

CRITERION 6. FACULTY

A. Leadership Responsibilities

Dr. Jon J. Kellar is Head of the Department of Materials and Metallurgical Engineering which manages the B.S. Metallurgical Engineering Degree program. Dr. Kellar has been Chair/Head since 2000. Dr. Kellar reports to the Provost, Dr. Duane Hrcir.

Thus, Dr. Kellar is the lead administrator with primary responsibility for the B.S. Metallurgical Engineering program. Dr. Kellar, in collaboration with program faculty members, has responsibility for and control of the program curriculum and responsibility for program development and the design of new programs. Additional primary responsibilities of Dr. Kellar include program enrollment management and the fostering of opportunities for external funding.

Dr. Kellar is the administrator responsible for all hiring of faculty members and other personnel in the program, annual evaluation for program personnel and faculty members, and the provision of input to the Provost regarding annual evaluations and petitions for promotion and tenure. Dr. Kellar reviews each faculty member's Professional Development Plan and negotiates the terms of the plan with each faculty member before it is sent to the Provost for final review and approval.

Dr. Kellar's fiduciary responsibilities include managing the budget for the program, making salary recommendations, and overseeing operating expenses and student support budgets. In addition, Dr. Kellar provides an important oversight and coordinating step in the process of approving research proposals submitted by faculty members in the program. Dr. Kellar provides input to the Provost on space utilization, program needs, and any additional information needed by the administration to ensure the effective management of institutional resources.

Other program leadership responsibilities in addition to those described above include assigning teaching responsibilities, coordinating schedules, making committee assignments, setting and enforcing policy, handling student and faculty concerns, performing faculty evaluations (including the Professional Development Plan mentioned above) and assuring that continuous improvement processes are established, understood, and implemented.

B. Authority and Responsibility of Faculty

The department head in collaboration with program faculty members has responsibility for and control of the program curriculum and responsibility for program development and the design of new programs. The program curriculum is controlled at the program level, with changes, modifications, and developments vetted by the University Curriculum Committee and forwarded to the Faculty Senate for approval.

Because of the integrated and interdependent way institutions in the Board of Regents system are managed, some curricular changes and modifications may need Board of Regents approval. In these instances, curricular changes are reviewed and approved by the provost before being taken to the Academic Advisory Council (AAC). The AAC is comprised of the vice president or provost for academic affairs at all institutions in the state system. The AAC forwards recommendations on curricular matters to the Council of Presidents (COPS) which makes recommendations for final approval to the Board of Regents.

Thus, the program curriculum modification process begins at the program level with discussions led by Dr. Kellar among the program faculty. If it is agreed upon, that said curricular modification is needed, a program faculty member is assigned the task of preparing the draft request for the University Curriculum Committee. Standard system curriculum forms are used. Once the draft is prepared, it is reviewed, and if necessary modified, by the program faculty before Dr. Kellar submits the request to the University Curriculum Committee on behalf of the program.

A listing to each of the curricular standard forms, as well as the process from the university level to the regental system for each can be found at the following link:

<http://www.sdbor.edu/administration/academics/aac/guidelines.htm>

Course consistency is ensured at the system level by a common course numbering system (e.g. CHEM 112 at SDSMT compared to same course at another regental institution). Because the Metallurgical Engineering program is unique to the SD system the common course number system does not apply to program courses. Rather, course consistency applies at the program level to those courses where different instructors may teach the same course in different semesters. For example, MET 232 Properties of Materials is routinely taught in the fall semester by Dr. Kellar and the spring semester by Dr. West. In such cases the same textbook is used by both instructors and they coordinate the instruction so that the same content (i.e. chapters) are covered each semester.

As a matter of Regents policy, all courses are evaluated by students with the IDEA end-of-semester student opinion survey (SOS). (See <<http://www.theideacenter.org>> for more information on this instrument.) Student evaluations of each course taught in the program are returned to the department head who reviews the evaluations and follows up with an individual consultation with each faculty member in the program. The results of all course surveys are placed in the faculty member's permanent file which resides in the Office of the Provost. While the provost has free access to all faculty member files, the department head and the faculty member are the primary audience for end-of-course student evaluations. The monitoring and improvement of teaching quality is the purview and primary responsibility of the department head in collaboration with the faculty members in the program. If the SOSs indicate a lack of quality instruction the Department Head works with the faculty member to help improve course quality. This support includes one-on-one discussion of course delivery as well as university support via programs offered by the Faculty Development Committee, as described in section 6F.

C. Faculty

The program has five full-time, tenure-track faculty all holding PhDs and three adjunct professors: Dr. Bharat Jasthi of the Arbegast Advanced Materials Processing Center (AAMPC), Dr. Peter Kim from Seokyeong University and Dr. James Sears of the Additive Materials Laboratory (AML). AAMPC and AML reside within SDSM&T. Tables 6-1 and 6-2 show the general analyses and workloads for the five full-time, tenure-track faculty and one supporting faculty member Dr. Jason Hower, Department of Chemical and Biological Engineering. Dr. Hower teaches the program's dual listed MET 433/ CBE 433 Process Control course.

D. Faculty Competencies

The faculty members collectively have an impressive teaching portfolio and complimentary research/industrial backgrounds to cover the depth and breadth necessary for the Metallurgical Engineering degree. These competencies are utilized to deliver the curricular needs of the degree

program. Faculty competencies include aqueous processing (Dr. William Cross), high temperature processing (Dr. Stanley Howard), mineral and materials processing (Dr. Jon Kellar), physical metallurgy (Dr. Michael West) and physical/mechanical metallurgy (Dr. Dana Medlin). As such, the faculty expertise adequately encompasses the necessary four elements of the field, namely, structure, properties, processing and performance. This broad range of competencies is reflected in the attached faculty resumes (Appendix B).

In addition to teaching faculty, the program often draws upon the expertise of staff research scientists and adjunct professors: Dr. James Sears (metal laser deposition), Dr. Bharat Jasthi (welding metallurgy), and Dr. Haiping Hong (materials processing). The above faculty and associates are of sufficient number to ensure good student-faculty interactions. Perhaps, the best example of such student-faculty interactions is within the laboratory and design portions of the curriculum. For example, during the current review cycle the program faculty have successfully competed for National Science Foundation and NASA awards to support the undergraduate curriculum, as show in Table 6-0.1.

It is worth noting that the NSF award “Blacksmithing Metallurgy: A Multifaceted Curriculum and Laboratory Plan” led to the on-going Samurai Sword Jr/Sr design project. Furthermore, that project has been well received by the general public. Specifically, the project was featured in a live broadcast (involving Dr. Kellar and students) in the Science Café series by SD Public Broadcasting (The Cutting Edge) in December 2009.

(<http://www.sdpb.org/tv/shows.aspx?MediaID=57574&Parmttype=Online&ParmAccessLevel=sdpb-all>) Similarly, the NASA supported design project resulted in coverage by SD Public Broadcasting in August 2009.

Finally, in February 2010 a group of students from the program were invited to present their Samurai Sword design project to legislators at the state capitol. (<http://news.sdsmt.edu/press/80535>). In addition to having a wide range of expertise and a demonstrated time in service to the program, program faculty are very active professionally. In particular, Drs. Howard (TMS Board of Directors), Kellar (past Chair MPD), and Medlin (ASM Fellow) all have distinguished records of service to their respective professional societies. Shown in Table 6-0.2 are the teaching faculty and their primary professional affiliations. In addition, Drs. Howard and Medlin are licensed Professional Engineers (South Dakota).

Faculty have also been recognized for teaching excellence. For example, during the past reporting period Dr. Kellar (2008) was recognized nationally by the Carnegie Foundation as the South Dakota Professor of the Year. This recognition compliments that of Dr. Howard, who in 2004 was recognized for his dedication to teaching excellence when he received the AIME Mineral Industry Education Award.

Appendix B. shows current abbreviated resumes for all faculty members with the rank of instructor and above who have primary responsibilities for course work associated with the program.

E. Faculty Size

Five faculty are responsible for delivery of the core Metallurgical Engineering curriculum. As mentioned above, the faculty breadth runs from mineral processing through mechanical metallurgy, all the core areas of Metallurgical Engineering.

All faculty are assigned undergraduate students for advising. Dr. Cross, Dr. Medlin and Dr. West are the primary freshman advisors. Those advisees that are majoring in Metallurgical Engineering stay with these advisors through their sophomore year. Following their sophomore year, Metallurgical Engineering

Table 6-0.1 NSF/NASA Supported Undergraduate Curriculum Awards during the current review cycle.

Curriculum Award (duration)	Abbreviated Award Abstract	Program Faculty Members Involved
NSF: Research Experiences for Undergraduates (REU) Site: Back to the Future (2009-2012)	This NSF award establishes an REU Site called 'Back to the Future' and offers a unique 10-week summer research program that integrates Metallurgical Engineering projects with historical, cultural and artistic significance.	West, Kellar, Cross, Medlin, Howard
NSF : Culture and Attitude---Innovative Partnerships for Success (2009-2014)	The goal of this project is to strengthen student support programming and increase the number of female B.S. graduates from the Metallurgical Engineering (MetE) and Industrial Engineering (IE) programs. Students who demonstrate an interest in participating in the support programming and have a high probability of success in MetE or IE are selected as scholarship recipients.	Kellar, Medlin (with Industrial Engineering faculty)
NSF : Blacksmithing Metallurgy: A Multifaceted Curriculum and Laboratory Plan (2007-2008)	This curricular project threaded kinesthetic blacksmithing activities into the B.S. Metallurgical Engineering Program to improve student learning and motivation. The project redesigned sophomore-through senior laboratories to include metalworking components to help students develop a better understanding of microstructural development and its relationship to mechanical properties.	Medlin, West, Kellar
NASA : Mineral Separation Technology for Lunar Regolith Simulant Materials (2009-2010)	This NASA award funded a design project to produce lunar regolith simulant materials from terrestrial minerals. The recipient worked closely with NASA personnel to develop the project's parameters while based at the Marshall Space Flight Center. In addition to using mineral processing techniques to concentrate and separate the terrestrial simulants, the award necessitated inclusion of system's engineering principles into the Metallurgical design class/projects.	Cross

Table 6-0.2. Program Teaching Faculty and Primary Professional Affiliations.

Primary Professional Affiliation(s)	Faculty Member
AWS/TMS	West
SME/MRS	Cross
SME	Kellar
TMS	Howard
ASM/TMS	Medlin

student advising is split equally between the five BS Metallurgical Engineering program faculty. Dr. Kellar is responsible for the final degree audit prior to graduation.

Similarly, the student professional development activities are also distributed among the faculty. Dr. Howard serves as the Materials Advantage (TMS/ASM/Acers) student chapter advisor, Dr. Charles Kliche (Mining Engineering) is the SME student chapter advisor and Dr. West serves as the AWS student chapter advisor. In addition to numerous professional development activities (e.g. trips to society annual meetings) each of these student chapters routinely hosts service activities both on campus and within the community. For example the Materials Advantage chapter annually hosts a ‘highway cleanup’ day and hosts disadvantaged children at a local amusement park (Flags and Wheels).

During the current review cycle the program was fortunate to have been awarded a \$1M endowment by Nucor Steel for the establishment of a professorship. Dr. Medlin serves as the initial Nucor Professor and has utilized the funds generated by the endowment for annual activities that directly positively impact students in the program. These activities includes an extracurricular ‘Dollars and Tons’ activity which simulates steelmaking with a business perspective and an annual trip to the Nucor facility in Norfolk, NE.

F. Faculty

Appendix B includes an abbreviated resume for each program faculty member with the rank of instructor or above.

F. Faculty Development

All tenure-track and tenured faculty are required to prepare a professional development plan. These plans are three-year plans for tenure-track faculty with less than three years at SDSM&T or six-year plans for all other faculty. The professional development plans for faculty members who are not tenured full professors indicate a progressive increase in the quality and significance of planned accomplishments that, when fully and successfully implemented, will contribute toward promotion and/or tenure as described in the appropriate standards document. The plans for tenured full professors indicate activities that will support their continued professional growth and leadership. The goals detailed within the plan are divided into three areas, teaching and advising, research, scholarship and creative endeavor, and service, with effort relative to the departmental expectations in each area and to departmentally established standards.

First, the completed plan is submitted to the Department Head for evaluation and possible revision. Once approved by the Department Head, the faculty member's plan is sent to the relevant Dean for final review and approval.

Resources and support available to faculty unit members include program funds from the state, institutional (Faculty Development Committee—see below), endowments (e.g. Fuerstenau Professorship, Nucor Professorship) and external support (e.g. National Science Foundation/NASA)

At the Institutional level, faculty development is administered by the provost. In 2009, the Provost created an advisory group for faculty development consisting of department heads and a faculty member who is coordinator for faculty development. The faculty development coordinator, Dr. Jennifer Karlin, is a faculty member in the industrial engineering program, and she has responsibility for the creation and offering of faculty development activities that span the academic year and begin with new faculty orientation at the beginning of the academic year.

The budget for faculty development is controlled by the provost, but signature authority has been granted to the coordinator, Dr. Karlin. Institutional funds and state monies for faculty development are approximately \$38,000 per academic year. In addition, a new student fee instituted in 2009 generates approximately \$110,000 per year for targeted use in developing mobile computing applications in the curriculum.

As a complement to faculty development, the Education and Assessment Research Seminar (EARS), provides an outlet for campus faculty to be engaged in an ongoing dialogue on issues related to best practices in engineering and science education and assessment. Over the past three years, EARS has offered 23 seminars on a variety of faculty initiated topics including a discussion on ASEE's year of dialogue initiative, holistic learning, campus diversity initiatives, mathematics education, technology enabled learning, and Research Experiences for Undergraduates (REU). Program faculty have given EARS seminars on the NSF Back to the Future REU Site and the NSF Back in Black CCLI projects.

Other specific program professional development activities associated for each faculty member over the past five years are as follows:

Dr. Howard

- Executive Board and Retirement Board of TMS;
- Yucca Mountain Nuclear Waste Containment Vessel Review Panel;
- ABET Consultant;
- High-Purity Ge Reduction, Zone Refining, and Crystal Growth;
- Metallurgical Thermodynamics textbook writing;
- Friction stir joining of amorphous metal; corrosion properties of friction stirred Alloy 22;
- Thermal expansion properties of friction stirred Invar; in-situ reaction stir processing;
- Four TMS financial officer board of director appointments;
- Functionally graded laser additive tool and die enhancement research.
- Numerical Methods textbook completion;

Dr. West

- SDSM&T Faculty Cohort "Tablet PC Strategies and Use in the Classroom", Summer 2008;
- Site Director, NSF I/UCRC Center for Friction Stir Processing (CFSP), 2008-present;
- Advisory Board, Western Dakota Technical Institute, Welding Manufacturing Program;
- Committee Member, ASM Handbook Committee, 2009-present;
- Graduate course, AHED 755 "Principles of College Teaching", Spring 2009;

- Site Director, NSF Research Experiences for Undergraduates REU Site “Back to the Future”, 2009-present;
- Fuel Cycle Research and Development (FCRD) Working Group Meeting, March 2010;

Dr. Cross

- Marshall Space Flight Center, NASA Faculty Internship, Huntsville, AL, Summer 2009;
- AHED 755 “*Principles of College Teaching*”, Teaching Pedagogy Course taken through South Dakota State, 2009;
- Optomec, *M³D Training Course*, Rapid City SD, 2006;
- Information Management Institute, *UV Ink Jet Course, Digital Printing Summer Camp*, Cambridge MA, 2005;
- Joint Institute for Nanoscience and Nanotechnology, *Fabrication and Characterization of Nano-Materials Course*, Pacific Northwest National Laboratories, Richland, WA, 2005;
- Expert Witness, *State of South Dakota vs. Dirksen*, Provided Expert Testimony of Infrared Analysis of Evidence, 2004;
- Joint Institute for Nanoscience and Nanotechnology, *Nanoclusters, Nanomaterials, and Nanotechnology Course*, Pacific Northwest National Laboratories, Richland, WA, 2004;

Dr. Medlin

- American Society for Testing Materials, Voting Committee Member, E-4 (*Metallography*) and E-4 (*Medical and Surgical Materials*), current;
- American Society for Metals, *Event Committee* (2005-2008), *MPMD Task Force and Organizing Committee* (2003-present), *Handbook Committee* (1998-2008);
- New Courses Developed at SDSM&T, *Forensic Engineering* (2006) and *Biomaterials* (2007);
- Ametek, Inc., Wallingford, CT, Metallurgical Engineering Consulting, 2009;
- Stryker Medical, Kalamazoo, MI, Metallurgical Engineering Consulting, 2010;
- L and H Industrial, Gillette, WY, Metallurgical Engineering Consulting, 2009-2010;
- Beardsley, Jensen and VonWald Law, Rapid City, SD, Failure Analysis & Expert Witness, 2008-2009;
- William Janklow Law, Sioux Falls, SD, Failure Analysis & Expert Witness, 2008-2009;
- Grant Writing Workshop, SDSM&T, July 2008;
- DUSEL Majorana Collaboration Meetings, Lead, SD, January 2009 and 2010;

Dr. Kellar

- NSF Panel Reviewer;
- External PhD dissertation reviewer (U of UT, U of Alberta, Wright State)
- DOE Panel Reviewer;
- Associate Editor Materials and Metallurgical Processing;
- Reviewer to numerous professional journals;
- SDSM&T Faculty Development Committee;
- 2004-2009 SME Mineral Processing Division (Chair 2008);
- National Resource Council (Canada) Panel Reviewer;
- SDSM&T Alumni Association Board of Directors;
- SDSM&T Foundation Board of Directors;

As shown in Table D-3.7.1 FY09 faculty travel (conferences etc.) was \$70,528 or roughly \$14,000 per program faculty member. This support allows the faculty significant opportunities for professional development.

Table 6-1 Faculty Workload Summary for BS Metallurgical Engineering

Faculty Member	FT or PT ⁴	Classes Taught (Course No./Credit Hrs.) Term and Year ¹	Total Activity Distribution ²		
			Teaching	Research/ Scholarly Activity	Other ³
Program Faculty					
Jon Kellar			40	25	35
	FT	MET 232, 3 cr., F09			
	FT	MES 790/890, 1 cr., F09			
	FT	MET 220, 3 cr., Sp10			
	FT	MET/ME 443, 3 cr., Sp10			
Stanley Howard			50	30	20
	FT	MET 320, 4 cr., F09			
	FT	MET 351, 2 cr., F09			
	FT	MET 464, 2 cr., F09			
	FT	MET 352, 1 cr., S10			
	FT	MET 465, 1 cr., S10			
William Cross			50	35	15
	FT	MES 601, 4 cr., F09			
	FT	MES 691, 3 cr., F09			
	FT	MET 220L, 1 cr., Sp10			
	FT	MET 310, 3 cr., Sp10			
	FT	MET 310L, 1 cr., Sp10			
Dana Medlin			55	30	15
	FT	MET 332, 3 cr., F09			
	FT	MET 330L, 1 cr., F09			
	FT	MES 670, 3 cr., F09			
	FT	MET 440, 3 cr., Sp 10			
	FT	MET 440L, 1 cr., Sp10			
	FT	MET 445, 3 cr., Sp10			
Michael West			50	35	15
	FT	MET 330, 3 cr., F09			
	FT	MET 231, 1 cr., F09			
	FT	MET 232, 3 cr., Sp10			
	FT	MET 231, 1 cr., Sp10			
Supporting Faculty					
Jason Hower	FT	MET 433, 3 cr., F09	40	50	10

1 Indicate Term and Year for which data apply (the academic year preceding the visit).

2 Activity distribution should be in percent of effort. Members' activities should total 100%.

3 Indicate sabbatical leave, etc., under "Other."

4 FT = Full Time Faculty PT = Part Time Faculty

Table 6.2 Faculty Analysis for Metallurgical Engineering

Name	Rank	TT T NTT	FT PT	Highest Degree and Field	Institution from which Highest Degree Earned & Year	Years of Experience			Profession Registration/Certification	Level of Activity		
						Govt./ Industry Practice	Total Faculty	This Institution		Professional Society	Research	Consulting/Summer Work in Industry
Jon Kellar	Professor	T	FT	PhD, Met Eng	U of UT (1991)		20	20		High	High	Low
Stanley Howard	Professor	T	FT	PhD, Met Eng	CO School of Mines (1971)		39	39	PE	High	Med	Med
William Cross	Assoc Prof	TT	FT	PhD, Met Eng	U of UT (1999).		16	16		Low	Med	Med
Dana Medlin	Assoc Prof	TT	FT	PhD, Mat Eng	U of NE Lincoln (1993)	14	8	4	PE	High	Med	Med
Michael West	Asst Prof	TT	FT	PhD, Mat Sci	U of TN Knoxville (2006)		4	4		Low	Med	Low

TT = Tenure Track, T = Tenured, NTT = Non Tenure Track