AC 2012-3078: THE DEVELOPMENT OF EMERGENCY MANAGEMENT TECHNOLOGY PROGRAM AT JACKSON STATE UNIVERSITY

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Pao-Chiang Yuan received his Ph.D in civil engineering (environmental/water resources engineering) from Oklahoma State University. Yuan serves as Peer Reviewer for state, private grant programs, and different professional journals and magazines. He is a Council Member of Mississippi Citizen Corps, Mississippi Office of Homeland Security. Yuan received USEPA research grant research on health impact study in the aftermath of Hurricane Katrina in East Biloxi, Miss. Yuan received a grant from the U.S. Department of Homeland Security to develop undergraduate program for emergency management and also received a grant for training a community emergency response team (CERT) from the Mississippi Office of Homeland Security.

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Jessica L. Buck is an Assistant Professor, and she serves as the Program Coordinator of the Technology Education Master's Degree program in the Department of Technology (under the College of Science Engineering, and Technology). She is the Program Recruiter for the undergraduate Emergency Management Technology program. In addition to her role as faculty, Buck serves as the Advisor for the Jackson State Chapter of ATMAE (Association of Technology Management and Applied Engineering) and the Trustee for Epsilon Pi Tau Technology Honor Society, the Delta Beta Chapter. On the national level, Buck, was elected as the President of the Research Division of the National Association of Technology (NAIT, now ATMAE) (2007). In 2010, she was elected as Vice-president of the Student Division in ATMAE. In addition, she serves at a reviewer for the International Association of Journals and Conferences. Buck earned a bachelor's of science degree in industrial technology from Alcorn State University, master's of science in technology from Mississippi State University, and a doctorate of philosophy in technology with an emphasis in education (community college administration minor) from Mississippi State University.

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The Development of Emergency Management Technology Program
at Jackson State University

ABSTRACT

Disaster takes many forms: an earthquake, a fire, a flood, a hurricane, a tornado, a hazardous chemical spill, a radiological accident, or anything else where people are at risk. Natural disasters and man-made calamities occur anytime, anywhere. Every year, millions of Americans face disaster and its terrifying consequences. These events pose great threats to public security. Therefore, it is necessary to create a concentration in emergency management technology to well prepare students as Emergency Management professionals.

Jackson State University (JSU) has established an "Emergency Management Technology" (EMT) program. This undergraduate program introduces emergency management technology into education and research. These efforts promote and encourage undergraduate students to pursue a degree in Homeland Security-related Science, Technology, Engineering, and Mathematics (HS-STEM) as well as ensure that they will have the skills needed to manage a crisis, to help prevent the worst, and to improve outcomes in all types of disasters. This paper discusses the program development and experiences in the first year of operation of EMT program.

1. INTRODUCTION

On the morning of September 11, 2001, four American airliners were hijacked by nineteen men armed with box cutters and knives. Two airplanes crashed into the World Trade Center, one into the Pentagon, and the last 80 miles southeast of Pittsburgh. In 2005, Hurricane Katrina[1,2] devastated the Mississippi coastal area. The need for specialists in the field of emergency management has never been greater. Those in the field of emergency management must have adequate training, experience and education. JSU's Technology Department already has a few courses related to it. However, there is still a need to create a concentration in Emergency Management Technology to well prepare our students as Emergency Management professionals.

During the Spring of 2010, JSU's Technology Department was selected to receive a grant from the US Department of Homeland Security (DHS) for establishing an Emergency Management Technology program. The Emergency Management Technology concentration provides students with the most up-to-date knowledge and skills of this rapidly expanding field. A bachelor degree with a major in Emergency Management Technology requires the successful completion of 124 credits of coursework, including 39 credits for the major; 64 credits in general education requirements; and 21 credits in the minor, electives and other degree requirements. The curriculum focuses on such topics as emergency planning, incident command, disaster response and recovery, hazard identification and mitigation, agency coordination, homeland security, and community emergency training. A capstone project provides the opportunity to apply and demonstrate emergency management skills gained during the course of the program.

The establishment of this Emergency Management Technology program has met the increased student and local community demands as well as accommodated more diverse participants. The newly developed Emergency Management Technology program can

- Expand curriculum options for undergraduate students by introducing a new concentration focused on HS-STEM;
- Increase the number of students engaged in HS-STEM-related research projects; and
- Extend educational and research partnerships with HS Center of Excellence.

2. PROGRAM DEVELOPMENT

During the Spring of 2010, JSU's Technology Department was selected to receive a grant from the U.S. Department of Homeland Security to establish an Emergency Management Technology program and offer scholarships. Beginning in Spring 2011, $210,000 of the total amount provides undergraduate tuition/stipend scholarships to be spent over a three-year period. In the winter of 2010, the EMT program received approval from JSU's curriculum committee. The EMT curriculum has been designed to satisfy the general criteria of the Association of Technology, Management, and Applied Engineering (ATMAE). The Technology Department will continue to track metrics to evaluate program benefits.

In September 2011, JSU's Technology Department received another grant from DHS, through its Science, Technology, Engineering, and Mathematics Career Development Grants program. This grant will enable JSU to award scholarships to more undergraduate students who demonstrate career interest in Homeland Security. The mission of this Career Development program is to ensure the successful transition of students from their undergraduate experiences to professional positions in the homeland security science and technology arena.

3. THE EMT CURRICULUM

The current undergraduate Technology curricula at Jackson State University are designed to prepare students to work in a wide range of industries, giving them a broad base upon which they can build, with subsequent education and training, to meet industry-specific needs. The new Emergency Management Technology Program at Jackson State University is an interdisciplinary venture that blends the expertise and strengths of faculty from the Technology Department. Building on traditional broad-based programs in the department, the EMT program has been designed to prepare the next generation of emergency management professionals with the knowledge and skills they need to improve outcomes in disasters of all types. Students will gain an essential understanding of the mission and principles of emergency management technology with an emphasis on management, use of technology, and cross-agency collaboration. Emergency Management Technology graduates will have an easier transition to the workplace.

The curriculum covers EMT-related theories and research as well as their application, including the interpretation of hazard, vulnerability, and risk-related data and literature. Courses also explore the major principles of this cross-disciplinary field that integrates all activities necessary to build, sustain, and improve the ability to mitigate, prepare for, respond to, and recover from threatened or actual natural disasters, acts of terrorism, or other man-made disasters.

The undergraduate Industrial Management and Hazardous Materials Management curricula formed the starting points for the EMT program. This includes the university core, math, science, and technology support courses common to all programs in the Technology Department. The Technology Department has previously offered a number of hazardous materials management courses. These will be supplemented by a number of new courses developed specifically for this program. The following are the new courses that have been developed.

ITEM 301   Principles of Emergency Management
ITEM 302   Introductions to Incident Command Systems
ITEM 303   Community Emergency Response Team
ITEM 304   Internship
ITEM 401   Application of Emergency Management Computer Technology
ITEM 402   Basic Geological Information System and Remote Sensing
ITEM 403   Disaster Management
ITEM 404   Special Project

ITEM 301 Principles of Emergency Management: The course introduces basic theory of emergency management[3,4]. It identifies the roles of federal, state, and local governments and the community in cases of emergency. The course also discusses disaster prevention, mitigation, recovery, technology support, and litigation issues.

ITEM 302 Introductions to Incident Command System: This course covers the emergency management practices used by responders during an emergency situation. The structure and responsibilities of the Incident Command System (ICS), the management of facilities, and typing of resources are covered in this class. The National Incident Management System (NIMS) principles are also included in this course.

ITEM 303 Community Emergency Response Team: This course provides students with the skills required by the Federal Emergency Management Agency (FEMA) to serve as Community (Citizen) Emergency Response Team (CERT) members within their communities[5,6]. Students will also be required to complete Community Emergency Response Team training, which will provide them with basic skills needed for immediate response in the aftermath of disasters. By working together, CERT members can assist in saving lives and protecting property by using the basic techniques learned from this course.

ITEM 304 Internships: The internship is designed primarily for students who have had little exposure to the field of emergency management. Students can find their placement (with the assistance and approval of the instructor) at national laboratories or DHS's funded Center of Excellence (COE) laboratories to gain hands-on practical experience with a public, private, or non-profit organization that has significant emergency management responsibilities.

ITEM 401 Application of Emergency Management Computer Technology: The purpose of this course is to develop an in-depth understanding and practical knowledge of the most frequently used software such as Wiser[7], HAZUS[8], and CAMEO[9], which were all designed by Federal Government agencies. This course will enable students to effectively use a computer in an emergency. The students can apply this skill to analyze, predict and prevent an emergency case.

ITEM 402 Basic GIS and Remote Sensing: This course introduces the theory and techniques of Geographic Information System (GIS)[10,11] and remote sensing[12,13] and their application to environmental analysis. Topics include the concepts of remote sensing, characteristics of spectromagnetic waves, types of remotely sensed data, sensor types, the theory of photogram metric techniques, and digital image analysis for acquisition of geographical information. Several lab activities involve the following: learning the basics of ERDAS Imagine, data acquisition through internet search for satellite images, importing datasets, band characteristics, and visual presentation.

ITEM 403 Disaster Management: The course explores important functions to be performed before, during and after disaster strikes[14,15]. It also identifies the strategies, tools, challenges and concerns relevant to the emergency manager and others involved in disaster management. The theoretical basis of emergency management will be the central focus of the course, but practical knowledge, skills and planning abilities will also be addressed throughout the semester. Students are expected to think critically about controversial issues and policies pertaining to the emergency and disaster arenas.

ITEM 404 Special Project: This course includes the following emergency management concepts: program planning and management, financial planning and management, managing information, managing people and time, personality types, leadership styles, followership styles, decision-making skills, team-building skills and group dynamics, community-building skills, intergovernmental relationships, negotiating skills, communication skills, emergency management ethics, and professionalism.

A summary of the Emergency Management Technology curriculum is given in the Appendix. The curriculum builds upon a solid foundation in mathematics, science, and technology fundamentals. In addition to its technical aspects, the curriculum also emphasizes oral and written communication skills, the importance of social forces on technology, and the maintenance of professional competence through continued self-improvement after graduation.

4. RESEARCH PLAN

Student research is a highly important component of this project. Students who have completed some introductory lecture courses are qualified to participate in student research projects. At smaller universities such as JSU offering undergraduate technology programs with limited number of faculty, the faculty time available for research is very limited due to heavy teaching loads. Therefore, involving undergraduate students in research under faculty supervision is valuable to both the faculty and students. Four of the research project examples are detailed as follows:

1. Application of Computer Aided Management of Emergency Operations (CAMEO)[16] suites software: The program can be use to (a) access, store, and evaluate information needed for emergency response to hazardous materials incident, and (b) develop hazardous materials emergency plans for the community. The program is also applied to respond to nature hazards and terrorist chemical emergencies. Students can work on it and use it as a tool to simulate the actual case and validate by the computer model.

2. Emergency Preparedness and Response area: Natural disasters such as flood, earthquakes, tornados and fires can strike a community with little or no warning. An influenza pandemic or other infectious diseases can spread from person-to-person, causing serious illness across the country or around the globe in a very short time. School shootings, threatened or actual, are extremely rare but are horrific and chilling when they occur. The terrorist attacks of September 11 and the anthrax scare have started a new era of terrorism. Communities across the country are struggling to understand and avert acts of terror. Students can study community mitigation and the prevention, preparedness, response and recovery from catastrophes. Another major focus will be on emergency management for higher education institutions, especially small and median size colleges and universities.

3. Structural Health Monitoring and Assessment of Critical Transportation Infrastructure Elements: Structural Health Monitoring[17-19] (SHM) refers to the broad concept of evaluating the performance of structural components using a variety of sensing techniques, for the purpose of providing advanced warning of future structural failures. To ensure human safety and to avoid catastrophic failure, SHM has become an increasingly important technology in civil, aerospace, and structural engineering to ensure the safe operation of various structures. Students engaged in the SHM research will study the effectiveness of different vibration-based techniques for damage detection. Students will become familiar with common vibration testing equipment and techniques. Students will assist faculty in developing a more global method for damage detection.

4. Evacuation Routs Study: Many disasters, natural or man-made, can lead to situations where people need to be moved from impacted areas to safe destinations. In the event of any evacuation, how to efficiently operate the transit is always the key issue for the emergency management and transit management agencies. A study is needed to identify the optimum staging areas and operation routes in Mississippi during an emergency. This study will help provide an efficient operational procedure in the planned evacuation. This is a critical step in disaster emergency management and homeland defense preparation.

5. PARTNERSHIPS

Partnerships play a vital role in this project. The collaborative relations with Homeland Security Centers of Excellence (COE) and other research laboratories have expanded the professional networks for this project team as well as further expose both JSU students and faculty to a number of state-of-the art homeland security technology applications.

The Department of Homeland Security's Center of Excellence, housed at Jackson State University, is the premier institution in the research of natural disasters, coastal infrastructure and emergency management. The Department of Technology collaborates with the Center of Excellence with its concentration in Emergency Management. The Department of Technology provides educational training on responding to catastrophic natural disasters. The Department also works with the one of the COE's divisions, the Center of Defense Integrated Data (CDID) which focuses on the Disaster Response Intelligence Systems (DRIS), incident management solutions for first responders and development of cooperation with local Mississippi Emergency Operations Centers (EOCs). CDID will provide summer internships where students can obtain hands-on experience and research opportunities.

The Emergency Management Technology program at JSU also collaborates with Tougaloo College for research and summer intern programs. Tougaloo College is a member of the National Transportation Security Center of Excellence (TC-NTSCOE). EMT program at JSU has also established connections with the Energetic Material Research and Testing Center (at the New Mexico Institute of Mining and Technology), the National Oceanic and Atmospheric Administration (NOAA), Mississippi Emergency Management Agency (MEMA), and local emergency management offices. We will continue to expand our connections with other DHS (or DHS-affiliated) research centers and other federal, state and local agencies. This will further increase our ability to link students with internships and employment opportunities.

6. CURRENT STATUS

The student recruitment has been under way since Fall 2010. The Emergency Management Technology program began admitting freshmen and transfer students in Spring Semester of 2011. During Spring 2011, three undergraduate students were awarded scholarships. In Fall 2011, three more students received scholarships. In September of 2011, the Department of Technology received additional funding from DHS under the HS-STEM Career Development Grant Program. That funding will allow JSU to offer full-tuition scholarships to five additional academically talented students.

Three courses (Principles of Hazardous Materials Management, Regulatory Framework, and Risk Assessment) were offered in the Spring 2011. Three new courses (Introductions to Incident Command Systems, Internship, and Application of Emergency Management Computer Technology) have been offered for the first time in Fall 2011. Three additional new courses (Principles of Emergency Management, Community Emergency Response Team, and Basic Geological Information System and Remote Sensing) are currently being offered in Spring 2012.

During the Summer 2011, the EMT program placed students into internship positions at the National Transportation Security Center of Excellence (COE) at Tougaloo College, Vicksburg Police Department's Community Resource office, and Disaster Preparedness & Response – Catholic Charities. The National Weather Service (NWS) in Jackson, Mississippi, the National Oceanic and Atmospheric Administration (NOAA), and National Transportation Security COE at Tougaloo College have committed to offer internship opportunities for EMT students in Summer 2012.

A strategic marketing plan was developed to assist in the promotion of the new program. Specific strategies include open house tours, advertisements, local campus recruitment, and high school and community college visits. As a result, the EMT program has received a multitude of positive comments. The first year of operation has been very educational for the faculty involved in the program. The program development has been successful and is meeting the initial goals. Our forecast is for continued program growth. The formal survey regarding student learning outcomes will be conducted. Student recruitment, retention, and placement will be recorded. The experiences and lessons-learned from this program will be shared with the engineering and technology education community.

6. CONCLUSIONS

As natural and man-made disasters pose greater risks to communities, the demand for skilled professionals who can manage and mitigate their effects continues to grow. The baccalaureate program in Emergency Management Technology was initiated at Jackson State University. The program began admitting freshmen and transfer students in Spring Semester of 2011, with the first graduates expected by the Spring of 2013. The availability of scholarships from the DHS is helping to attract top students to this program, thereby challenging both faculty and students to achieve their highest academic potential. The end result is a program that is expected to be of considerable benefit to the Emergency Management Technology profession.

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Appendix - Summary of EMT Degree Requirement

JSU Core Curriculum (43 hours)
• ENG 104, 105 (6 hours) – Composition
• ENG 205 (3 hours) – Literature
• ENG 213 (3 hours) – Writing
• History sequence (6 hours)
• Social Science Elective (3 hours)
• PHIL 301 (3 hours) – Philosophy
• PSY 201 (3 hours) – General Psychology
• SPCH 201 (3 hours) – Speech Arts
• Fine Arts Elective (6 hours)
• Foreign Language Option (6 hours)
• Physical Education (PE) Elective (1 hours)

Math/Science (21 hours)
• MATH 111, 112, 221 (9 hours)
• BIO 101 (4) – Biological Science
• CHEM 141 (4 hours) – Chemistry
• PHY 201 (4 hours) – Physics

Free Elective (6 hours)

General Technology (15 hours)
• CSC 115 Digital Computer Principles (3 hours)
• ITD 114 Computer Aided Drafting (3 hours)
• ITMA 105 Industry Safety (3 hours)
• ITMA 325 Industrial Psychology (3 hours)
• ITMA 420 Labor and Industrial Relations (3 hours)

Hazardous Materials Management - Courses in Major (15 hours)
• ITHM 300 Principles of Hazardous Materials Management (3 hours)
• ITHM 301 Regulatory Framework (3 hours)
• ITHM 302 Tech Treatment of Hazardous Materials (3 hours)
• ITHM 402 Industrial Hygiene (3 hours)
• ITHM 405 Risk Assessment (3 hours)

Emergency Management - Courses in Major (24 hours)
• ITEM 301 Principles of Emergency Management (3 hours)
• ITEM 302 Introductions to Incident Command System (3 hours)
• ITEM 303 Community Emergency Response Team (3 hours)
• ITEM 304 Internships (3 hours)
• ITEM 401 Application of Emergency Management Computer Technology (3 hours)
• ITEM 402 Basic GIS and Remote sensing (3 hours)
• ITEM 403 Disaster Management (3 hours)
• ITEM 404 Special Project (3 hours)