

Introducing Practical County and City Management to Undergraduate Students through the Course “Public Works Engineering and Management Practices”

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In every country, healthy infrastructure is essential to economic and social development of communities, regions, and nations. A public works department focuses on all critical issues related to city and county infrastructure management and operations. A public works engineering and management course has been developed within the civil engineering curriculum at the University of Florida that introduces students to a general picture of how cities and counties function within the United States.

As a senior level, 3-credit-hour elective course, it introduces civil engineering seniors to management and operational aspects of city and county government. Management topics include public works organization, managing people, communication management, contract management, legal issues, budgeting, as well as finance, zoning, planning and purchasing. The public works operations topics in the course cover transportation, equipment management, fleet management, traffic management in urban areas, waste management, emergency management, code administration, water resource management, buildings management, grounds and parks administration and air quality control. A description of the material covered is briefly given in this paper. In addition, guest speakers from various officiating departments, such as public works, transportation, county commissions, code administration, as well as a city attorney and a city mayor, are invited on a regular basis to give students a taste of practical, real-life problems and solutions. This course teaches real-life problem-solving skills and knowledge of infrastructure issues and concerns that students can utilize in their careers and will help students to better understand government functions in serving society needs.

Introduction

The public works department is responsible for infrastructure management including the management and operations of road, highway, subway, and bridges for moving traffic safely; providing storm drains and potable water; transporting liquid wastes to treatment facilities; collecting and disposing of solid wastes; designing and installing traffic-control facilities; and performing the multitude of other tasks that will allow an urban complex to function properly. Furthermore, it is the duty of public works officials to make certain that urban infrastructure is able to respond quickly and effectively to catastrophic

emergencies such as hurricanes, unexpected heavy snowfalls, terrorist attacks, earthquakes, and any other disaster so that an efficient delivery of services can be maintained (1).

The public works directors of today, as well as directors of various functions such as airports, water supply and distribution, and liquid and solid waste collection and disposal, probably started as neophytes with civil engineering degrees who learned the elements of supervision and management by on-the-job exposure. But that is not enough. The vastly expanded job of the public works professional now goes beyond technical competence. It requires the dynamics of leadership, communication, analytical skills and foresight. In addition, the manager must have the stamina to work easily and comfortably with elected and appointed officials, union representatives, community leaders, homeowner associations, and individual citizens (1).

In response to this need, the Department of Civil and Coastal Engineering at the University of Florida has developed an undergraduate course, “Public Works Engineering and Management Practices.” The purpose of the course is to develop an understanding about public works operations and practices in junior and senior civil engineering students. The course is divided into two parts. The first part introduces students to the concepts of managing public works. The topics in this part include public works organization, public works finance, information systems, legal issues, communication management, managing people, purchasing, and public works planning. The second part covers public works operations which includes topics such as engineering and contract management, transportation, building and grounds management, equipment management, fleet management, code enforcement, water resource management, solid waste management and air quality management. Guest speakers are also invited from the local public works department, along with city officials (commissioners, the city mayor, and law enforcement officials) and land developers. The speakers provide real-life information about managing public works and this exercise provides students excellent information on public works issues in the real world to supplement their understanding of course material. This paper discusses the topics covered in this course and by the guest speakers. The authors conclude that it is essential to teach civil engineering students with the same methodology, skills and techniques required to manage a dynamic environment such as public works.

Public Works Definition

Public works is defined as, “*The application of scientific, economic, and management principals to the solution of physical, service and system problems to implement community plans, meet community goals, and achieve optimum costs of construction, operation and maintenance.*”

Public works is a dedicated profession with origins in antiquity. Municipal engineers were one of the earliest professional groups in local government, tracing their formal organization in the United States to the first meeting in 1894 of the American Society of Municipal Improvements. This organization and others have combined to form the

American Public Works Association with a membership of about 20,000. Public works managers today are reaffirming those duties and responsibilities to serve the public that have made it possible for the United States to achieve such a high standard of living, one that depends largely on the services provided by local governments.

Course Organization

This public works engineering and management course is divided into two parts. Part one deals with theoretical, managerial and operational concepts involved in public works. Students are provided with real-life case studies for topics covered in the class. The case studies involve a problem faced by a public works manager and how it was solved. In Part two of the course, lectures are given by guests from several city and county offices, including the city mayor, as well as the local public works department and law enforcement offices. The purpose of inviting guest speakers is to provide students with supplementary information on managing today's dynamic public works environment and the real-life challenges it involves.

Part One

This part of the course is further divided into two phases. Phase one teaches students about managerial issues related to managing a public works department. Phase two includes topics related to public works operations and understanding of issues faced by public works managers.

Phase 1

Phase 1 includes material on the following topics:

Public Works Organization: This subject deals with the organization of a typical public works department. Students learn the hierarchy of managing a public works department. They are provided with organization charts and tools used by several public works departments. The organization charts help them understand the chain of command and how the responsibilities are divided among a spanned tree of officials. The expected outcome of covering this material is to learn tactical management of an organization and the distribution of responsibility in the chain of command.

Information Systems: Since this is the age of information, and no organization, whether public or private, can survive without an efficient information system, this is an important topic. In this topic, students learn the importance of having efficient information systems through several information systems examples as implemented by various city and county public works departments. They are provided with a case study in which a public works manager was able to save significant administrative costs by implementing an efficient information system, and this ultimately translated into tax savings for citizens.

Public Works Finance: Efficient budgeting and financial planning is essential for an organization to stay abreast of a changing environment. The students are taught about

several different widely used budgeting techniques, including line-item budget, performance budget, program budget, planning programming budget and zero-based budget. Information concerning revenue and several sources of revenue is presented, such as tax revenues, property taxes, impact taxes, local taxes, consumption and income tax, user charges, etc. Students are encouraged to analyze the current fiscal year budget of any city or county to understand the concepts. They are also taught about capital budgeting utilized in generating capital for several city and country projects.

Public Works Planning: Growth in population over time often alters land development policies. The public works department is intimately involved in studying population growth patterns and then developing land use policies, zoning requirements, etc. Students are taught about several interrelated issues in public works planning, such as legal issues, political and economic issues, social and diversity issues, fiscal challenges, environmental and intergovernmental constraints. Students are also introduced to zoning ordinances, the legal aspects involved in zoning, maps and preliminary engineering, variance, non-conformity issues to ordinances, and subdivision development regulations. Growth management and capital improvement programming concepts are also introduced.

People and Communications Management: Effective people management, personnel training and job analysis are critical issues related to an improved functionality of any organization. This portion introduces students to human resource management issues, personnel training issues and people management. Topics include job analysis, personnel function, performance appraisal, recruitment and selection, motivation, incentives and training. Communications management covers information such as communicating with elected officials, listening to citizens and their complaints, organizing meetings as part of interpersonal communications, working with media, addressing the public, listening to neighbors and organizational communications.

Legal Aspects of Public Works: Local government is one of the most regulated systems in the U.S.A., perhaps second only to the nuclear power industry. Therefore, it is essential for public works personnel to understand the legal framework under which they operate. Students are taught about civil rights obligations; legal issues involved in purchasing and contracting; planning; design and finance; differences between “discretionary” vs. “ministerial” acts; local government tort liability; municipal liability; municipality employee liabilities; conflict of interest; and conflict resolution.

Phase 2

Phase two of the first part of the course deals with the topics related to public works operations. These topics are described further below.

Engineering and Contract Management: Local public works engineering is concerned with streets, bridges, alleys, sewers, drainage, water supply and distribution, wastewater treatment, public buildings, parks, lighting, traffic engineering, parking, and solid waste management. It also plays an overseer’s role in utilities, public transit, and airport

facilities. Elected officials expect coordination of engineering and contracts so as to promote maximum savings and convenience, and minimize conflict and disruption. This topic covers issues of project management, project design and project planning. In addition, the issues of general contracting, pricing, contract bidding and awards, different types of bids and their requirements and prequalification are also covered using real-life case studies obtained from the Public Works Department of the City of Gainesville.

Transportation: This topic involves management of transportation issues within the framework of a public works department. Issues include sidewalk maintenance, road maintenance, snow removal for smooth traffic operations, traffic signal installation and maintenance. Other issues discussed and presented through case studies are regional transit management, subdivision street patterns, transportation systems management policy issues, airport and harbor facilities, pedestrian systems and bikeways. Students are also taught practices followed by public works departments in pavement management, maintenance actions and preventive maintenance of public transportation infrastructure.

Buildings and Grounds Maintenance: The term “maintenance” in this sense includes all work that sustains and restores buildings, the equipment housed in them and the grounds around them so that they function safely and economically and give an appearance that inspires public confidence. Students are taught centralized maintenance, building management methods, such as management by objectives, life-cycle costing and quality circles. Students are also introduced to routine and preventive maintenance as part of building management.

Water Resource Management: Among the primary needs of urban local governments is a source of water, a means of distributing it throughout the community, and a sanitary wastewater system to collect and dispose of liquid waste. Because these systems are underground and out of sight, citizens tend to take them for granted. A local government administrator must have a basic working familiarity with water and sewer system services. Neglect of these systems for other government services with greater public visibility can lead to their serious deterioration. Students are introduced to these challenges faced by local governments. In addition, they are also introduced to the practices undertaken by local governments to ensure wastewater treatment, maintenance of pipes, storm-water drainage, and maintenance of water systems.

Solid Waste Management: Students are introduced to how a public works manager develops and implements a plan that will provide a level of service that protects public health and the environment; that will meet the convenience levels for which residents are willing to pay; and that can be carried out by the personnel, equipment and the facilities available to the administrator.

Code Enforcement: The construction, maintenance, and alteration of houses, apartment buildings, office buildings, retail stores, and other structures are conducted within a framework of city and county ordinances, regulations, forms, procedures, examinations, inspections, and, where necessary, enforcement. The word “code” is generally used to cover the major parts of this framework involving building structure and integrity,

mechanical equipment, electrical systems, plumbing systems, and fire protection. Students are introduced to these codes and regulations in setting codes through several examples of local codes.

Part Two

In Part two of the course, guest speakers from the local public works department, city commission, office of the state attorney, Sheriff's office, Department of Transportation and private sector involved in land development deliver lectures. The guest speakers give presentations about real-life challenges and issues related to managing infrastructure and public works.

The city mayor has often been invited to lecture in this class. Students learn about urban city development, population management, expansion of city and issues related with it, politics within the town hall, etc. Among other popular guest speakers are a code enforcement manager, city attorney, county sheriff, regional airport manager, etc.

The guest speakers discuss issues central to local government issues. The concepts and issues students learn about through regular class sessions and case studies are strongly fortified by the professional experience of these speakers. The guest lecture series also helps students to realize the current and common real-life issues local governments face and they are able to properly verbalize about these issues after the lecture.

Conclusion

This paper has presented a description of the structure of the senior-level course, "Public Works Engineering and Management Practices." This course introduces senior civil engineering students to concepts and issues involved in managing local government. The concepts learned in class are then expanded upon by a series of guest speakers who speak about their professional experiences dealing with issues central to management of local government. Students learn about the core practices and issues involved in managing local government, as well as the challenges and how seasoned professionals in this field have tackled some of these issues. This course is helpful to students who wish to continue their careers in public infrastructure management.

References

[1] International City Management Association, Management of Local Public Works, International City Management Association, 1986, Washington DC.