

ABET
Self-Study Report

for the

B. S. in Metallurgical Engineering

at

South Dakota School of Mines and Technology

Rapid City, SD

April 10, 2010

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Self-Study Report

Metallurgical Engineering

Bachelor of Science Degree

South Dakota School of Mines and Technology

BACKGROUND INFORMATION

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B. Program History

The metallurgical engineering program began with the establishment of then Dakota School of Mines in 1885. The state constitution specified, and continues to require, that mining and metallurgy be taught in at least one state institution.

At the time of the 2004 ABET visit, all five of the departmental faculty members were full professors with over 120 years of experience. Three of these professors have since retired. The department has been fortunate in filling these vacated positions with three highly-qualified professors via open and nationally advertised search process: Dr. Dana Medlin from Zimmer with university experience at the Colorado School of Mines; Dr. Michael West from the University of Tennessee with extensive experience at Oak Ridge National Laboratory; and Dr. William Cross who moved from a successful and decades-long Research Scientist position within the department and who has been relied on regularly to fill temporary vacancies in the department's instructional program. The addition of new program faculty has allowed the offering of new elective courses: MET 430/430L Welding Engineering and Design of Welded Structures, and MET 450 Forensic Engineering. MET 430/430L has been offered every even-year fall since 2006 and MET 450 every odd-year spring since 2009. No elective course offerings were lost with the retirements. The new program course offerings allowed a previously required course (MET 443 Composite Materials) to move to the 'Directed Met Elective' category, giving students added flexibility in their curriculum.

The biggest change in the program's curriculum has been in the content of the junior and senior design course sequence. In 2004 the department's juniors and seniors were very engaged in primarily mechanical engineering-based design projects: competition vehicle projects. These projects usually involved national competitions, strict constraints on materials, and were often repeated year after year. After several years of involvement in these projects, the metallurgical engineering team members were found to be performing little new design work but were performing quality assurance work, primarily with welds. Consequently, the metallurgical engineering faculty opted for more creative design opportunities for our students. After some curricular experimentation with individual projects, the program established the Samurai Sword Project in 2007, which produces a Samurai sword starting with local iron ores. This project, which is ongoing, integrates all aspects of metallurgical engineering, and draws heavily upon the program core curriculum. In addition, new design model cohorts junior (MET 351/352) and senior (MET 464/465) students on design teams and involves 100% of program faculty. In 2008-9 all juniors and seniors were assigned to one of four Samurai Sword design teams: pelletizing, reduction, forging, or quenching. In 2009-10 an additional team unrelated to the Samurai Sword Project was formed to work on a NASA-funded moon dust simulation, once again involving a cohort of junior/senior student. At the same time, the Samurai Sword Project added team members from mechanical engineering and an advanced-placement high school senior.

A very recent change to the program curriculum involves the replacement of GE 130/130L Introduction to Engineering with MET 110/110L. This change was driven by many engineering programs moving away from the broad GE 130/130L course to discipline specific courses. Consequently, the university decided to no longer offer GE 130/130L. MET 110/110L will be initially offered fall 2010.

C. Options

The BS in Metallurgical Engineering degree program has no options or tracks but the department offers a minor in *Materials Science – Metals* for other degree programs. This minor is composed of courses within the metallurgical engineering degree program so the teaching of no additional courses is required. The minor has proven popular among BS Mechanical Engineering students (10 enrolled spring 2009), and has helped broaden the program's multi-disciplinary training. The B. S. in Metallurgical Engineering program has 14 credit hours of elective courses: five for free electives; six for science electives; and six are for directed technical electives. The department maintains and publishes a list of science courses that qualify as science electives. A suite of +400 level MET courses are available for selection within the Directed Met Electives, or students can request to take an engineering course outside of our program as long as it meets a related Metallurgical Engineering discipline component. Students have considerable freedom in selecting their free electives but program faculty advisors encourage students to select only substantial courses.

D. Organizational Structure

The Head of Department of Materials and Metallurgical Engineering reports to the Provost and Vice President who reports to the President as shown in the below order:

Robert A. Wharton, President

Duane Hrcncir, Provost and Vice President for Academic Affairs

Jon Kellar, Head, Department of Materials and Metallurgical Engineering

An organizational chart for the institution is shown in Figure A-1.

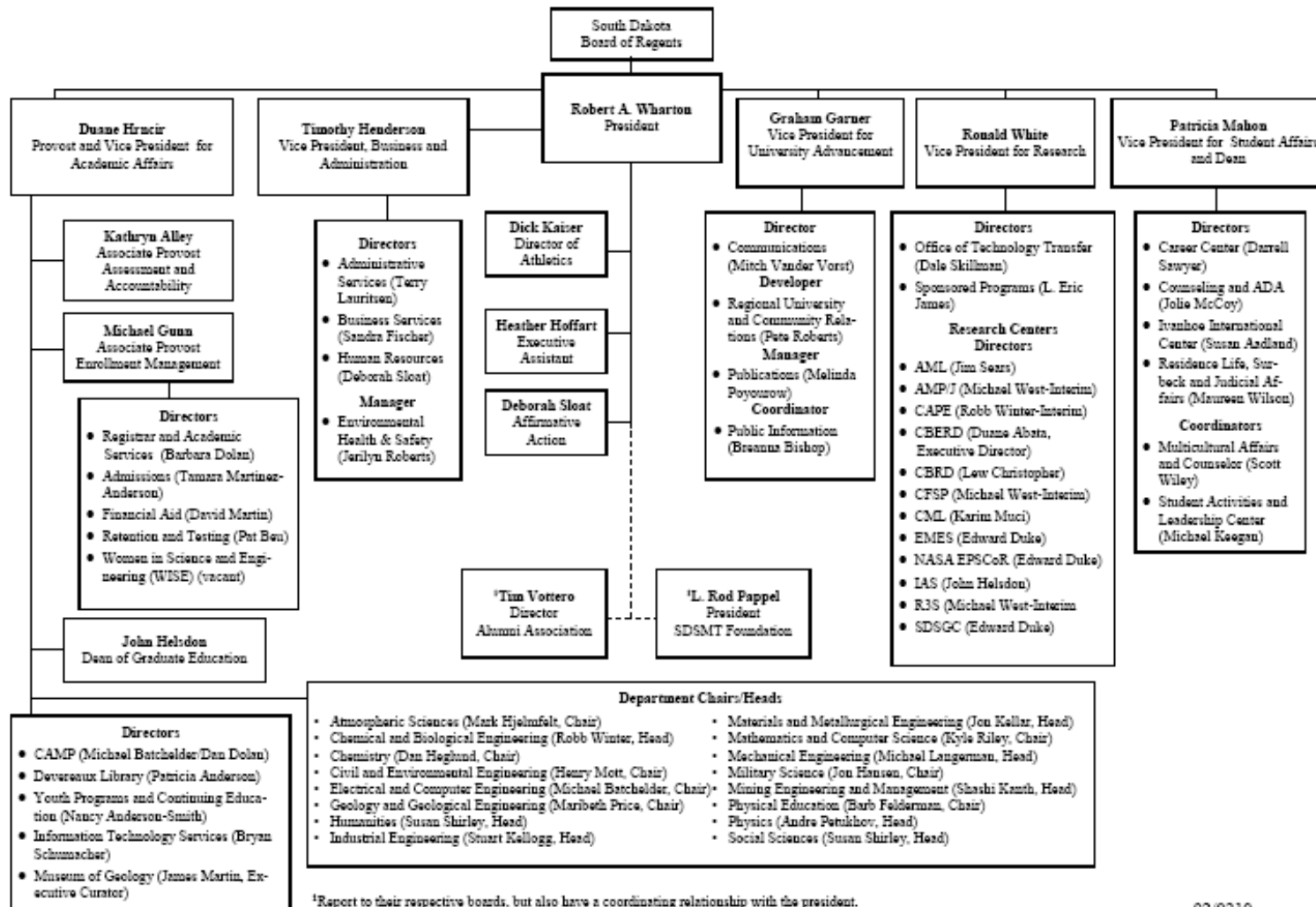
E. Program Delivery Modes

The program mode of the BS Metallurgical Engineering program is a 100% day-time program. Cooperative education courses (CP 297/397/497) courses generally involve students completing an intern/coop experience with an off campus industrial firm. There is no difference in this program from other engineering programs on campus. Shown in Table A.1 is the number of students enrolled in the Metallurgical Engineering program and graduates since 2003.

Table A-1 Enrollment trends in the BS Metallurgical Engineering program since 2003

Academic Year		Enrollment Year					Total	Total	Degrees Conferred		
		FR	SO	JR	SR	5th			Undergr	Grad	Bachelor
Fall 2009	FT	21	14	15	24		74		12		
	PT	2	0	1	1		4				
Fall 2008	FT	18	15	22	8		63		4		
	PT	0	1	2	2		5				
Fall 2007	FT	18	22	6	9		55		8		
	PT	0	2	0	1		3				
Fall 2006	FT	23	9	5	22		59		16		
	PT	0	1	0	0		1				
Fall 2005	FT	16	8	16	11		51		6		
	PT	0	0	0	2		2				
Fall 2004	FT	11	15	8	9		43		0		
	PT	0	1	0	2		3				
Fall 2003	FT						47		7		

South Dakota School of Mines and Technology Organizational Chart—January 2010



02/0210

Figure A-1 SDSM&T Organizational Chart

The enrollment in the Department of Metallurgical Engineering was been steady before the last self-study report with between 45 and 55 students with approximately 10 graduates per academic year. In recognition of the need to enhance recruiting efforts while faculty retirements were occurring, a part-time recruiting coordinator was hired in 2003. The coordinator recruited for the BS programs in Metallurgical Engineering, Geology/Geological Engineering and Physics. The recruiter helped bridge the transition between faculty retirements and the establishment of new faculty, and more recently the program has relied on the extra-curricular activities such as weekly blacksmithing, enhanced scholarship offers, prospective student interaction and tours, summer workshops, and Material Advantage sponsored activities to further our recruiting efforts. These efforts have proven successful as the program enrollment has grown to its largest size in the last +20 years.

F. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions taken to address them

There were no program deficiencies, weaknesses, or concerns cited in the 2004 ABET Review.

Two “observations” were made in the 2004 ABET review about transitions associated with the retirement of faculty and the new (at that time) course sequencing schedule (Set A-D). Clearly, the program has successfully managed the faculty transitions, and the course sequencing schedule has been slightly refined, but has become well accepted within the program advising process.