

## **Request for Authorization to Establish Master of Science in Environmental Engineering and Master of Environmental Engineering Degrees at North Carolina State University**

North Carolina State University requests authorization to establish a Master of Science in Environmental Engineering and a Master of Environmental Engineering (CIP 14.1401).

### **Program Description**

The proposed MS in Environmental Engineering for students with an engineering background is a 30-hour program including a 6-credit hour thesis. The proposed Master of Environmental Engineering is a non-thesis program with the option for a 3-credit project. Both degrees will be based on the extensive existing graduate course offerings in the specialty area of environmental engineering within the existing graduate program offered by the Department of Civil, Construction, and Environmental Engineering. Students will take at least 5 courses from the department with additional courses selected from the extensive array of related courses offered across the university. The current program includes 13 faculty members in environmental, water resources, and coastal engineering. The Master of Environmental Engineering will be offered in a distance education format for working professional engineers.

### **UNC Tomorrow Relevance**

UNC Tomorrow Commission Final Report: 4.6. Our Environment, Major Finding: UNC should assume a leadership role in addressing the state's energy and environmental challenges.

### **Highlights from UNC-GA Data Template**

Environmental engineers have a projected employment growth of 25 percent over this decade (US Labor Department). More environmental engineers will be needed to comply with environmental regulations and to develop methods of cleaning up existing hazards. A shift in emphasis toward preventing problems rather than controlling those that already exist, as well as increasing public health concerns resulting from population growth, are expected to spur demand for environmental engineers. One other UNC campus, UNC-Chapel Hill, offers masters degrees in Environmental Sciences and Engineering, and UNCC offers a Master of Civil Engineering degree. NCSU has added 5 baccalaureate, 4 masters, and 1 PhD program in the last three years and has discontinued 1 baccalaureate, 8 masters, and 1 PhD program during that period.

### **Outcome of Consultation with Disciplinary Panel**

In addition to NCSU and UNC-GA representatives, the panel included faculty members from ECU, NCA&T, and UNCC. The panel discussed the curriculum and the various distance education technologies that would be used in course delivery (hybrid of synchronous and asynchronous instruction) and distance courses that would be offered. The NCA&T representative expressed interest in sharing some of the distance courses. Members of the panel were uniform in their support of the proposed degree.

### **Student Demand**

NCSU already has a critical mass of graduate students concentrating their studies in environmental engineering within the existing Master of Civil Engineering program. Students will be drawn from recent graduates in STEM undergraduate programs at NCSU and other universities. By the fourth year of the program, 8 full-time and 22 part-time students are expected to be enrolled in the Master of Environmental Engineering degree and 25 full-time and 5 part-time students are expected to be enrolled in the Master of Science degree.

### **Opportunities for Graduates of the Program**

Graduates with the Master of Civil Engineering degree who focus on the environmental engineering concentration are highly recruited by governmental environmental agencies at the federal, state, and local levels; by engineering consulting companies that provide environmental services; environmental services companies; non-profit research institutes; and non-governmental organizations.

### **Resource Implications**

**Resource needs:** The program will not require any new faculty because the courses that will be used are already being offered in the current Master of Civil Engineering program. Current facilities, library holdings, and technology are adequate.

**Resources allocated:** The department has received assistance from the NCSU Distance Education and Learning Technology Applications (DELTA) office to develop the distance courses for the program.

**Estimated cost to the State:** NCSU estimates that approximately 30 full-time and 10 part-time students currently enrolled in its Master of Civil Engineering would have enrolled in the Environmental Engineering programs if they were available. Thus, with NCSU already receiving enrollment funding for those students, approximately 207 additional student credit hours produced by an additional 20 (3 full-time and 17 part-time) students who would not have enrolled in Civil Engineering would result in an additional \$337,330 of state appropriation.

### **Recommendation**

It is recommended that the Board of Governors approve NC State University's request to establish a Master of Science in Environmental Engineering and a Master of Environmental Engineering (CIP 14.1401) subject to the availability of funding.

## General Information Template for Academic Program Review

### ***Degree Area and Level:***

Masters of Environmental Engineering (CIP 14.1401) and MS in Environmental Engineering (CIP 14.1401) at NCSU

### ***Addressing UNC Tomorrow:***

This proposed program would address several Recommendations within the UNC Tomorrow Report including the components to enhance our Global Readiness (Recommendation 4.1), Our Citizens and Their Future: Access to Higher Education (Recommendation 4.2), and Our Environment (Recommendation 4.6).

### ***Role of Program in Relation to State and Regional Needs:***

According to NCSU's proposal, "Our previous and current graduates who focus on an environmental engineering concentration within the MSCE degree are high recruited by governmental environmental agencies at the Federal, state and local level (e.g., NC Division of Air Quality, U.S. Environmental Protection Agency), by engineering consulting companies that provide environmental services (e.g., CH2M Hill, Eastern Research Group), industrial companies, (e.g., IBM, ExxonMobile), environmental services companies (e.g., Waste Management), non-profit research institutes (e.g., RTI International, Resources for the Future), non-governmental organizations (e.g., Environmental Defense Fund), and many others. Thus, through the existing environmental engineering concentration within the existing MSCE program we have already demonstrated that course preparation of students focusing in environmental engineering meets the needs of North Carolina, the region, and the nation. Our graduates take to their careers technical expertise as well as the skills to assume leadership roles in industry, academia, and government."

### ***US Labor Department Analysis:***

- *Summary* – Environmental engineers should have employment growth of 25 percent during the projections decade, much faster than the average for all occupations. More environmental engineers will be needed to comply with environmental regulations and to develop methods of cleaning up existing hazards. A shift in emphasis toward preventing problems rather than controlling those that already exist, as well as increasing public health concerns resulting from population growth, also are expected to spur demand for environmental engineers. Because of this employment growth, job opportunities should be good even as more students earn degrees. Even though employment of environmental engineers should be less affected by economic conditions than most other types of engineers, a significant economic downturn could reduce the emphasis on environmental protection, reducing job opportunities.

[http://www.occsupplydemand.org/OSD\\_UnitOfAnalysis.aspx?CLUSCODE=027A-01&ST=NC&PathNo=1](http://www.occsupplydemand.org/OSD_UnitOfAnalysis.aspx?CLUSCODE=027A-01&ST=NC&PathNo=1)

### ***Availability of Program Statewide (Enrollment and Degrees Awarded in Last 3 Years):***

- *Public universities* – The UNC-CH program title listed below is Environmental Sciences and Engineering but the subject/CIP (03.0104) area is Natural Resources and Conservation not Engineering.

Enrollment			Academic Year						
			Fall 06	Spr 07	Fall 07	Spr 08	Fall 08	Spr 09	Fall 09
UNC-CH	Environmental Sciences and Engineering	MPH	3	3	2	1	1	3	4
		MS	34	25	22	20	25	24	25
		MSEE	9	8	10	13	11	9	16
		MSPH	26	26	23	23	29	26	26

APPENDIX W

Number of Degrees Awarded			Academic Year		
			2006-2007	2007-2008	2008-2009
UNC-CH	Environmental Sciences and Engineering	MPH	1	2	0
		MS	14	9	8
		MSEE	5	6	6
		MSPH	9	13	10

- Private universities – Not available.

**Available in Online or Distance Format from UNC institutions:**

Not available.

**Available or not from Academic Common Market:**

Not available.

**NCSU Campus enrollment and degrees awarded in similar programs at the Masters level:**

(Based on two CIP digits – 14 CIP is the summary group for Engineering under which Environmental Engineering is a program)

Enrollment			Academic Year						
			Fall 06	Spr 07	Fall 07	Spr 08	Fall 08	Spr 09	Fall 09
NCSU	Engineering, General	M	64	59	74	66	87	87	83
	Aerospace, Aeronautical and Astronautical Engineering	MS	35	35	40	33	47	46	68
	Agricultural/Biological Engineering and Bioengineering	M	0	0	0	0	0	0	8
		MS	26	23	28	30	30	26	29
	Biomedical/Medical Engineering	MS	21	19	23	21	21	18	18
	Chemical Engineering	M	0	0	0	0	0	0	2
		MS	15	16	20	21	25	27	26
	Civil Engineering, General	M	0	0	0	0	0	0	0
		MS	164	150	168	168	184	173	201
	Computer Engineering, General	MS	81	81	104	84	123	93	114
	Electrical, Electronics and Communications Engineering	M	0	0	0	0	0	0	0
		MS	182	152	202	142	215	171	209
	Materials Engineering	M	0	0	0	0	0	0	0
		MS	13	13	14	13	7	4	15
	Mechanical Engineering	M	0	0	0	0	0	0	2
		MS	69	73	111	96	114	97	133
	Nuclear Engineering	M	0	0	0	0	0	0	22
		MS	35	31	33	27	25	28	18
	Textile Sciences and Engineering	M	0	0	0	0	0	0	14
		MS	60	61	74	76	87	68	69
	Industrial Engineering	M	0	0	0	0	0	0	5
		MS	29	26	49	38	69	45	61
	Manufacturing Engineering	M	37	38	43	45	48	61	53
	Operations Research	M	0	0	0	0	0	0	3
		MS	25	25	22	21	17	14	14

APPENDIX W

Number of Degrees Awarded			Academic Year		
			2006-2007	2007-2008	2008-2009
NCSU	Engineering, General	M	24	14	19
	Aerospace, Aeronautical and Astronautical Engineering	MS	14	8	14
	Agricultural/Biological Engineering and Bioengineering	M	6	5	4
		MS	2	3	12
	Biomedical/Medical Engineering	MS	6	7	1
	Chemical Engineering	M	7	1	0
		MS	16	12	19
	Civil Engineering, General	M	36	49	43
		MS	23	13	6
	Computer Engineering, General	MS	48	80	72
	Electrical, Electronics and Communications Engineering	M	6	38	9
		MS	53	32	57
	Materials Engineering	M	1	4	4
		MS	16	3	5
	Mechanical Engineering	M	1	0	5
		MS	25	33	30
	Nuclear Engineering	M	7	5	2
		MS	2	11	9
	Textile Sciences and Engineering	M	11	8	11
		MS	19	18	27
	Industrial Engineering	M	3	7	15
		MS	18	13	10
	Manufacturing Engineering	M	15	22	15
		M	0	1	8
	Operations Research	M	0	1	8
		MS	13	11	7

***Campus Average of enrollment and degrees awarded in this degree area at the Masters level:***  
*(Based on two CIP digits – 14 CIP is the summary group for Engineering under which Environmental Engineering is a program - over the last 3 Academic Years, Fall 2006-Fall 2009)*

Campus Average			
	Number of Active Programs	Enrollment per Semester	Degrees Awarded per Year
ECU	1	14	N/A – Program established in 2006
NCA&T	6	28	12
NCSU	15	64	26
UNCC	4	48	21
UNC-CH	2	4	3
Campus Average:		32	16

## APPENDIX W

### ***NCSU Campus Degree Programs added in the past three years:***

- *Bachelor*
  - BS Agricultural Science (06/08/2007)
  - BA German Studies (06/08/2007)
  - BA Leadership in the Public Sector (08/11/2006)
  - BS Bioprocessing Science (10/13/2006)
  - BA Design Studies (03/16/2007)
- *Master*
  - MS Analytics (02/09/2007)
  - MAT - Master of Arts in Teaching (10/17/2008)
  - MA Anthropology (08/11/2006)
  - MGIM - Master of Global Innovation Management (01/11/2008)
- *Doctoral*
  - PhD Fisheries and Wildlife Sciences (01/12/2007)

### ***NCSU Degree Programs discontinued in past three years:***

- *Bachelor*
  - BS Health Occupations Education (03/20/2009)
- *Master*
  - MS Agricultural and Resource Economics (03/20/2009)
  - MEd in Special Education, Behavior Disorders (03/20/2009)
  - MS Behaviorally/Emotionally Handicapped (03/20/2009)
  - MEd Mentally Handicapped (03/20/2009)
  - MS Mentally Handicapped (03/20/2009)
  - MEd Specific Learning Disabilities (03/20/2009)
  - MS Specific Learning Disabilities (03/20/2009)
  - MS School Psychologist (05/11/2007)
- *Doctoral*
  - PhD School Psychologist (05/11/2007)