PROGRAM ANNOUNCEMENT

October 2007

Institution:	New Jersey Institute of Technology
New Program Title:	Power and Energy Systems
Degree Designation:	Master of Science
Degree Abbreviation:	M.S. Power_Energy_Systems
CIP Code and Nomenclature (*if possible*):	
Campus(es) where the program will be offered:	NJIT Newark Campus
Date when program will begin (month and year):	Fall 2008
List the institutions with which articulation agreements will be arranged:	

Is licensure required of program graduates to gain employment? □ Yes X No

Will the institution seek accreditation for this program? X Yes □ No
If yes, list the accrediting organization:

Middle States Association of Colleges and Schools_____

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Descriptive Information

I. Objectives

This Master of Science in Power and Energy Systems program is focused in the area of power and energy systems to meet the critical need of workforce in power and energy industry.

The objectives of the proposed program are:

1. To prepare future engineers to work in the power and energy industry, and
2. To provide students with the knowledge-base to be involved with the technology advancements and future developments in power generation, control and management as well as alternate and new energy resources.

A partnership of NJIT and leading power industries, such as PSE&G and ASCO Power Technologies is proposed to address this prominent issue of educating future leaders and workforce in power and energy industry.

II. Need

A. Need for the Program

Recent studies have shown that the current power and energy resources with existing technology and management protocols would not be sufficient to meet the growing needs of our society and future industrial and commercial applications. US Department of Energy has established an Office of Fusion Energy Sciences to deal with the global issues related to clean fusion energy. With the Presidential support, US Government Research Funding Agencies including DOE have committed to double the research funding in nanotechnology and alternate energy sources. Five year budget plan from Department of Energy indicates the increase of budget from $3.5 billion in FY 2006 to $5.26 billion in FY 2011 (http://www.ofes.fusion.doe.gov/FusionDocuments/SC5-yearplanmaster.pdf). Energy resources and technology has become a key thrust area of significant importance at several leading institutions. With the synergy in nanotechnology, solar cells and other related sciences at NJIT, we must formalize an advanced energy technology initiative to offer academic and research program in energy resources, technology management, and alternate energy research.

Academic programs in energy technology and management are much needed to prepare to future workforce for energy and power industry as more than 50% of the workforce in power industry is retiring in this decade. At the same time, developing new, clean and more efficient energy resources and technologies is of global significance.

NJIT and industry partnership taking a leading edge in this area will contribute significantly in the growth of NJIT and relationship with power and energy industry to serve our national needs and society.

Future Alternate Energy Resources:

The largest energy consumption categories in the US are transportation and electricity generation. Clean, renewable sources such as wind and solar will be limited to selected local applications. Nuclear power, while likely to expand, is limited to electric power generation and still faces widespread public opposition. It is important therefore for future engineers with advanced degrees to be familiar with the nuclear technology and the related social issues based on solid science. The drive to reduce greenhouse gas emissions will require carbon sequestration in some form during large-scale electric power generation. The large and relatively cheap coal deposits within the US signal the future use of coal for electric power generation in advanced, ultra-clean combined-cycle plants with carbon dioxide sequestration. With such plants, even water vapor will be condensed and reused. Petroleum, with a carbon/hydrogen atom ratio between coal and natural gas, is still too high in carbon content for continued conventional combustion for power or transportation. It rich chemical structure is best exploited for petrochemicals and other products such as road materials. Petroleum would still make the most sense for transportation modes where refueling is limited; e.g. airplanes, locomotives, trucks. The burning of natural gas for electric power generation is clean in a non-greenhouse environmental context. But, its relatively high hydrogen content makes its use for large-scale electric power generation less desirable. It is preferred to burn natural gas in homes and factories for safety reasons due to its highly visible blue flame. With a desire to reduce carbon emissions, hydrogen use as a transportation fuel makes sense. Hydrogen generation from natural gas, hydrocarbons, coal, or water are all well established technologies, though use of carbon-based sources would require carbon capture and sequestration. A major challenge facing hydrogen as a motor fuel comes from its distribution. Though hydrogen fuel cell development continues, this is rapidly becoming almost an established technology. Some suggest a catalytic reforming process to convert methane (natural gas) to hydrogen directly upstream of the fuel cell in the vehicle or at a fueling location. The problem here is the lack of carbon capture.

The proposed partnership program would further develop and enhance our academic and research infrastructure in alternate energy generation and distribution research including solar-cell, nanotechnology, compressed air, hydrogen fuel cell, and fusion sciences. Specific academic programs at graduate level will be developed and offered in energy technology and management.

B. Describe the relationship of the program to the following: institutional master plans and priorities.

As the global concerns about clean energy and projection of exponential growth in energy consumption in the future have emphasized the need of focused academic and research programs in advanced energy technologies, a well planned initiative at NJIT will enhance visibility at the national level. It will provide an outstanding opportunity for NJIT to educate professionals to meet the growing demand of workforce in energy and power utility industry, and to engage our faculty and students in high-impact research programs for the development of future energy resources.

Industry experts are proposed to be directly involved in the curriculum development, delivery and sponsorship to provide a strong foundation to serve the current and future needs. A multidisciplinary draft curriculum is included in the Appendix involving ECE,

CHE, ME, IE and Management departments to provide a unique educational and training experience to students with internships and co-op opportunities with the leading industry. Future efforts and partnerships would be directed towards establishing a research center in Advanced Power and Energy Technologies to serve industry and the nation through innovative research and technology development.

C. List similar programs within the state and in neighboring states. How does this program compare to those currently being offered?

According to IEEE Power Engineering Society survey and investigating other resources, it appears that there are no programs offering an M.S. in power and Energy Systems in New Jersey.

III. Students

Estimate anticipated enrollments from the program's inception until a steady state or optimum enrollment is reached.

During the last 5 years, a graduate course in power engineering is offered once a year. These power courses are offered to meet the MS in Electrical Engineering requirements. Enrolment has been around 10. This semester (07F), the current enrolment in the Power System course jumped to 19 students! It appears that the steady state enrolment in the proposed program is about 25 students.

IV. Resources to Support the Program

Briefly describe the additional resources needed to implement and operate the program during the program's first five years, e.g., the number of full-time faculty, number of adjunct faculty, computer equipment, print and non-print material, etc.

A. Course Development

The department faculty will be able to develop the required courses.

B. Faculty

At least one full-time faculty member will be needed.

C. Libraries and Computing Facilities

Nothing additional is needed.

D. Classrooms and Laboratories

Nothing additional to what is available will be needed.

V. Curriculum

Degree Requirements:

Upon entering the program, students select an area of specialization supervised by the MS PES Program Advisor. The master's program consists of 30 credits. Students who enter the program and receive departmental or research-based awards must do 6 credits of master's thesis or 3 credits of master's project as part of the 30 credits requirements. Students should consult with the Program Advisor or designee before registering for courses to make sure they are meeting department requirements. As a requirement for graduation, students must achieve a 3.0 cumulative GPA.

All students are required to fulfill two semesters of ECE 791 Graduate Seminar.

Core Courses- 9 Credits (3 courses) are required from the following:

ECE 601	Linear Systems
ECE 610	Power System Steady- State Analysis
ECE 612	Computer Methods Applied to Power Systems

Specialized Courses/Electives: Group A: Minimum 9 Credits (3 courses) are required:

ECE 611	Transients in Power Systems
ECE 613	Protection of Power Systems
ECE 616	Power Electronics
ECE 698	Power Generation and Distribution Systems
Mgmt 620	Management of Technology

Electives: Group B: 12 Credits (Non-Thesis), 9 Credits with Project (3 Credits), or 6 Credits with Thesis (6 Credits) are required from the following:

ECE 618	Power System Design of Alternate Energy Sources
ECE.698	Special Topics: Environmental and Regulatory Issues in Power and Utility Industry
ECE 698	Special Topics: Recent Advances in Renewable Energy Systems
ECE 617	Economic Control of Interconnected Power Systems
ECE 698	Power Generation and Distribution Systems
ME 607	Advanced Thermodynamics
ME 610	Applied Heat Transfer
EnE 671	Environmental Impact Analysis**
IE 614	Safety Engineering Methods
Mgmt 620	Management of Technology
Mgmt 691	Legal and Ethical Issues
Mgmt 692	Strategic Management**

**** MGMT 692 and other business and management courses can be included as optional electives based on the student background, instructor approval and advisor recommendation.**

Project/Thesis:

Thesis is required for all those receiving departmental or research-based support. For all others, a project or thesis is optional.

ECE 700	Master's Project (3 credits)
ECE 701	Master's Thesis (6 credits)