



## NJIT's School of Applied Engineering and Technology

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We outline plans for a new School within the Newark College of Engineering (NCE), The School of Applied Engineering and Technology.

In 2018-19 the new School will operate under the current auspices of the Department of Engineering Technology while plans for formal restructuring and renaming are being developed.

The School shall be responsible for all traditional Engineering Technology (ET) functions at NJIT, all common engineering-focused activities of first-year Engineering students (including activities in the NJIT Makerspace), the *General Engineering* undergraduate program (until recently known as *Engineering Science*), and all formal activities in the area of Engineering Education (including engineering education research and engineering faculty training).

This is a reorganization of existing programs and initiatives, which in its first phase would not make significant changes to most existing functions, except for the addition of the *NJIT Makerspace*. In time, however, this reorganization would allow the consolidation of existing programs and the development of new programs to meet the evolving technological and business climate.

In its first 5 years, the School is expected to serve about 2000 (distinct) Engineering students every year in classroom, lab and workshop activities. About 1000 of these students will have primary affiliation with the School (mostly Engineering Technology students). We expect the permanent faculty size of the School to be 35-40 in the steady state.

Academic units similar to the proposed School exist in other universities. Here are several examples.

School	Unit
Rochester Institute of Technology	College of Applied Science and Technology
Oklahoma State University	Division of Engineering Technology
Purdue Polytechnic Institute	Engineering Technology
Kent State University	College of Applied Engineering, Sustainability and Technology
Eastern Illinois University	Applied Engineering and Technology
Eastern Kentucky University	Applied Engineering and Technology

## Rationale

The new School would address several challenges that have emerged in the operations of NJIT and NCE.

(1) The growth, expansion, and increased professional diversity of Engineering Technology programs, well beyond the capacity of a single department (Ref: Data Appendix, Table 1: Engineering Technology Enrollments)

- a. ET has grown steadily over the last ten years, from 472 students in AY 2006 to 789 in 2017 (an increase of 67%). This growth is expected to continue and accelerate, motivated by strong demand from Industry. (In some areas demand from employers lead to 100% employment of students upon graduation.)
- b. ET now houses 10 different programs which span a large number of diverse areas and specializations. It proved difficult to manage them under a single umbrella.

Construction Engineering Technology (CET)

Construction Management Technology (CMT)

Concrete Industry Management (CIM)

Computer Technology (CMPT)

Electrical and Computer Engineering Technology (ECET)

Manufacturing Engineering Technology (MNET) (new program)

Mechanical Engineering Technology (MET)

Medical Informatics Technology (MIT)

Surveying Engineering Technology (SET)

Technology Education (TEED)

Telecommunication Management Technology (TMT) (program is being sunset)

(2) The need to provide opportunities for hands-on design and prototype building

As ET programs grew, and as industry needs evolved, we have not provided ET students with commensurate opportunities to engage in relevant design and prototype building. These are activities that are considered central to the education of Engineering students in general and Engineering Technology students in particular.

The emergence of the *NJIT Makerspace* provides new design, experimentation and educational opportunities to NJIT students. Hands-on Makerspace activities have the potential to address the current design/prototype deficiencies in our curricula, and differentiate NJIT education from engineering education in other tri-state area schools.

The full realization of this potential would require technical and educational infrastructure which is well organized and supported. The challenge is how and where to manage the Makerspace and house its staff. The Makerspace is managed at present directly from the NCE Dean's Office.

(3) The need to improve retention of NCE students (Ref: Data Appendix, Table 2)

Some of the steps taken so far are:

(a) The establishment of new offerings on engineering applications of mathematics (complementary to traditional remediation);

(b) Summer activities to help students who are behind in mathematics upon entry to NJIT;

(c) Recasting of the *General Engineering* program (currently known as *Engineering Science*). The program prepares underprepared students to transfer into the other Engineering or Engineering Technology programs. It serves as the permanent home for some students who would graduate with a General Engineering degree.

These new initiatives are managed at present directly from the NCE Dean's Office. The challenge is to find the appropriate place to administer them and develop them further.

(4) The need to develop a strong *Engineering Education* program at NJIT

While NJIT has a formal program in Technology Education (housed in the ET Department), we lag behind in Engineering Education research, and we are not considered a player in this field (some of the key players are Purdue University, the University of Illinois, and, closer to NJIT, Drexel University). NJIT does not have on staff any person whose research training and background are primarily in Engineering Education and who is recognized as expert in the Engineering Education community.

This state of affairs deprives NJIT from opportunities to conduct relevant research, attract researchers in Engineering Education, and benefit from Engineering Education research funding.

(5) The need to improve the NJIT First Year Design experience

The First-year Design experience offered to NCE students at present is of uneven quality. First-year Design activities vary widely in quality, rigor and relevance between sections and groups, and participation of NCE faculty in First-year Design advising and mentoring is insufficient. Coordination is suboptimal.

(6) The need to improve internship and co-op programs

At present, NCE students (especially ET students) take part in co-op and internship activities. However participation is well below our potential in both quality and quantity. In part, this state of affairs is traced to the lack of proper unit in NCE that would promote internships and co-ops, to NCE students and to Industry.

### **Responsibilities**

The School will be responsible for the following activities.

(1) The current *Department of Engineering Technology*, which will be divided into...

(a) *A Division of Sustainable Technology and the Built Environment;*

- a. Concrete Industry Management (CIM)
- b. Construction Engineering Technology (CET)
- c. Construction Management Technology (CMT)
- d. Surveying Engineering Technology (SET)

(b) *A Division of Applied Electrical and Mechanical Engineering Technology*

- a. Computer Technology (CPT)
- b. Electrical & Computer Engineering Technology (ECET)
- c. Mechanical Engineering Technology (MET)
- d. Medical Informatics Technology (MIT)
- e. Manufacturing Engineering Technology (MNET)

(c) A (future) division of Chemical and Biological Engineering Technology

- a. Chemical Engineering Technology
- b. Biological Engineering Technology

(2) *A Division of Engineering Education*

- a. The undergraduate program in *General Engineering* (the current *Engineering Science* program); it serves 'undecided' students, students who are not yet ready to be admitted into the other Engineering programs, and students who wish to have a General Engineering degree as a stepping stone to graduate studies in other areas.
- b. Offerings for students in the first two years in Engineering and Engineering Technology, especially in design and utilization of the NJIT Makerspace, including design classes for first year students and the *Manufacturing Engineering Technology* program.
- c. Coordination of experiential education in the NJIT Makerspace for all NCE students.
- d. All current offerings in *Technology Education*, which would expand in time to include graduate studies and research in Engineering Education.

(3) All engineering activities within the Newark College of Engineering that are *common to all first-year students* (especially First-year Design)

(4) Summer "boot camps" for new students and other NCE summer enrichment programs.

(5) Coordination and monitoring of co-op and internship activities in NCE.

## Organizational Chart

The proposed organizational chart of the School is shown in Figure 1. The School is a unit of NCE, coordinated by the School's Director.

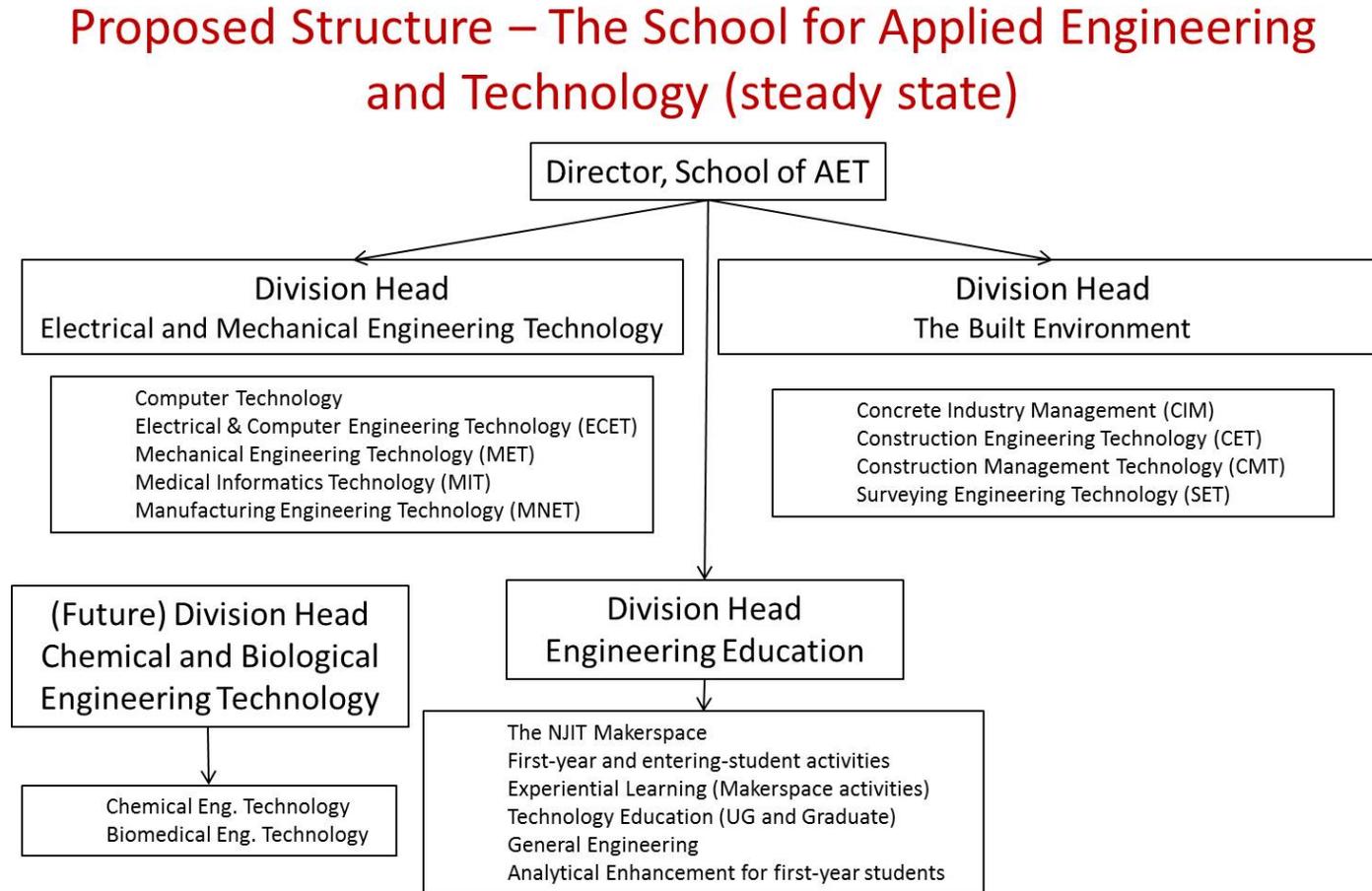


Figure 1: Organizational Chart of the School of Applied Engineering and Technology

**Personnel estimates**

<b>Unit/responsibility</b>	<b>School</b>	<b>Electrical and Mechanical</b>	<b>Built Environment</b>	<b>Chemical and Biological</b>	<b>Engineering Education</b>
Tenured and Tenure-track Faculty	2	12	12		3
Permanent Instructional Staff		8	8		6
Students Advisors		1	1		2
Administrative Support	5				
Technical Support	5				5 (Makerspace)
Part time and student employees		10	10		16

### Key Actions and Timeline, first 12 months

Month		Comments
(Completed)	Socialization with ET Department	
(Ongoing)	Socialization with NCE faculty	
(Approval requested)	Advertise Associate Dean/Director position	
(Completed)	Hire Makerspace Machinist	
(Completed)	Finalize Makerspace plans and budgets	Phase 2 is in implementation
(Completed)	Establish and run summer boot camp for pre-calculus students	
(Completed)	Establish and run ENGR-101	A course/lab on relations between mathematics and engineering
(Completed)	Revise General Engineering/ESC curriculum	
(Completed)	Change name of ESC to General Engineering	Paperwork prepared for formal submission to CUE
(Completed)	Recruit Director of Experiential Learning	Responsible for development of Makerspace
(Ongoing)	Recruit Engineering Education faculty	One faculty member will start September 2019, a second hire is being negotiated
(Completed)	Establish Advisory Board for the SAET	
(Completed)	Complete White paper	Complete P&L statement Detailed Timeline
2	Develop administrative approval plan	Including administrative structure of School and Divisions
2	Analyze hiring needs and plans	Including impact on distribution of hired faculty and startup packages
2-3	Analyze space and experimentation infrastructure organization	
4-8	Develop Charter and Operations Manual for Divisions	
4-8	Develop Makerspace pilot for ET and General Engineering FED classes	
10	Establish two divisions, assignment of faculty, leadership of units	Mechanical and Electrical The Built Environment
10	Complete long-term accreditation plan for General Engineering	
12	Establish Engineering Education Division	