

Request for Authorization to Establish a Master of Science in Electric Power Systems Engineering at NC State University

NC State University requests authorization to establish a Master of Science in Electric Power Systems Engineering degree program (CIP 14.1001).

Program Description

The primary objective of the M.S. in Electric Power Systems Engineering (MS-EPSE) program is to provide students with a thorough understanding of the tools, methods, and practice of electric power engineering. Students must complete nine required courses for a total of 27 semester credit hours, plus a three credit hour capstone project. The program consists of a set of integrated courses which cover both the core electric power engineering topics as well as the new cross-disciplinary technical topics relevant to the clean energy smart grid. The program also provides professional training through a set of courses addressing communication skills, project management, engineering economics, and technical writing. The Department of Energy (DOE) has previously identified a need for this type of academic degree program, and in July 2010, DOE awarded NCSU a three year grant to facilitate the development and delivery of this program. The program complements the NSF-funded Future Renewable Electric Energy Delivery and Management Systems (FREEDM) Engineering Research Center located on the NCSU Centennial Campus, and will share faculty, facilities, and other resources with that program. The proposed MS-EPSE has been approved by the Council of Graduate Schools to satisfy the Professional Science Masters (PSM) requirements.

UNC Tomorrow Relevance

This proposed program would address several Recommendations within the UNC Tomorrow Report including the components to enhance Our Global Readiness (Recommendation 4.1) and Our Communities and Their Economic Transformation (Recommendation 4.4).

Highlights from UNC-GA Data Template

No other public or private college or university in North Carolina offers a similar degree. In the past three years, NC State University has established seven masters and two baccalaureate programs, and has discontinued eighteen masters and one baccalaureate program.

Outcome of Consultation with Disciplinary Panels

The panel included three faculty members from ECU and four from UNCC, in addition to the NCSU faculty presenters. There was supportive, collegial discussion among the panel participants on how the proposed program complements, and is appropriately different from, existing programs on the ECU and UNCC campuses. All three campuses enthusiastically agreed that approval of this program would provide excellent opportunities for collaboration among these related but different programs. Overall discussion was quite positive, with consensus on the desirability of offering this degree program.

Student Demand

Student demand for specialization courses in Electric Power Systems and Renewable Energy has been increasing noticeably on the NCSU campus. The enrollment in two of the main core power engineering graduate courses has doubled within the past three years to an average of 25 students. Current graduating student exit surveys indicate consistently that students want additional power related course offerings. In response to these student requests, two new programs were recently initiated: an undergraduate concentration, and a graduate certificate program, in renewable electric energy systems. Enrollment in both of these programs is good, with 37 students enrolled in the former and 17 in the latter. Furthermore, many local electric power-related industries have been encouraging NCSU to initiate this PSM degree program. NC State projects full enrollment of the MS-EPSE program in its fourth year will be 30 full-time students.

Opportunities for Graduates of the Program

It has been widely reported that up to 50% of power engineers will be eligible to retire within the next ten years. In addition, there is a large presence of companies within close proximity of NCSU which need the engineering workforce to develop and utilize the new smart grid technologies. The electric utility companies have also shown a strong interest in the proposed MS-EPSE program, having indicated they will give high priority to graduates of this PSM program when hiring.

Resource Implications

Resource needs: No new faculty, facilities, equipment, courses, library resources, or information technology services are currently needed to implement the proposed degree program.

Resources allocated: The three-year DOE grant is paying one new teaching faculty position and has provided the resources to equip a new teaching computer laboratory at the FREEDM Center. All required courses have been developed. When the DOE grant expires, if enrollment growth funds are not available, NCSU has committed to support this program by the funding and review models it applies to all its PSM programs. Also, NCSU has developed and implemented a campus-wide plan for evaluating the “productivity and efficiency” of all new and existing degree programs which will be used to make funding decisions on this new degree program.

Estimated cost to the State: Based on the University funding formula, when the program reaches full enrollment, NCSU would receive additional state appropriations of approximately \$878,000 if fully funded by the General Assembly.

Recommendation

It is recommended that the Board of Governors approve NC State University’s request to establish a Professional Science Masters (PSM) Master of Science in Electric Power Systems Engineering degree program (CIP 14.1001) subject to the availability of funding.

General Information Template for Academic Program Review

Degree Area and Level:

Master of Science in Electric Power Systems Engineering (CIP 14.1001) 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) and Our Communities and Their Economic Transformation (Recommendation 4.4).

Role of Program in Relation to State and Regional Needs:

According to the proposal, "In assessing the need for training of the power engineering workforce results have indicated that on both the local and regional level there is a high demand for power engineers. According to Collaborative Economics, North Carolina's employment concentration in energy efficiency and energy has increased by nearly 80 percent between 1995 and 2007. It has been widely reported that up to 50% of power engineers will be eligible to retire within the next ten years. In addition, there is quite a large presence of companies within the close proximity of NC State University, such as ABB, SIEMENS, PSI, Elster, MegaWatt Solar, CISCO and IBM, which need the engineering workforce to develop smart grid technologies. The electric utility companies such as Progress Energy, Duke Energy, and TVA have all shown a strong interest in the proposed MS-EPSE program. Each has indicated that they will give high priority to graduates of this program when hiring."

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

- Public universities – Not available.
- Private universities – 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 Electric Power Systems Engineering is a program.)

Enrollment			Academic Year						
			Fall 07	Spr 08	Fall 08	Spr 09	Fall 09	Spr 10	Fall 10
NCSU	Engineering, General	M	74	66	87	87	83	71	77
	Aerospace, Aeronautical and Astronautical/Space Engineering	MS	40	33	47	46	68	61	59
	Agricultural Engineering	M	0	0	0	0	8	6	11
		MS	28	30	30	26	29	27	33
	Bioengineering and Biomedical Engineering	MS	23	21	21	18	18	14	17
	Chemical Engineering	M	0	0	0	0	2	1	2
		MS	20	21	25	27	26	27	43
	Civil Engineering, General	M	0	0	0	0	0	0	0
		MS	168	168	184	173	201	197	244
	Computer Engineering, General	MS	104	84	123	93	114	96	69
	Electrical and Electronics Engineering	M	0	0	0	0	0	0	0

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		MS	202	142	215	171	209	158	206
Materials Engineering	M	0	0	0	0	0	0	0	0
	MS	14	13	7	4	15	13	22	22
Mechanical Engineering	M	0	0	0	0	2	0	0	0
	MS	111	96	114	97	133	136	177	177
Nuclear Engineering	M	0	0	0	0	22	19	23	23
	MS	33	27	25	28	18	19	19	19
Textile Sciences and Engineering	M	0	0	0	0	14	14	19	19
	MS	74	76	87	68	69	62	83	83
Industrial Engineering	M	0	0	0	0	5	15	21	21
	MS	49	38	69	45	61	48	54	54
Manufacturing Engineering	M	43	45	48	61	53	54	42	42
Operations Research	M	0	0	0	0	3	0	5	5
	MS	22	21	17	14	14	14	15	15

Number of Degrees Awarded			Academic Year		
			2007-2008	2008-2009	2009-2010
NCSU	Engineering, General	M	14	19	24
	Aerospace, Aeronautical and Astronautical/Space Engineering	MS	8	14	14
	Agricultural Engineering	M	5	4	0
		MS	3	12	11
	Bioengineering and Biomedical Engineering	MS	7	1	6
	Chemical Engineering	M	1	0	1
		MS	12	19	23
	Civil Engineering, General	M	49	43	45
		MS	13	6	23
	Computer Engineering, General	MS	80	72	90
	Electrical and Electronics Engineering	M	38	9	1
		MS	32	57	85
	Materials Engineering	M	4	4	4
		MS	3	5	4
	Mechanical Engineering	M	0	5	0
		MS	33	30	44
	Nuclear Engineering	M	5	2	5
		MS	11	9	4
	Textile Sciences and Engineering	M	8	11	0
		MS	18	27	35
	Industrial Engineering	M	7	15	22
		MS	13	10	8
	Manufacturing Engineering	M	22	15	25
	Operations Research	M	1	8	4
		MS	11	7	6

Campus Average of enrollment and degrees awarded per degree program in this area at the Masters level over the over the last 3 Academic Years, Fall 2007-Fall 2010:

(Based on two CIP digits – 14 CIP is the summary group for Engineering under which Electric Power Systems Engineering is a program.)

Campus Average			
	Number of Active Programs	Enrollment per Semester	Degrees Awarded per Year
ECU	1	23	5
NCA&T	7	24	10
NCSU	15	71	29
UNC-CH	1	6	3
UNCC	4	47	20
Campus Average:		34	13

NCSU Campus Degree Programs added in the past three years:

- *Bachelor*
 - BS Genetics (11/13/2009)
 - BS Soil and Land Development (04/09/2010)
- *Master*
 - Master and MS Biomanufacturing (09/08/2011)
 - MA Foreign Language and Literature (02/11/2011)
 - Master of Environmental Engineering (04/09/2010)
 - MS Environmental Engineering (04/09/2010)
 - Master Geospatial Information Science and Technology (02/12/2010)
 - Master Environmental Assessment (02/12/2010)
 - MAT - Master of Arts in Teaching (10/17/2008)
 - MGIM - Master of Global Innovation Management (01/11/2008)
- *Doctoral*
 - N/A

NCSU Campus Degree Programs discontinued in past three years:

- *Bachelor*
 - BS Health Occupations Education (03/20/2009)
- *Master*
 - MEd Middle Grades (02/11/2011)
 - MS Middle Grades (02/11/2011)
 - MEd Curriculum and Instruction, English Education (02/11/2011)
 - MS Curriculum and Instruction, English Education (02/11/2011)
 - MEd Curriculum and Instruction, Reading (02/11/2011)
 - MS Curriculum and Instruction, Reading (02/11/2011)
 - MEd Curriculum and Instruction, Social Studies Education (02/11/2011)
 - MS Curriculum and Instruction, Social Studies Education (02/11/2011)
 - MA French Language and Literature (02/11/2011)
 - MA Spanish Language and Literature (02/11/2011)
 - Master Chemistry (08/13/2010)
 - 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)
- *Doctoral*
 - N/A