Comparative advantages and research interest areas of the Department of Civil Engineering, Addis Ababa University

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Summary
The Department of Civil Engineering (DCE) was established in 1955 as part of the College of Engineering. To date more than 1700 students graduated with a BSc degree in civil engineering, and more than 45 students with an MSc degree specialising in structure, hydraulic engineering and geotechnical engineering.

Currently the department runs a BSc degree programme in civil engineering (with 237 students already in the 3rd, 4th and 5th years), and three MSc programmes in the areas of hydraulic engineering (11 students), geotechnical engineering (26 students), and structural engineering (20 students).

The department has a very strong staff in the water sector. Out of 18 instructors with PhDs, 8 are in the water sector creating a good composition in the hydrology, irrigation, hydropower, water resources engineering, sanitary engineering, hydraulic engineering areas.

The department is planning to launch two new MSc programmes in:
(1) Road and transportation engineering and,
(2) Construction technology and management.

Current activities of the department related to the water sector

Research
Currently the department runs research in integrated water resources development using a case catchment area of about 200 km² near Addis Ababa. The research project has three components: the first is soil erosion and sedimentation study, the second is the study on surface and groundwater resources assessment, and the third is a study on sanitation and water supply.
Training

There is also a work-in-progress to open a new department in water and environmental engineering, which envisaged running a BSc programme in water and environmental engineering and three MSc programmes in:

1. Irrigation engineering
2. Hydropower engineering and

Historical background

The Department of Civil Engineering was established in 1955 as part of the College of Engineering. In 1961 the College of Engineering (the current Faculty of Technology) came under the central administration of the University College of Addis Ababa (UCAA) later named Haile Selassie I University (HSIU), and currently known as the Addis Ababa University (AAU). The department was first located in the premises of the Technical School at Mexico Square and moved to Arat Kilo Science Faculty in 1965. In 1969, it was transferred to its present location around the Amest Kilo area. In 47 years of the department’s endeavours, more than 1700 undergraduate and 45 postgraduate students have obtained their BSc and MSc degrees in civil engineering respectively.

Programmes of the department

Educational programmes

The department provides a variety of courses, which can be studied either in a full time five-year regular day programme or in an eight-year continuing education (evening) programme leading toward a BSc degree in civil engineering. A five-year evening programme is also provided leading to an advanced diploma in civil engineering.

Moreover, the department offers a two-year full-time postgraduate programme leading to an MSc degree in geotechnical, hydraulic, and structural engineering. Preparations have been finalised to launch MSc programmes in road and transportation engineering and construction technology and management.

Research activities

Research is carried out in the department both in groups and individually. Major research interests of the staff members are the following:

- Rainfall-runoff modelling
- Groundwater modelling
- Application of GIS in hydrology and water resources
• sediment transport mechanisms and modelling of erosion in watersheds
• water quality modelling
• performance of concrete
• concrete mix design using ordinary Portland cement
• precast slab-beam system
• improvement of quality of blocks
• management in construction
• structural design and optimisation
• fire safety for buildings
• low-cost housing
• dynamic soil-structure interaction
• reinforced-earth technology
• preparation of design aids for hollow reinforced concrete sections

Recently completed projects include:
• determination of optimum operating policy for Koka dam, Ethiopia
• use of scoria for the preparation of structural concrete
• use of geotextiles for stabilising soils
• evaluation of approximate methods for the analysis and design of columns under biaxial bending
• establishment of the Intel Developer Forum (IDF) curves for northern Ethiopia.

Moreover, academic staff members prepare teaching materials and textbooks for the various civil engineering courses offered in the department.

**Facilities**

The northern campus of the Faculty of Technology accommodates about 800 students. The Department of Civil Engineering shares the available facility with other departments of the faculty.

**Laboratories:** The department has laboratories for soil testing, structural testing, material testing, hydraulics and hydrology, sanitary, highway and surveying. These laboratories are used for educational/consultancy purposes.

**Computers:** The department has its own computer centre with Internet connections for staff and postgraduate students. Undergraduate students share the Internet connection facility of the Faculty of Technology.

**Libraries:** Two libraries for general and postgraduate readings with about 15,300 volumes are found in the northern campus of the Faculty of Technology. One may consult other libraries of the AAU that consists of a Central Library (Kennedy Library) located in the main campus, other eleven specialised branch libraries, and one periodical reference library. The postgraduate library of the Faculty of Technology is also equipped with computers with Internet connections.
Staff profile

Currently, the Department of Civil Engineering has 30 academic staff on duty, of whom one is a Fulbright professor and another one is Emeritus, and one is an expatriate professor. Three academic staff members are on study leave. The department’s supporting staff profile includes one secretary and six technical staff. The current (2002) department’s staff qualifications and specialisations are given in Table 1.

Table 1. A profile of the staff qualifications and specialisations of the Department of Civil Engineering (academic year 2001/2002).

<table>
<thead>
<tr>
<th>Specialisation</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction management and materials</td>
<td>1 1</td>
</tr>
<tr>
<td>Geotechniques</td>
<td>4 – 1</td>
</tr>
<tr>
<td>Hydraulic and water resources engineering</td>
<td>7 (2) 1 – 1</td>
</tr>
<tr>
<td>Road and transport engineering</td>
<td>1 (1) 1 – 1</td>
</tr>
<tr>
<td>Structural engineering</td>
<td>6 1 1</td>
</tr>
<tr>
<td>Sanitary and environmental engineering</td>
<td>2 1 1</td>
</tr>
<tr>
<td>Total</td>
<td>21 (3) 4 5</td>
</tr>
</tbody>
</table>

N.B. The value in parenthesis shows the number of staff on study leave abroad working toward the degree.

Students’ admission and entertainment

Admission to the Department of Civil Engineering is very competitive, and is based on freshman and pre-engineering academic achievements.

Regular students are privileged to lodging, food and medical services. Facilities for several outdoor sports and indoor entertainment are available.

Strategic plans

General

a. upgrade and streamline the curricula of the current undergraduate and postgraduate programmes and develop new programmes relevant to the needs of the country
b. strengthen research focusing on priority sectors of national development
c. develop and offer short courses to industries on various topics
d. open other postgraduate and undergraduate programmes
e. give consultancy services to the public and private institutions.
Current activities of the department related to the water sector

Research

Currently the department conducts water related research in three main areas.

1. In integrated water resources development using a case catchment area of about 200 km² near Addis Ababa. The research project has three components: the first is soil erosion and sedimentation study, the second is the study on surface and groundwater resources assessment, and the third is the study on sanitation and water supply (rural and urban). The research teams have established six soil erosion surface runoff measuring stations in the watershed of the Beresa River.

2. Study of the flow characteristics of selected rivers in Ethiopia

3. Study in IDF curve establishment for southern Ethiopia


Training

There is also a work-in-progress to open a new department in water and environmental engineering which envisaged to run one BSc programme in water and environmental engineering and three MSc programmes in irrigation engineering, hydropower engineering and sanitary and environmental engineering.

Comparative advantages of the department

The comparative advantages of the department are: (1) its highly qualified and experienced academic staff who know the country’s problems very well, and (2) research experiences through currently running research projects especially in integrated water resources development on an experimental watershed.

Research interest areas on short- and long-term basis:

1. micro scale—household/community and farm-level integrated water and land resource development through:
   - integrated micro watershed soil conservation (reducing soil erosion and enhancing soil moisture)
   - water harvesting (hydrology and technology)
   - adaptation and use of low-cost (affordable) micro-irrigation technologies including gravity drip irrigation system (for vegetable, fruits and crop production).

2. medium scale—Integrated watershed and natural resource management
- flood forecasting
- study on irrigation and drainage scheme design and management
- water harvesting for small-scale irrigation and water supply for pastoral areas
3. large scale—River basin management including
   - application of decision-support tools for water management
   - drought and flood forecasting
   - climate variability and its implications for long-term productivity
   - design and management of large-scale irrigation schemes and other major water infrastructure.

**Conclusion**

The Department of Civil Engineering has a long-time experience in research and teaching. It currently runs a number of research projects. In the water sector, currently the department conducts research on integrated water resources development on selected case watersheds, on IDF curve establishment for the country, and on monthly flow estimation for un-gauged watersheds.

There is also a plan to open different new departments in water and environmental engineering at undergraduate and postgraduate levels.

The department is also planning to conduct joint research on household/community and farm-level integrated water and land resource development.