 to 219 in AY 07/08 and 259 for Fall 2008). This trend is expected to continue as the job market for environmental engineers and the alternative and renewable energy sector are predicted to grow significantly in the next decade. See Section II.B. for a detailed description of employment projections.

2. Describe the curricular changes and/or staffing increases required to accomplish such an expansion?

The major need for any expansion of the program is increased faculty, office space and additional support for instructional activities in the form of support staff, and laboratory equipment and maintenance.

The ERE curriculum would need minor modifications to keep up with technology changes and current practice.

C. Impact of augmented resources

Suppose that your program were ranked in a category that recommended augmentation of resources. What would be the impact of augmented resources? (Answer for a 10% augmentation and a 20% augmentation.)

A 10% augmentation to the ERE program would allow the ERE program to recover services and capabilities suffered in recent budget cuts. These include:

- Maintaining laboratory equipment and improving the laboratory experience for student
- Improving lower-division course offerings and experience to increase retention of lower-division students
- Providing additional upper-division elective courses that maintain student interest and retention
- Decreasing the time to degree by providing more thorough and consistent required course offerings
- Teaching more courses using tenure-track faculty with a commitment to build the ERE program and improve the undergraduate experience.

A 20% augmentation to the ERE program would support the following changes in addition to those listed above under the 10% augmentation:

- Hiring a tenure-track faculty with an expertise in one of the two areas, environmental geotechnology or ecological engineering, that ERE has lost and been unable to replace due to faculty retirements.
- Admit more lower-division students to meet the job growth demands in engineering.

D. Impact of reduced resources

Suppose that your program were ranked in a category that recommended reduction of resources. What would be the impact of reduced resources? (Answer for a 10% reduction and a 20% reduction.)

A 10% reduction to the ERE program would result in:

- Possible loss of accreditation because the available resources could not support ABET requirements. Loss of accreditation means loss of the ERE program because accreditation and the ability to become licensed engineers is necessary for graduates to succeed in the profession.
- A reduction in the number of majors the program could support
- A reduction in the course offerings through loss of all lecturers
- An increased time to degree for ERE students because course offering schedules would not align with student course needs
- Laboratory activities would be canceled because equipment could not be maintained

A 20% reduction to the ERE program would result in loss of accreditation because the available resources could not support ABET requirements. Loss of accreditation means elimination of the ERE program because accreditation and the ability to become licensed engineers is necessary for graduates to succeed in the profession. The program would lose both faculty and students if it was not accredited.

E. Impact of program elimination

Suppose that your program were recommended to be discontinued. What would be the impact of program elimination?

If HSU eliminated the ERE program:

- HSU would lose a highly successful and visible program that attracts students to campus even if they choose not to major in ERE.
- HSU would lose an accredited program.
- The Schatz Energy Research Center would no longer be viable. SERC would lose its affiliated department, leaving faculty co-directors without their part-time faculty positions.

SERC would also no longer have ERE graduate and undergraduate students available as student research assistants and would be unable to complete research projects.

- The University would see a decrease in grants and contracts of approximately \$1,000,000 per year with the loss of ERE and SERC.
- The North Coast community would lose a significant source of technical expertise and service learning projects conducted by ERE students through required ENGR courses.
- Enrollment in Math, Chemistry, and Physics courses would decrease. The decrease would be especially prevalent in Math (Calculus) and Physics (110 and 315) courses.
- Local businesses, especially engineering and watershed restoration consulting firms and state and federal agencies, would lose an important source of professional employees. Currently, over 150 HSU ERE alumni are employed as engineers in the Humboldt and Del Norte counties. Many of the local engineering and watershed restoration consulting firms were founded by HSU engineering alumni.

VI. Additional Information (Limit: 1 page) [up to 5 extra credit points may be assigned to the overall score]

Provide crucial information that is not provided under the previous categories.

- Without the ERE department, the Humboldt Energy Independence Fund would not exist. ERE students were instrumental in the creation of HEIF and continue to be a major driving force behind the administration of HEIF and its projects.
- Without the ERE department, the Campus Center for Appropriate Technology (CCAT) would not exist. CCAT was started by ERE students and faculty in the late 1970s. ERE students are still involved in CCAT at multiple levels. ERE faculty serve on the CCAT Steering Committee. Many ENGR courses involve projects at CCAT.
- Without the ERE department, the Arcata Marsh and Wildlife Sanctuary probably would not exist. This world renowned facility is known for the use of constructed wetlands to treat municipal wastewater. ERE Professor Robert Gearheart, along with Professors in Fisheries and Biology, designed the constructed wetlands and continues to conduct research at AMWS with ERE faculty and students.
- Without the ERE department, the Schatz Energy Research Center would not exist. SERC was started by ERE faculty and currently is staffed by ERE faculty, graduates and students.