A Century-Long Evolution of Engineering Education at Idaho State University

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Abstract: This paper presents the evolution of engineering education at Idaho State University (ISU), Pocatello, Idaho. The primary reason for this account is that the engineering (undergraduate and graduate) program at ISU although small is unique in more than one respect. The undergraduate program started with offering Associate degrees in various disciplines such as Agricultural, Chemical, Civil, Electrical, Mechanical, etc., moved to a BS degree in General Engineering, then to a BS in Engineering with a strong interdisciplinary flavor and then finally evolved with the addition of BS in Civil, Electrical and Mechanical Engineering disciplines. However, the interdisciplinary core has been retained as a requirement for all BS degrees. Further, the graduate programs (MS and PhD) started with a narrow focus on Nuclear Science and Engineering and evolved to MS in Measurement and Control Engineering (MCE), Engineering Structures and Mechanics (ESM), and Environmental Engineering (ENVE) with a strong interdisciplinary component. Similarly the PhD program started with Nuclear Science & Engineering evolved into broad-based PhD program in Engineering and Applied Science between the College of Engineering and the Department of Physics. Efforts are underway to add an emphasis area in Subsurface Sciences in cooperation with the Departments of Geosciences and Mathematics. We believe that at ISU the engineering program from BS to PhD is woven throughout with interdisciplinary fabric.

Introduction: A brief history of the College of Engineering (CoE) is in order. The Academy of Idaho (now Idaho State University) was established in 1901 and 2 of the first 4 graduates from the Academy were “Civil Engineers”. The Engineering program started as a Department of Engineering and Trade during 1910’s, became a part of Division of Agriculture, Engineering and Forestry during 1950s when it started offering 2-year Associate Degrees in Agricultural Engineering (AgE), Chemical Engineering (ChE), Civil Engineering (CE), Electrical Engineering (EE), Mechanical Engineering (ME), and Mining and Metallurgy Engineering(MME). The Idaho State Legislature action in 1965 prohibited ISU from offering

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Proceedings of the 2002 American Society for Engineering Education Annual Conference & Exposition
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traditional degree program in the above disciplines but would allow the Bachelor of Science (BS) in General Engineering with a nuclear option. Because of the proximity of the university to the National Reactor Testing Station (now Idaho National Engineering and Environmental Laboratory) with its approximately 10,000 employees in the 1960s, the path was clear to provide Master of Science (MS) program in Nuclear Science and Engineering (NS&E), and ISU established the Department of Nuclear Science and Engineering. It later became the School of Engineering in 1975 and the College of Engineering in 1986. Modification in 1996 of the restrictive State Legislature led to the present status of offering BS in Engineering and BS in Civil, Electrical and Mechanical Engineering disciplines. A summary of events is provided in chronological order[1-6]:

a) 1901: Academy of Idaho (now Idaho State University) established  
b) 1904: 2 of first 4 Graduates of the Academy of Idaho were “Civil Engineers”  
c) 1919: Division of Engineering and Trades established at Idaho Technical Institute  
d) 1927: Engineering and Trades were separated  
e) 1963: Idaho State College became Idaho State University (ISU)  
f) 1965: Restrictions by the State Board of Education to offer only General Engineering  
g) 1968: Department of Engineering and Nuclear Science established  
h) 1968: MS in Nuclear Science and Engineering started  
i) 1975: School of Engineering established  
j) 1985: First ABET Accreditation of BS in General Engineering program  
k) 1986: School of Engineering became College of Engineering  
l) 1987: MS in Measurement and Control Engineering  
m) 1987: PhD in Nuclear Science and Engineering  
n) 1988: Second ABET Accreditation of BS in General Engineering program  
o) 1990: BS in Engineering Management, a joint program with the College of Business  
p) 1990: BS in General Engineering changed to BS in Engineering  
q) 1993: MS in Environmental Engineering  
r) 1993: Measurement and Control Engineering Research Center  
s) 1994: Third ABET Accreditation of BS in Engineering program  
t) 1996: State Restrictions Removed to offer Civil, Electrical and Mechanical Engineering  
u) 1997: PhD in Engineering and Applied Science established  
v) 1997: BS degrees with emphasis in Civil, Electrical, Mechanical Engineering  
w) 1999: BS in Computer Science (CS) program moved to the College of Engineering  
x) 2000: MS in Engineering Structures and Mechanics started  
y) 2000: ABET 2000 Accreditation of all 4 Programs: Engineering, CE, EE, ME  
z) 2001: BS Degrees in Civil, Electrical and Mechanical Engineering

Evolutionary Stage I (1901-1975): During the early stage, the Engineering program at ISU started offering Associate Degrees in a variety of disciplines such as AgE, ChE, CE, EE, ME, MME. During 1960’s when ISU was restricted not to offer BS degrees in the above fields in order to avoid any duplication of programs that existed at that time at the University of Idaho (the land-grant institution in the State of Idaho), the Engineering program took it as a challenge and opportunity to offer something unique leading to an interdisciplinary BS program in General Engineering. Under this program, a core curriculum of 84 credits was prescribed with “General” and “Nuclear” options of 32 credits each [3]. A Management option was also added at the
request of local industry. It was agreed that in our curriculum “general” was to reflect a strong interdisciplinary base, with some specialization through directed option course work.

**Evolutionary Stage II (1975-1995):** In 1975, the University combined the Architecture and Engineering Departments from the College of Liberal Arts to form the School of Engineering. The term “School” was adopted to indicate that we were not large enough to deserve college status, and that professional programs were involved. During this time, a second revision of the curriculum was undertaken to make the program more interdisciplinary. The engineering core has courses belonging to traditional disciplines such as Civil, Electrical, Mechanical, and Nuclear and thus making it truly interdisciplinary. Six areas were chosen to be designated as sequences as shown in Figure 1 below.

![General Education and Engineering Core](image)

**Figure 1:** BS in Engineering Program at Idaho State University

As one can see from this (Figure 1), a student after getting a broad-based, interdisciplinary engineering core can choose any two sequences to complete the requirements for a BS degree. Besides natural combinations such as sequences A and B, C and D and E and F, we had several students choosing combinations of sequences A and C, C and E, and C and F showing a true interdisciplinary background for such students. During this period, the School of Engineering became the College of Engineering and General Engineering renamed as Engineering. Further, graduate programs (MS) in Nuclear Science and Engineering and an interdisciplinary Measurement and Control Engineering were established along with PhD program in Nuclear Science and Engineering mostly to cater to the needs of Idaho National Engineering Laboratory (INEL now INEEL) in Idaho Falls, Idaho, operated by the Department of Energy (DoE). Also, a BS program in Engineering Management was initiated in cooperation with the College of Business. However, we have not seen a clear way to accredit this program with either the College of Business (through AACSB) or with ABET.

**Present Stage (1996-):** Several changes took place during this period. We carved out of the existing interdisciplinary program by adding 9 more credits leading to 3 new programs: BS in Civil, Electrical and Mechanical Engineering. In order to be unique compared to other traditional discipline-oriented (CE, EE, ME) programs, we retained the interdisciplinary engineering core for all these 3 new programs so that the students get a broad-based engineering education. The program is summarized in Figure 2. Another important thing to be noted in our program is that there are 2 senior capstone design courses spread throughout the senior year and that these two courses are not separate for each discipline (CE, EE, ME) but are common to all students in the
specialized programs. This gives a unique opportunity for the students from different disciplines to work on truly interdisciplinary projects and to team up together with students from other disciplines. All 4 programs have been fully accredited by Accreditation Board for Engineering and Technology (ABET). The BS program in Computer Science (CS) was moved from the College of Business.

Further, at the graduate level, we have added several interdisciplinary programs as

1) MS in Measurement and Control Engineering (M&CE) which admits students from Electrical, Mechanical, Chemical, Aerospace Engineering, Physics or similar programs [7],

2) MS in Nuclear Science and Engineering (NS&E) having students with background in Mechanical, Nuclear and Chemical Engineering,

3) MS in Environmental Engineering (ENVE) with Civil, Chemical Engineering, Biology, Chemistry etc. backgrounds,

4) MS in Engineering Structures and Mechanics (ES&M) taking students from Civil, Mechanical, Aerospace Engineering, and

5) Interdisciplinary M.S. program in Waste Management and Environmental Sciences, administered through the Office of Research.

![Diagram of General Education Requirements and Engineering Core]

At the PhD level, we moved from the narrowly focused Nuclear Science & Engineering to a much more broad-based interdisciplinary program in Engineering and Applied Science (E&AS) offered jointly with the Department of Physics in all areas of Engineering and Physics including...
Nuclear Science and Engineering. The PhD program has special emphasis areas in Nuclear Science and Engineering Applications and in Sub Surface Sciences, the latter involve Depts. of Geosciences and Mathematics. Again, we want to emphasize that there is interdisciplinary fiber throughout our programs from BS to PhD.

**Unique Features of Engineering Program at ISU:** We now summarize the unique features of the engineering program.

1) During the early stages of our engineering program at ISU, the concept of an interdisciplinary degree was forced upon us by legislation. We soon found that there were unique opportunities and advantages to this threat! We developed an interdisciplinary BS program in Engineering.

2) The employers were quite happy with our graduates, reportedly because the graduates had a more versatile background than engineers from traditional programs and worked very effectively in project management roles. However, some employers were cautious in hiring our graduates with BS in Engineering.

3) However, some employers wanted us to offer traditional degrees and we responded to them by offering the same and at the same time retaining our unique feature of an interdisciplinary nature.

4) Our students are better prepared to participate in, and understand, multi-disciplinary team projects. As such, they're generally more qualified to take on project management responsibilities, and to do so more promptly than engineers with narrower backgrounds. Surveys conducted among employers of our graduates strongly support that statement. In fact, if you look at the typical C-D sequence graduate, his/her core program is much like that gained by a dual-degree Electrical/Mechanical graduate from most other institutions, and that's a combination that has been prized by employers for many years.

5) Even from the point of administrative structure, the College still functions as a single unit with the help of designated coordinators for each of the undergraduate disciplines. This provides us with several advantages like absence of rigid demarcations between different disciplines and fruitful cooperation between faculty belonging to different disciplines (CE, EE, ME, etc.) and more importantly sharing resources like laboratories, equipment, etc. providing the college and the university with a better utilization of resources.

We believe strongly that our engineering program from BS to PhD level at Idaho State University is unique in offering interdisciplinary programs preparing students to take up positions which are becoming more and more interdisciplinary rather than specific disciplinary.

**Bibliography**


*Proceedings of the 2002 American Society for Engineering Education Annual Conference & Exposition*  
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