5. Program Effectiveness – Outcomes Assessment

5.1 Learning Outcome Assessment Procedures

The objectives of the BS degree program in Metallurgical Engineering are

1. Graduates will be practicing professionals or engaged in graduate/advanced studies in metallurgical engineering or related areas,
2. Graduates will continue to expand their knowledge and capabilities and contribute effectively to their chosen profession and to society, and
3. Graduates will demonstrate technical and interpersonal skills that promote success in their career.

The program outcomes have been established to assess how the program meets the departmental and ABET objectives. The chosen program outcomes incorporate development of all of the abilities required in the students graduating from this program. The program outcomes established are

A. Ability to apply knowledge of mathematics, science, and engineering
B. Ability to design and conduct experiments, and interpret data
C. Ability to design technically and financially sound processes, equipment, or materials to reflect environmental and social responsibility
D. Understand structure-property-processing relationships in metallic materials
E. Function on multi-disciplinary teams
F. Ability to identify, formulate, and solve engineering problems
G. Understanding of professional and ethical responsibility
H. Ability for effective oral and written communication
I. Appreciate the global impact of metallurgical engineering profession/practice
J. Ability to recognize the need for and to engage in life-long learning
K. Understand contemporary issues in metallurgical engineering
L. Ability to use techniques, skills, and modern engineering tools necessary for engineering practice

The program outcomes and contribution of each course to pro-gram outcomes are documented in Course Management Surveys and student evaluations for each course.

The objectives are linked to one or more outcomes as shown below.

Outcomes	Objectives		
	1	2	3
A. Ability to apply knowledge of mathematics, science, and engineering	X	X	X
B. Ability to design and conduct experiments, and interpret data	X	X	X
C. Ability to design technically and financially sound processes, equipment, or materials to reflect environmental and social responsibility	X	X	X
D. Understand structure-property-processing relationships in metallic materials	X	X	X
E. Function on multi-disciplinary teams	X	X	X
F. Ability to identify, formulate, and solve engineering problems	X	X	X
G. Understanding of professional and ethical responsibility	X	X	X
H. Ability for effective oral and written communication	X	X	X
I. Appreciate the global impact of metallurgical engineering profession/practice	X	X	X
J. Ability to recognize the need for and to engage in life-long learning	X	X	X
K. Understand contemporary issues in metallurgical engineering	X	X	X
L. Ability to use techniques, skills, and modern engineering tools necessary for engineering practice	X	X	X

5.1.1 Assessments/Evaluations

The department has adopted the campus-wide student evaluation scheme in almost all the departmental courses. This scheme is well understood by students, and the departmental Student Advisory Committee administers the evaluations. Under this scheme faculty receive feedback on the standard questions relating to faculty teaching performance and to the course itself. In addition faculty can select from a menu of questions to probe student reactions to any specific aspects of a course that are of particular interest. This makes it easy to obtain formal student reaction to the introduction of new presentation or educational techniques. Faculty can then modify course material and methods accordingly.

The assessment of outcomes of courses and curriculum is made using data collected from Course Evaluation Surveys, Course Management Surveys incorporating faculty feedback, Exit Interview Surveys of undergraduate students, and Alumni Surveys, Employer Surveys, and the Graduate Council Review (Table 5.1). Most recent assessment is based on data collected from

Course Management Surveys (2009–2015) incorporating Course Evaluation Surveys (2009–2015), Exit Interview Surveys (2009–2015), Alumni Surveys (2009–2015), Employer Surveys (2014), ABET review (2015/2016) and the Graduate School Review (2010-12).

Table 5.1 Program Assessments from Various Assessment Tools

Assessment Tool	Nature of Input	Frequency	Program Assessment
Course Management Surveys	Quantitative	Every Semester	Very Good to Excellent
Exit Interviews	Qualitative/ Quantitative	Once a year	Very Good to Excellent
Alumni Survey Rating	Quantitative	Once a year	Very Good
Employer Survey Ratings	Quantitative	Formally once or twice during cycle	Very Good
Graduate School Review	Qualitative	About 7 years	Excellent
ABET Review	Qualitative	About 7 years	Excellent

Tenure-track faculty are reviewed annually for merit salary increases. Criteria considered include teaching effectiveness, scholarly productivity, service, and professional reputation. The reviewing body evaluates each faculty member and provides a confidential ranking for consideration in awarding merit increases. Anonymous student course evaluations provide quantitative and qualitative measures of teaching performance that weigh seriously in retention, tenure, promotion and merit review deliberations. Special recognition for outstanding teaching is considered in reviewing teaching performance, as is initiation of new courses or substantial revision of existing courses. Research productivity is measured by numbers of substantial papers in refereed technical journals, external research grants, graduate students supervised, and special awards from professional societies. Service to the Department, the College and the University through faculty committees and positions of leadership (e.g., committee chair) helps determine the service component. Public service includes membership on various government and civic boards, and on committees and leadership positions in professional societies.

5.1.2 ABET Review

Assessment of our program is afforded by ABET reviews, which have given the Metallurgical Engineering program high marks in 2003, 2010, and 2016. (Please see Appendix K.)

5.1.3 Advisory Committee Review

Further assessment of our program has been provided by our Advisory Committee Review, most recently in May, 2015. The Advisory Committee consists of the following members:

Donald G. Foot Jr., CEO, Versa Gold
Dr. Pinakin Chaubal, General Manager, Process Portfolio, Global R & D, ArcelorMittal Research and Development
Dr.Steve Hughes , President, Ceramatec

Rick Gilbert, VP, Freeport McMoran
Dave Kinneberg, President, James Avery, Dallas, TX
Dr. R. Neale Neelameggham, Consultant/Magnesium, Ind LLC, Salt Lake City
Philip Thompson, Director Dawson Metallurgical Laboratories, F. L. Smidth Minerals, Inc., Salt Lake City
Karen Quinn, Senior Manager Internal Audit, ATk/Orbital Launch Systems
Heidi Maupin, Army Research Lab
Dr. Ray Peterson, Aleris International
Scott Bird, RioTinto

Many of their comments refer to both undergraduate and graduate programs, and the feedback is being used to improve the program.

5.2 Undergraduate Learning Outcomes Assessment Feedback

Course Management Survey input was obtained from the faculty for each departmental course. For quantitative assessment, contribution to each of the outcomes (A to L) by each course is assigned by the instructor on a scale of 0 to 6. The total contribution to each outcome from all the courses is obtained by adding all these units (weighted for credit-hour assignment of each of the courses and the total units assigned for the outcomes by the instructor of each course). Results of the survey are shown in Tables 5.2 to 5.6. The survey and its assessment indicate that the curriculum is resulting in the outcomes expected from the program.

Course evaluations are used to constantly assess and improve the individual courses. The Department Chair monitors these evaluations and communicates to the faculty whenever any specific changes are needed. The average ratings for satisfaction with respect to various outcomes are above 5 on a scale of 1 to 6 (1 being low) as shown in Tables 5.7, 5.8 and 5.9.

Alumni, Advisory Committee, employer, and senior exit surveys provided qualitative inputs on satisfaction with the program offerings, quantitative inputs regarding the program outcomes, and the needed improvements to the program. All of these surveys indicate a high level of satisfaction regarding the nature of curriculum and the performance of the graduates in industry.

The alumni survey indicated assessment scores in the range of 3.4 to 5.0 for various program outcomes on a scale of 1 to 5, with 5 indicating maximum satisfaction and 1 indicating least satisfaction. The alumni assessment of courses offered by the department indicates satisfaction with ratings in the range of 3.0 to 4.6 on a scale of 1 to 5. Many of the suggested changes or improvements to existing courses or new courses were already in place by the time of the survey. (See Tables 5.10 to 5.13.)

Employer surveys gave assessment scores in the range of 3.5 to 5 and average 4.25 over various outcomes (Tables 5.14).

The exit interviews indicated an overall satisfaction with the program offerings (4 to 4.5, on a scale of 1 to 5) (Tables 5.15-5.17). The exit interview assessments of core courses offered by the department indicate satisfaction with ratings in the range of 2.5 to 3.7 on a scale of 1 to 5. All the graduates of the program have found gainful employment. The curriculum has been constantly upgraded, so that many of the suggestions have already been implemented.

The assessment of the department for undergraduate and graduate education by the Graduate Council in 2010 was excellent. We are scheduled for another Graduate Council review of the graduate and undergraduate programs in the 2016/2017 academic year.

The instructors of the department's courses are very experienced educators and highly accomplished researchers. The averages of course evaluations and the instructor ratings are very high in general, 5.32 and 5.24 respectively, on a scale of 1 to 6. Many of the courses are well established, and continuously updated and enhanced, providing the students the best educational experience. Overall the students express satisfaction with the curriculum, and any concerns expressed by students are addressed as appropriate. Any changes made in the curriculum and methods of instruction affecting various outcomes are addressed for each outcome. The process for outcomes assessment and implementation of changes is illustrated in Figure 5.1.

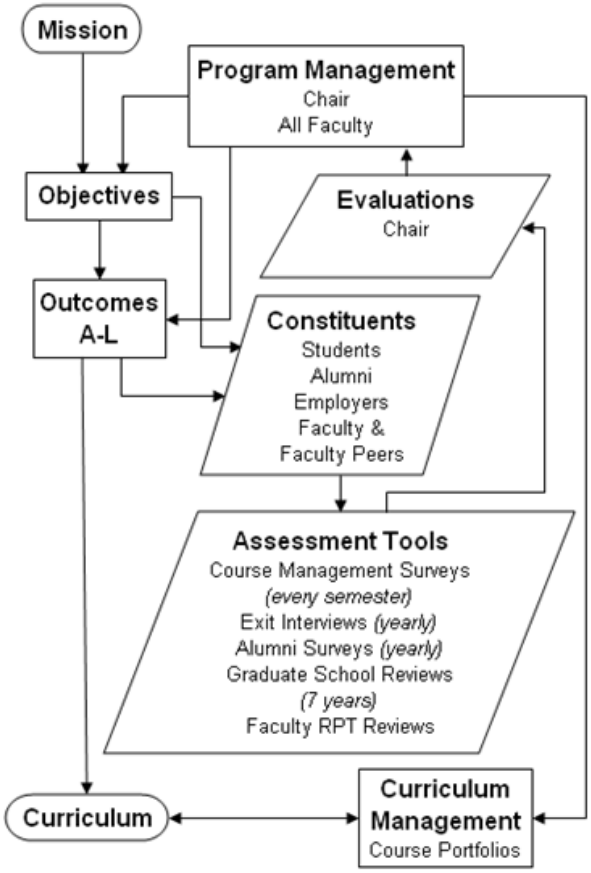

Figure 5.1 Outcomes assessment and implementation of changes.

5.2.1 Relationship of Courses in the Curriculum to the Program Outcomes

5.2.1.1 COURSE MANAGEMENT SURVEY

The relationship of courses in the curriculum to the Program Outcomes based on Course Management Survey data from individual courses is presented here. The data on contribution to various outcomes from Course Management Surveys of the courses as assessed by the instructors were presented in Tables 5.2 to 5.4. The level of activity for each outcome averaged over core departmental and non-departmental courses, plus equivalent credit hours devoted to each outcome, are shown in Tables 5.5 and 5.6.

Table 5.2. Summary of Results from Course Management Survey for Required MET E Courses, 2015 Showing Relative Emphasis of Various Outcomes in the Course

		ABET Outcomes											
Course Number	Title	A	B	C	D	E	F	G	H	I	J	K	L
MET E 1610	Introduction to Extractive Metallurgy	4	1	2	3	4	4	2	5	6	3	4	3
MET E 1620	Introduction to Physical Metallurgy	4	4	3	6	0	3	0	2	0	1	3	4
MET E 3070	Statistical Methods in Earth Sci & Eng	6	6	2	0	0	6	0	6	0	1	0	3
MET E 3220	Material and Energy Balances	5	3	4	0	1	5	1	3	2	3	3	4
MET E 3500	Fluid Flow	4	4	3	0	2	4	2	2	2	1	2	4
MET E 3530	Experimental Techniques in Metallurgy	5	6	2	2	4	2	2	4	2	1	3	4
MET E 3620	Thermodynamics and Phase Equilibria	5	1	1	4	0	5	1	2	2	3	2	4
MET E 4990	Undergraduate Seminar	1	0	1	1	1	1	2	3	3	3	3	1
MET E 5260	Physical Metallurgy I	6	4	3	6	1	3	2	2	4	2	3	4
MET E 5450	Mechanical Metallurgy	6	2	4	6	5	3	2	2	2	1	3	3
MET E 5670	Mineral Processing I	6	6	6	5	5	5	2	5	3	3	4	6
MET E 5680	Mineral Processing II	6	6	6	5	5	5	2	5	3	3	4	6
MET E 5690	Process Engineering Statistics	5	6	2	0	0	5	2	4	1	1	0	4
MET E 5700	Hydrometallurgy	5	4	3	0	2	3	2	3	2	2	3	4
MET E 5710	High Temperature Chemical Processing	6	6	6	3	3	6	5	5	6	4	6	5
MET E 5750	Rate Processes	6	6	6	3	3	6	4	5	4	5	5	6
MET E 5760	Process Synthesis, Design & Econ	6	3	6	6	2	6	4	5	3	2	3	5
MET E 5780	Metals Processing	3	3	3	6	3	2	1	2	1	1	2	3

Activity Levels: 0 No activity 6 High activity, essential

Course folders contain results from each semester the course was taught and for which data is available and the summary provided here.

Table 5.3. Summary of Results from Course Management Survey for Elective MET E Courses, 2015

		ABET Outcomes											
Course Number	Title	A	B	C	D	E	F	G	H	I	J	K	L
MET E 5210	Nuclear Materials	6	3	4	3	1	6	2	2	4	3	4	4
MET E 5240	Transmission Electron Microscopy	6	4	2	3	1	2	2	3	2	2	2	6
MET E 5270	Powder Metallurgy	4	2	2	6	0	5	2	1	0	0	2	6
MET E 5280	Magnetic Materials &Devices	6	0	6	6	0	0	0	0	0	0	0	0
MET E 5290	Nanoscience and Technology	6	1	2	4	3	2	2	2	6	4	6	1
MET E 5320	Materials and the environment	3	2	6	4	6	3	3	3	6	6	6	3
MET E 5600	Corrosion Fundamentals	5	1	3	1	2	3	1	1	0	1	3	4
MET E 5660	Surfaces and Interfaces	4	2	1	4	5	4	1	6	1	2	5	3
MET E 6300	Alloy & Material Design	6	3	2	6	3	3	3	3	2	2	2	4

Table 5.4. Summary of Results from Course Management Survey for Other Required Engineering and Science Courses, 2015

		ABET Outcomes*											
Course Number	Title	A	B	C	D	E	F	G	H	I	J	K	L
CHEM 1210	General Chemistry I	6	0	0	0	0	0	0	0	0	0	0	4
CHEM 1215	General Chem. I Lab	6	0	0	0	0	0	0	0	0	0	0	4
CHEM 1220	General Chem II	6	0	0	0	0	0	0	0	0	0	0	4
CHEM 1225	General Chem II Lab	6	0	0	0	0	0	0	0	0	0	0	4
CHEM 3060	Physical Chemistry I	6	0	0	0	0	0	0	0	0	0	0	4
MATH 1210	Calculus I	6	0	0	0	0	0	0	0	0	0	0	4
MATH 1220	Calculus II	6	0	0	0	0	0	0	0	0	0	0	4
MATH 2250	ODE's & Lin Alg	6	0	0	0	0	0	0	0	0	0	0	4
MATH 2210	Calculus III	6	0	0	0	0	0	0	0	0	0	0	4
CP SC 1000	Eng Computing	4	2	4	0	0	4	0	0	0	0	0	6
WRTG 2010	Intermediate Writing	6	0	0	0	0	0	0	0	0	0	0	4
PHYCS 2210	Phys for Science & Eng	6	0	0	0	0	0	0	0	0	0	0	4
PHYCS 2220	Physics for Science & Eng	6	0	0	0	0	0	0	0	0	0	0	4
PHYCS 1809	Gen Physics Lab	6	0	0	0	0	0	0	0	0	0	0	4
EL EN 2200/2210	El En for Non-majors	H	M	L	-	L	M	-	L	-	-	-	M
ME EN 1300	Statics/Strength	H	-	H	-	M	-	M	-	-	M	M	M

*Outcome assessments are as reported by the relevant departments and the totals for each course therefore vary.

Table 5.5 Average Outcome Activity Level and Equivalent Credit Hour Devoted to Each Outcome for Required And Elective MET E Courses, 2014

	A	B	C	D	E	F	G	H	I	J	K	L
Average Outcomes for MET E Courses Weighted For Credit Hours	4.1	3.0	2.7	2.5	1.7	3.2	1.5	2.7	1.8	1.6	2.2	3.2
No. of Equivalent Credit Hours Devoted Towards Each Outcome	7.8	5.7	5.1	4.7	3.2	6.1	2.8	5.1	3.4	3.1	4.2	6.0

Table 5.6 Average Outcome Activity Level and Equivalent Credit Hour Devoted to Each Outcome for Other Required Engineering and Science Courses*

	A	B	C	D	E	F	G	H	I	J	K	L
Av. of Outcomes Weighted for Credit Hrs.	5.9	0.3	0.9	0.0	0.4	0.5	0.3	0.1	0.0	0.3	0.3	4.3
No. of Equivalent Credit Hours Devoted Towards Each Outcome	21.3	1.1	3.4	0.0	1.4	1.8	1.2	0.2	0.0	1.2	1.2	15.6

*Outcome assessments are as reported by the relevant departments, and the totals for each course therefore vary.

5.2.1.2 COURSE EVALUATIONS

The course evaluations for the departmental courses show course composite rating of 5.24 ± .1 and instructor composite rating of 5.32 ± 0.09 for 2009–2015 on a scale of 1 to 6 (Figures 3.1 and 3.2).

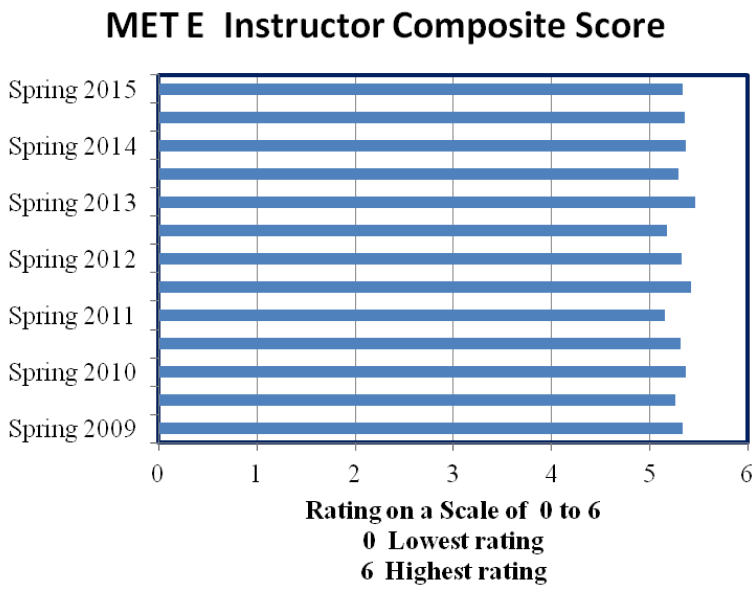

Figure 5.2. Metallurgical Engineering instructor composite rating

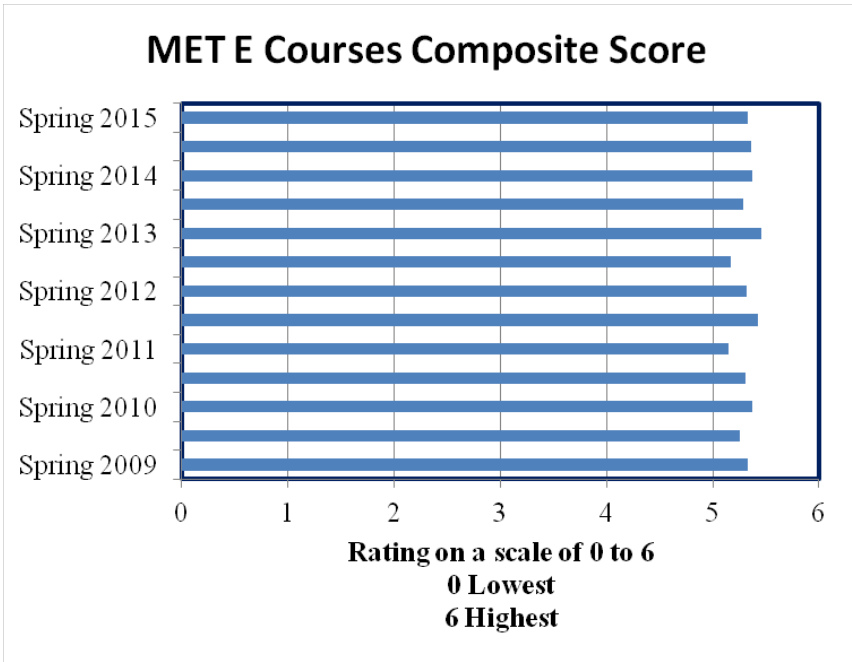

Figure 5.3. Metallurgical Engineering course composite rating

The average satisfaction rating of outcomes are generally in the range of 5.0 to 5.2, suggesting that the course instruction leads to desired level outcomes A through L (see Tables 3.7 to 3.9).

Table 5.7. Summary of Results from Course Evaluations for Required MET E Courses, 2009-2015*

Course Number	Title	ABET Outcomes											
		A	B	C	D	E	F	G	H	I	J	K	L
MET E 1610	Introduction to Extractive Metallurgy	5.2	5.0	4.9	5.1	5.1	5.0	5.0	5.0	5.2	5.1	5.1	5.0
MET E 1620	Introduction to Physical Metallurgy	5.1	4.8	4.9	5.2	4.9	4.9	4.9	4.8	5.2	4.8	5.0	4.9
MET E 3070	Statistical Methods in Earth Sci & Eng	4.9	4.8	4.4	4.2	4.6	4.8	4.4	4.6	4.4	4.4	4.2	4.6
MET E 3220	Material and Energy Balances	5.1	4.9	4.7	4.8	4.5	5.0	4.5	4.5	4.5	4.7	4.6	5.0
MET E 3500	Fluid Flow	5.2	5.2	5.1	5.1	5.1	5.2	5.1	5.2	5.2	5.2	5.1	5.3
MET E 3530	Experimental Techniques in Metallurgy	5.4	5.2	5.3	5.1	5.4	5.2	5.2	5.0	5.0	5.2	5.2	5.3
MET E 3620	Thermodynamics and Phase Equilibria	5.6	5.3	5.4	5.3	5.2	5.6	5.4	5.2	5.3	5.5	5.4	5.5
MET E 4990	Undergraduate Seminar	4.8	0.0	4.9	4.9	4.8	4.8	5.1	5.1	5.2	5.3	5.2	4.9

Course Number	Title	ABET Outcomes											
		A	B	C	D	E	F	G	H	I	J	K	L
MET E 5260	Physical Metallurgy I	5.4	4.9	5.1	5.5	5.0	5.3	5.1	5.1	5.2	5.1	5.2	5.4
MET E 5450	Mechanical Metallurgy	5.4	5.3	5.3	5.4	5.1	5.4	5.3	5.4	5.4	5.4	5.4	5.3
MET E 5670	Mineral Processing I	5.3	5.2	5.3	5.3	5.2	5.2	5.3	5.3	5.4	5.2	5.3	5.3
MET E 5680	Mineral Processing II	5.3	5.1	5.3	5.2	5.2	5.2	5.3	5.3	5.4	5.2	5.3	5.3
MET E 5690	Process Engineering Statistics	5.3	5.2	5.1	5.0	5.0	5.2	5.2	5.2	5.0	5.3	5.1	5.2
MET E 5700	Hydrometallurgy	5.1	5.1	5.2	5.0	5.1	5.1	5.1	5.1	5.1	0.0	5.1	5.2
MET E 5710	High Temperature Chemical Processing	5.1	5.7	4.9	5.0	4.8	5.2	5.2	5.1	5.4	0.0	5.3	5.2
MET E 5750	Rate Processes	5.3	4.9	5.0	4.8	4.6	5.2	5.1	5.0	5.0	5.3	4.9	5.2
MET E 5760	Process Synthesis, Design & Econ	5.3	5.2	5.5	5.4	5.4	5.1	5.4	5.4	5.6	5.5	5.5	5.4
MET E 5780	Metals Processing	4.8	5.2	5.0	5.2	4.7	4.8	4.8	4.9	4.9	5.4	5.1	5.0

Activity Levels: 0 No activity 6 High activity, essential

*Course folders contain results from each semester the course was taught, and a summary is provided here.

Table 5.8. Summary of Results from Course Evaluations for Elective MET E Courses, Fall 2009-Spring 2015 *

Course Number	Title	ABET Outcomes											
		A	B	C	D	E	F	G	H	I	J	K	L
MET E 5210	Nuclear Materials	5.4	5.2	5.1	5.6	5.2	5.3	5.7	5.5	5.7	3.9	5.7	5.3
MET E 5240	Transmission Electron Microscopy	5.2	5.3	5.2	5.2	5.3	5.2	5.3	5.2	5.1	5.2	5.2	5.3
MET E 5270	Powder Metallurgy	4.8	4.8	4.8	5.0	4.9	4.8	4.9	4.9	5.0	0.0	0.0	5.1
MET E 5280	Magnetic Materials &Devices	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MET E 5290	Nanoscience and Technology	5.0	4.2	4.6	5.2	4.8	4.9	5.0	4.8	5.3	4.8	5.3	5.1
MET E 5600	Corrosion Fundamentals	5.3	5.4	4.8	5.2	5.3	5.1	5.2	5.3	5.5	5.2	5.0	5.1
MET E 5660	Surfaces and Interfaces	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MET E 6300	Alloy & Material Design	5.9	5.6	5.2	5.4	5.3	5.5	5.4	5.5	5.7	5.6	5.5	5.4
MET E 5320	Materials and the environment*	4.8	4.9	4.9	4.8	5.7	4.9	5.2	5.4	5.4	5.1	5.2	5.1
	Average	**5.2**	**4.3**	**5.0**	**5.2**	**5.2**	**5.1**	**5.2**	**5.2**	**5.4**	**4.0**	**4.5**	**5.3**

ND – No data available because of too few responses or other reasons

* Course folders contain results from each semester the course was taught and summary provided here)

Table 5.9 Summary of Results from Course Evaluations for Core and Elective MET E Courses, 2009-Spring 2015.

Student Responses	A	B	C	D	E	F	G	H	I	J	K	L
All Core MET E Courses (49 Credit hours)	5.2	5.1	5.1	5.1	5.0	5.1	5.1	5.0	5.1	5.1	5.1	5.1
Elective METE Courses (8 credit hours)	5.2	4.3	5.0	5.2	5.2	5.1	5.2	5.2	5.4	4.0	4.5	5.3
Average	5.2	5.0	5.1	5.1	5.0	5.1	5.1	5.1	5.2	5.0	5.0	5.2

5.2.1.3 RESULTS FROM ALUMNI SURVEY (2009-2015)

The respondents to the annual alumni surveys (2009–2015) expressed satisfaction with the metallurgical engineering training that they received. For nearly all the respondents, the first job in their career was highly related to metallurgical engineering. Some of the alumni have moved into areas unrelated to metallurgical engineering, but the majority of them have remained in jobs related to metallurgical engineering. The current work areas of respondents cross a broad

spectrum that includes physical metallurgy, mineral processing, extractive metallurgy, law, consulting, sales and management. The faculty felt that this reinforces the importance of continuing the broad training given in all areas of metallurgy by the department.

The faculty felt that training in all of the areas has been strengthened in recent years and will continually update the various courses. The respondents indicated that all the core courses taught are important, and the extent of importance varied depending on their current work areas (Tables 5.10 and 5.11). The responses to question regarding the assessment of the program outcomes (Tables 5.12 and 5.13) indicated satisfaction in all areas of the training.

The faculty felt that some of the suggested changes in curriculum have already been implemented. The issue of training in economics, business, and management is now addressed through a single course in engineering economics and the capstone design course. Alternative avenues are being explored within the constraint of the limited number of credit hours that can be allocated for the undergraduate degree.

Table 5.10 Importance of Required Departmental Courses from Respondent's Perspective and Professional Experience (on a scale of 1 to 5)

(Average Scores from 41 alumni responses received 2009 through 2015)

REQUIRED COURSES	Average
MET E 1610 Introduction to Extractive Metallurgy	4.1
MET E 1620 Introduction to Physical Metallurgy	3.9
MET E 3070 Statistical Methods in Earth Sci & Eng	4.2
MET E 3220 Material and Energy Balances	4.2
MET E 3500 Fluid Flow	3.5
MET E 3530 Experimental Techniques in Metallurgy	4.0
MET E 3620 Thermodynamics and Phase Equilibria	3.7
MET E 5260 Physical Metallurgy I	3.6
MET E 5450 Mechanical Metallurgy	3.6
MET E 5670 Mineral Processing I	3.8
MET E 5680 Mineral Processing II	3.7
MET E 5690 Process Engineering Statistics	4.4
MET E 5700 Hydrometallurgy	3.8
MET E 5710 High Temperature Chemical Processing	3.5
MET E 5750 Rate Processes	3.7
MET E 5760 Process Synthesis, Design & Econ	3.8
MET E 5780 Metals Processing	3.8

Table 5.11 Importance of Elective Departmental Courses from Respondent's Perspective and Professional Experience (on a scale of 1 to 5)

(Average Scores from 41 alumni responses received 2009 through 2015)

MET E 5210	Nuclear Materials	2.2

MET E 5240	Transmission Electron Microscopy*		3.5
MET E 5270	Powder Metallurgy		3.3
MET E 5280	Magnetic Materials & Devices		3.1
MET E 5290	Nanoscience and Technology		3.2
MET E 5300	Alloy & Material Design		3.8
MET E 5320	Materials and the Environment	New course	
MET E 5600	Corrosion Fundamentals		3.8
MET E 5800-001	Special Topics in Metallurgical Eng (i) Industrial Internship		2.8

*New course

Table 5.12 Alumni Survey: Importance of preparation in the outcome skills.

	A	B	C	D	E	F	G	H	I	J	K	L
Average (2009-2015)	**4.8**	**4.6**	**4.4**	**4.5**	**4.5**	**4.9**	**4.5**	**4.9**	**3.8**	**4.3**	**3.9**	**4.5**
2009	4.8	4.4	4.3	ND	4.6	4.9	4.7	5.0	3.8	3.6	3.3	4.2
2010	4.7	4.7	4.6	ND	4.2	4.9	4.4	4.8	3.8	4.1	4.0	4.3
2014	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	4.0	4.0
2015	4.8	4.5	4.3	4.5	4.6	4.8	4.5	5.0	4.0	4.7	4.2	4.8

Table 5.13 Alumni Survey: Level of satisfaction with preparation in the outcome skills.

	A	B	C	D	E	F	G	H	I	J	K	L
Average (2009-2015)	**4.6**	**4.1**	**3.7**	**4.3**	**3.6**	**4.3**	**3.6**	**3.7**	**3.5**	**3.6**	**3.3**	**4.1**
2009	4.8	3.9	3.8	-	3.3	4.1	3.6	3.8	3.4	3.3	2.8	4.1
2010	4.4	4.1	3.1	-	3.1	3.9	3.6	3.6	3.1	3.6	3.3	3.6
2014	5.0	5.0	4.0	5.0	4.0	5.0	4.0	4.0	5.0	4.0	5.0	5.0
2015	4.6	4.2	3.7	4.1	3.7	4.4	3.5	3.8	3.4	3.6	3.3	4.2

5.2.1.4 EMPLOYER SURVEY

The responses to question regarding the assessment of the program outcomes in the Employer Survey (Table 5.14) indicated satisfaction in all areas of the training.

Table 5.14 Employer Survey of Importance and Level of Satisfaction with Preparation in the Outcome Skills (2009-2015)

Outcome		Importance	Level of Satisfaction
A.	Apply mathematics, science and engineering principles	4.9	4.9
B.	Design and conduct experiments and interpret data	4.7	4.7
C.	Design a system, component, or process to meet desired needs	4.5	4.5
D.	Understand structure-property-processing relationships in metallic materials	4.5	4.3
E.	Function on multidisciplinary teams	4.9	4.8
F.	Identify, formulate, and solve engineering problems	4.6	4.4
G.	Understand professional and ethical responsibility	4.9	4.8
H.	Communicate effectively	4.1	4.2
I.	Understand the impact of engineering solutions in a global context	4.2	4.2
J.	Recognize the need for and to engage in life-long learning	4.2	4.2
K.	Know contemporary issues	4.6	4.6
L.	Use the techniques, skills, and modern engineering tools necessary for engineering practice	4.4	4.4

5.2.1.5 EXIT INTERVIEWS

The responses to question regarding the assessment of the program outcomes in the Employer Survey (Table 5.15 5.16 and 5.17) indicated satisfaction in all areas of the training.

Table 5.15 Assessment of Outcomes (Scale of 1-5), Ratio of Importance in Career to How Well the Department Prepared You

	2009/10	2010/11	2011/12	2013/14	2014/15	All Years

	imp.	prep.	imp.	prep.	imp.	prep.	imp.	prep.	imp.	prep.	imp.	prep.
Outcome A	4	4	4	4	4.8	4.4	5	4	5.0	4.8	4.7	4.4
Outcome B	4.5	4	5	3	3.6	4	5	3	5.0	4.8	4.4	4.1
Outcome C	3.5	4	4	3	4	3.8	4	3	4.8	4.0	4.2	3.8
Outcome D	ND	ND	ND	ND	ND	ND	5	5	4.8	4.3	4.8	4.4
Outcome E	3	4	4	3	4.6	3.4	5	5	5.0	4.8	4.5	4.0
Outcome F	4.5	3.5	5	4	3.8	4	5	4	4.8	3.8	4.4	3.8
Outcome G	3	3	4	4	4.2	2.6	4	3	5.0	4.5	4.2	3.4
Outcome H	4	3.5	5	4	4.4	3.8	5	3	3.8	4.0	4.2	3.8
Outcome I	3	4.5	4	4	2.4	3.4	4	5	4.8	4.5	3.5	4.1
Outcome J	4	4	4	4	3.8	3.8	5	5	4.8	4.5	4.2	4.2
Outcome K	3.5	3.5	5	4	3.2	3.4	5	4	5.0	4.3	4.1	3.8
Outcome L	4	5	4	4	4	3.8	5	4	4.8	4.8	4.3	4.1

*No senior exit interviews were done in 2012/13.

ND- No data available

Table 5.16 Course Assessments from Exit Interviews (Scale of 1 to 5)

	2009-2015
REQUIRED COURSES	
MET E 1610 Introduction to Extractive Metallurgy	3.9
MET E 1620 Introduction to Physical Metallurgy	4.2
MET E 3070 Statistical Methods in Earth Sci & Eng	4.0
MET E 3220 Material and Energy Balances	3.9
MET E 3500 Fluid Flow	3.1
MET E 3530 Experimental Techniques in Metallurgy	3.9
MET E 3620 Thermodynamics and Phase Equilibria	4.2
MET E 5260 Physical Metallurgy I	3.9
MET E 5450 Mechanical Metallurgy	4.0
MET E 5670 Mineral Processing I	2.9
MET E 5680 Mineral Processing II	3.1
MET E 5690 Process Engineering Statistics	4.0
MET E 5700 Hydrometallurgy	3.5
MET E 5710 High Temperature Chemical Processing	3.5
MET E 5750 Rate Processes	4.0
MET E 5760 Process Synthesis, Design & Econ	3.6
MET E 5780 Metals Processing	4.0
MET E 5830 Senior Project	3.9
ELECTIVE COURSES	
MET E 5210 Nuclear Materials	3.8
MET E 5240 Transmission Electron Microscopy	3
MET E 5270 Powder Metallurgy	4
MET E 5280 Magnetic Materials & Devices	

MET E 5290	Nanoscience and Technology	4.2
MET E 5300	Alloy & Material Design	5
MET E 5600	Corrosion Fundamentals	2
MET E 5660	Surfaces and Interfaces	
MET E 5800	Special Topics in Metallurgical Eng	
	(i) Industrial Internship	
	(ii) Other-Specify	

*New course

Table 5.17 Satisfaction with the Department

	On a scale of 1 to 5
2009/10	4
2010/11	4
2011/12	4.5
2012/13	ND
2013/14	4
2014/2015	4.8
Mean (2009–2014) Normalized to number of respondents	4.4

5.2.2 Assessment Summary

Course Management Survey input was obtained from the faculty for each departmental course. For quantitative assessment, contribution to each of the outcomes (A to L) by each course is assigned by the instructor on a scale of 0 to 6. The total contribution to each outcome from all the courses is obtained by adding all these units, weighted for credit-hour assignment of each of the courses and the total units assigned for the outcomes by the instructor of each course. Results of the survey are shown in Tables 5.2 to 5.6. The survey and its assessment indicate that the curriculum is resulting in the outcomes expected from the program.

Course evaluations are used to constantly assess and improve the individual courses. The Department Chair monitors these evaluations and communicates to the faculty whenever any specific changes are needed. The average ratings of for satisfaction with respect to various outcomes are above 5 on a scale of 1 to 6 as shown in Tables 5.7, 5.8 and 5.9.

Alumni, Advisory Committee, employer, and senior exit surveys provided qualitative inputs on satisfaction with the program offerings, quantitative inputs regarding the program outcomes, and the needed improvements to the program. All of these surveys indicate a high level of satisfaction regarding the nature of curriculum and the performance of the graduates in industry.

The alumni survey indicated assessment scores in the range of 3.4 to 5.0 for various program outcomes on a scale of 1 to 5, with 5 indicating maximum satisfaction and 1 indicating least satisfaction. The alumni assessment of courses offered by the department indicates satisfaction with ratings in the range of 3.0 to 4.6 on a scale of 1 to 5. Many of the suggested changes or improvements to existing courses or new courses were already in place by the time of the survey. (See Tables 5.10 to 5.13.)

Employer surveys gave assessment scores in the range 3.5 to 5 and average 4.25 over various outcomes (Table 5.14).

The exit interviews indicated an overall satisfaction with the program offerings (4 to 4.5, on a scale of 1 to 5) (Tables 5.15-5.17). The exit interview assessments of core courses offered by the department indicate satisfaction with ratings in the range of 2.5 to 3.7 on a scale of 1 to 5. All the graduates of the program have found gainful employment. The curriculum has been constantly changed so that many of the suggestions in general have already been implemented.

The assessment of the department for undergraduate and graduate education by the graduate council in 2010 was excellent.

The instructors of the department's courses are very experienced educators and highly accomplished researchers. The averages of course evaluations and the instructor ratings are very high in general, 5.32 and 5.24 respectively, on a scale of 1 to 6. Many of the courses are well established, and continuously updated and enhanced, providing the students the best educational experience. Overall the students express satisfaction with the curriculum, and any concerns expressed by students are addressed as appropriate. Any changes made in the curriculum and methods of instruction affecting various outcomes are addressed for each outcome, as summarized in Figures 5.2 and 5.3.

5.3 Degree Completion Data

See Table 5.18 for graduate degree completion/attrition data.

Table 5.18 Graduate Degree Completion/Attrition Data, Department of Metallurgical Engineering 2009-2016

Entering Student Cohort Academic Year	Students admitted to master's program	Students admitted to doctoral program	Students who changed to doctoral without completing masters	Students who changed to masters without completing doctoral	Students who left before completing master's degree	Students who completed master's degree	Students who left before completing doctoral degree	Students who completed doctoral degree	Average time to complete master's degree (years)	Average time to complete doctoral degree (years)	Students remaining in graduate programs
2009-10	7	13	2	2	0	7	0	13	3.14	4.1	0
2010-11	3	10	0	5	1	7	0	5	2.91	3.67	0
2011-12	4	10	2	3	0	5	1	6	2.47	3.83	2
2012-13	10	14	0	2	2	10	1	3	2.53	3.33	8
2013-14	5	10	0	0	2	2	1	2	2.5	3.0	8
2014-15	5	10	0	1	0	1	0	0	1.0	–	14
2015-16	7	9	0	2	1	0	1	0	–	–	14

5.4 Employment

All of the undergraduate students graduated so far have found good employment within about three months of graduation with the current national average starting salary of over $57,000/year. Local companies in Utah hiring our graduates include Kennecott Copper, ASARCO, US Magnesium Corporation of America, Western Zirconium, ATK Launch Systems, Intel-Micron Flash Technologies, and other small companies located around the Salt Lake City area. In Table 5.19, statistics of undergraduate students with the degree and the year of graduation as well as the initial or current place of employment are provided. All of the graduate students have successfully found gainful employment in industry, government, or faculty/postdoctoral positions in the US or in their home countries; see Table 5.20.

5.4.1 Undergraduate Student Employment

Table 5.19 Initial or Current Employment or Placement of Bachelor's Degree Graduates

Student	Year Graduated	Initial or Current Employment or Placement
Carlson, Nathan Edward	2010	Boart Longyear
Helsten, Tyler Jason	2010	University of Utah Graduate School
Marshall, Megan Jane	2010	Rio Tinto, Salt Lake City
Tucker, Tyler Keith	2010	Lisbon Valley Mining Co., La Sal, Utah
Lefler, Michael Don	2011	FLSmidth
Ludwig, Matthew Craig	2011	Freeport McMoran
McAllister, Justin Paul	2011	Rio Tinto, South Jordan, Utah
Morrison, Ryan Cannon	2011	ATI Allegheny-Ludlum
Randall, Brent Ronald	2011	FLSmidth
Taylor, David Allen	2011	Proc. Eng. Res., Salt Lake City, Utah
Burak, Adam Joseph	2012	Univ. of Utah Metallurgical Engg. graduate program
Crossman, Randall Joseph	2012	Rio Tinto (T&I)
Derrick, Alexander T	2012	MS 2016, FLSmidth, Salt Lake City, Utah
Hardin, Neal David	2012	California Steel Industries,Rancho Cucamonga, CA
Henline, Colton	2012	Edwards Lifesciences
Jurovitzki, Abraham Leizer	2012	MS 2015. Commercial Metals Company, Texas
Randall, Danielle	2012	American Prep. Acad., Utah

Student	Year Graduated	Initial or Current Employment or Placement
Zerai, Yousef Mahmoud	2012	Kuwait
Howell, Brady James	2013	_____,Clinton, Utah
Khorsheed, Hussain Abbas	2013	Kuwait
Wilson, Blaine E.	2013	Robinson Nevada Mining Co., Ruth, Nevada
Dunstan, Matthew Kirk	2014	Univ. of Utah Metallurgical Engg. graduate program
Horvath, David Christopher	2014	Univ. of Utah Metallurgical Engg. graduate program
Khajah, Ahmad Baqer	2014	Kuwait
Schang, Kari Loraine	2014	Alcoa, Davenport, Iowa
Alnaser, Husain FFHS	2015	Univ. of Utah Metallurgical Engg. graduate program
Anglesey, Brandon Cloyde	2015	Univ. of Utah Metallurgical Engg. graduate program
Azbill, Daniel David	2015	To join BYU Graduate School
Colburn, Kevin David	2015	Univ. of Utah Business School
Lefler, Hyrum David	2015	Univ. of Utah Metallurgical Engg. graduate program
Nakhee, Ali A.	2015	Kuwait
Rou, Somnaang	2015	Univ. of Utah Metallurgical Engg. graduate program
Thompson, Benjamin Clyde	2015	Hill Airforce Base, Ogden, Utah
Allred, Colton Ryan	2016	
Alnajjar, Nora Walid	2016	University of Utah Metallurgical Engg. MS program
Ganbat, Tuvshinbat	2016	Rio Tinto, Mangolia
Gonzalez, Mario Alberto	2016	Univ. of Utah Metallurgical Engg. MS program
Jamieson, Andrew Scott	2016	University of Virginia Graduate School
Kergaye, Omar Sami	2016	Univ. of Utah Metallurgical Engg. MS program
Lark, Alexander Raymond	2016	Univ. of Utah Metallurgical Engg. MS program
Laroche, Richard Andrew	2016	Univ. of Utah Metallurgical Engg. MS program
Marshall, Urian Spencer	2016	Farmington, Utah
Tsogdelger, Chimedyudon	2016	Rio Tinto, Mangolia
Wendel, Jared Steven	2016	Brahma Construction, Refractory Division

Student	Year Graduated	Initial or Current Employment or Placement
Willhard, Travis Paul	2016	Univ. of Utah Metallurgical Engg. MS program

5.4.2 Graduate Student Employment

Table 5.20 Initial or Current Employment or Placement of Master's or Doctoral Degree Graduates

Student	Year Graduated	Degree	Advisor	Initial or Current Employment or Placement
Choi, Jin Won	2009	PhD	Sohn	Korean Air Force
Dyussekenov, Nurzhan	2009	MS	Sohn	Indotech?, Salt Lake City Astana, Kazakhstam
Gupta, Priyank	2009	MS	Moats	India
Khouraibchia, Youness	2009	MS	Moats	Freeport McMoRan
Mahapatra, Amrita	2009	MS	Miller	FLSmidth, Salt Lake City
Paruchuri, Vamsi K	2009	PhD	Miller	IBM Research @ Albany Nanotech, Albany, NY
Saurabh, Swadhin	2009	MS	Rajamani	FLSmidth
Wang, Jei-Pil	2009	PhD	Cho	Pukyong National University in Busan, Korea
Butler, Brady G	2010	MS	Fang	US Army Research Laboratory, Maryland
Choi, Young Joon	2010	PhD	Sohn	Global Foundries, Clifton Park. NY
Choi, Moo Eob	2010	PhD	Sohn	POSCO, S. Korea
Garside, Gavin J	2010	PhD	Guruswamy	SPACEX Corporation, Los Angeles
Goneguntla, Harini Naidu	2010	MS*	Rajamani	James Hardie, Fontana, California
Zhang, Haibo	2010	PhD	Fang	Megadiomond, Orem, Utah
Kodali, Phanindra	2010	MS	Miller	Mineral Park Mine, Kingman. AZ
Pinegar, Haruka Kimura	2010	MS	Sohn	Rio Tinto, SLC, Utah
Sarswat, Prashant K	2010 2012	MS PhD	Free	University of Utah, Metallurgical Engineering research faculty

Student	Year Graduated	Degree	Advisor	Initial or Current Employment or Placement
Shitole, Shamita Anil	2010	MS	Free	University of Utah MSE
Tuzcu, E. Tugcan	2010	PhD	Rajamani	DAMA Engineering, Head of Mining & Metallurgy Dept., Ankara, Turkey
Wang, Hongtao	2010	PhD	Fang	Engineer/Scientist, Kennametal, Rogers. Arkansas
Warner, Nathan T	2010	MS	Free	IM Flash Technologies, Lehi, Utah
Xu, Wenjing	2010	MS	Miller	Unknown
Alkac, Dilek	2011	PhD	Rajamani	Metso Minerals, Colorado Springs. Colorado
Chang, Paul N.	2011	PhD	Chandran	Advanced Ceramic Corporation, Arizona
Gao, Yubo	2011	MS	Sohn	_____.Salt Lake City, Utah
Guo, Jun	2011	PhD	Fang	Federal Carbide, Tyrone, PA
Gupta, Vishal	2011	PhD	Miller	EP Minerals, Nevada
Hwang, Su Hyun	2011	MS	Sohn	
Kumar, Vineet	2011	PhD	Fang	Kennametal, Latrobe. Pennsylvania
Liu, Sarah	2011	MS	Sohn	Arcelor Mittal, East Chicago. Indiana
Phipps, Tim Aaron	2011	ME	Moats	Westec, Salt Lake City, Utah
Sarma, Biplab	2011	PhD	Chandran	Shaw Nap Tech, Utah
Thimmegowda, Deepak	2011	PhD	Guruswamy	Intel-Micron, Fremont. California
Wampler, Heather A	2011	ME	Moats	_____Albuquerque. New Mexico
Wang, Haitao	2011	PhD	Sohn	Heavystone LLC, SLC, Utah
Bagri, Prashant	2012	MS	Moats	University of Utah Metallurgical Engineering PhD program
Elnathan, Francis	2012	PhD	Moats	Freeport McMoran
Hsieh, Ching-Hao 'Ken'	2012	MS	Miller	Swiss Ray
Janwong, Adirek	2012	PhD	Moats	Electrometals
Kar, Soumya	2012	PhD	Free	Intel Corp., Hillsboro. OR
Marino, Sandro L	2012	MS	Miller	Interfusao, Sao Paulo SP, Brazil

Student	Year Graduated	Degree	Advisor	Initial or Current Employment or Placement
Medina, Juan Francisco	2012	PhD	Miller	CiDRA Minerals Processing, Wallingford, Connecticut
Opara, Aleksandra	2010 2012	MS* PhD*	Miller Adams	Indotech?, Salt Lake City
Ramanathan, Meenakshisundaram	2012	PhD	Guruswamy	Intel Corp., Portland, Oregon
Ren, Chai	2012	PhD	Guruswamy	Univ. of Utah Metallurgical Engg. Postdoc
Saha, Biswadeep	2012	PhD	Guruswamy	Intel Corp., Portland, Oregon
Vethosodsakda, Thien	2012	MS	Free	Freeport McMoran, Safford, Arizona
Yin, Xihui	2012	PhD	Miller	Kemira, Brookhaven, Georgia
Bhattacharyya, Dhiman	2013 2016	MS PhD	Miller Misra	Intel, Portland, Oregon
Chitta, Pallavi	2013	PhD	Guruswamy	Ceramatec
Dhawan, Nikhil	2013	PhD	Rajamani	Assistant Professor, Indian Institute of Technology – Roorkee, Uttarakhand State, India
Emami, Samar	2013	PhD	Sohn	USG, Libertyville, Illinois
Harding, David P	2013	PhD	Fang	Diamicron, Orem, Utah
Ilunga Tshibind, Alex	2013	MS	Misra	Freeport McMoran Inc., Safford, Arizona
Jagannathan, Madhusudan	2010 2013	MS PhD	Chandran Chandran	IM Flash Technologies, Lehi, Utah
Kim, Younghwan	2013	MS	Misra	Tech Holdings, Salt Lake City
Liu, Bo	2013	MS	Fang	Argonne National Lab.
Mejia, Joel Alejandro	2013	MS	Miller	Unknown-, Morgantown, West Virginia
Mohassab Ahmed, Mohassab Yousef	2011 2013	MS PhD	Sohn Sohn	University of Utah, Metallurgical Engineering postdoc
Olivas-Martinez, Miguel	2013	PhD	Sohn	US Steel Corp., Pittsburgh, Pennsylvania
Pan, Bo	2013	MS	Miller	Unknown, Columbia, Maryland

Student	Year Graduated	Degree	Advisor	Initial or Current Employment or Placement
Safarzadeh, M Sadegh	2013	PhD	Moats	South Dakota School of Mines & Technology, Rapid City SD
Sarkhosh, Tooba	2013	MS	Rajamani/ Misra	Princeton University, New Jersey
Shukla, Abhijeet	2013	MS	Free	Intel, Portland, Oregon
Singh, Rahul	2013	ME	Rajamani	Freeport McMoRan, Phoenix, Arizona
Yuan, Zhixue	2013	MS	Sohn	Hazelett Strip-Casting Corporation, Colchester, Vermont
Zhu, Liangzhu	2013	PhD	Sohn	Univ. of Utah, SLC, Utah
Chambers, Amy Jo	2014	MS	Moats	Simplot, Pocatello, Idaho
Crossman, Raquel	2014	MS	Miller	Freeport McMoran, Arizona
Li, Jingzhu	2014	MS	Fang	NOV,The Woodlands, Texas
Middlemas, Scott C.	2014 2009	PhD BS	Fang	US Army Research Laboratory, Aberdeen Proving Ground, Maryland
Neff, Jason Lee	2014	MS	Guruswamy	IHC, Washington, Utah
Peoples, Michael J	2014	MS	Miller	Univ. of Utah Metallurgical Engg.
Rashidi, Samira	2014	PhD	Rajamani	ThyssenKrupp Industrial Solutions (USA), Inc., Atlanta, Georgia
Robison, Mark R.	2014	MS	Free	U.S. Air Force, Clearfield, UT
Smith, York Reed	2014	PhD	Misra	Univ. of Utah Metallurgical Engg. faculty
Tahvilian, Leila	2014	PhD	Fang	Ford Motor Co., Michigan
Wang, Zuoxing	2014	MS	Miller	Unknow, Salt Lake City, Utah
Yao, Xian	2014	PhD	Fang	RDM, LLC, Draper, Utah
Zhang, Xia	2014	PhD	Miller	Freeport McMoran, Morenci, Arizona
Bhattacharyya, Anirban	2014	MS	Rajamani	Intel, Portland OR
Bronson, Tyler M.	2015	PhD	Sohn	Los Alamos National Lab, Los Alamos, New Mexico
Gu, Lin	2015	MS	Fang	China Offshore Oil Co.

Student	Year Graduated	Degree	Advisor	Initial or Current Employment or Placement
Jurovitzki, Abraham	2015 2012	MS BS	Simpson	Commercial Metals Company (CMC Texas), Texas
Liu, Jing	2015	PhD	Miller	Robinson Mine, Ely, Nevada
Luo, Xiangyi	2015	PhD	Fang	Argonne National Lab.
Paramore, James D	2015	PhD	Fang	Orise, Fellow, United States Army Research Laboratory, Aberdeen Proving Ground, Maryland
Sun, Pei	2015	PhD	Fang	University of Utah Metallurgical Engineering Research Assoc.
Tserendagva, Tsend-Ayush	2015	PhD	Miller	Cytec, Stamford, Connecticut
Wahbah, Eman	2015	MS	Misra	University of Utah, Metallurgical Engineering graduate program
Yang, Lu	2015	MS	Fang	University of Utah Metallurgical Engineering, Research Assistant
Zhou, Chengshang	2015	PhD	Fang	University of Utah, Post-docoral Associate
Zhu, Yakun	2013 2015	MS PhD	Free	Ohio State University, Columbus, Ohio
Appusamy, Kanagasundar	2016	PhD	Guruswamy	Intel, Portland, Oregon
Bhattacharyya, Dhiman	2016	PhD	Misra	Intel, Portland, Oregon
Derrick, Alexander	2016 2012	MS BS	Free	FLSmidth, Salt Lake City, Utah
Dholu, Nakul	2016	MS	Rajamani	Freeport McMoRan Technology Center, Phoenix, Arizona
Feng, Haidong	2016	MS	Miskovic	_____Salt Lake City Utah
Jin, Jiaqi	2016	PhD	Miller	Barrick Gold,
Rappleye, Devin	2016	PhD	Simpson	Lawrence Livermore National Laboratory, California
Wang, Yan	2016	PhD	Miller	Postdoc, Univ. of Utah