COLORADO SCHOOL OF MINES
EARTH • ENERGY • ENVIRONMENT

Office of Academic Affairs
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April 28, 2017

To: Faculty Senate

Re: Response to Productivity Recommendations

Dear Faculty Senators,

Please find below detailed responses to the emeritus queries you provided me in your communication of April 11, 2017. I would be more than happy to discuss these further if you so desire. Also, please feel free to distribute this communication as you see appropriate.

Below, in bold, I list the Senate's emeritus questions verbatim followed by my responses. These responses have been informed by input from the Deans.

Thanks…

Sincerely,

Thomas M. Boyd
Interim Provost

1. Deans and Department Heads should work with their departments to develop productivity/workload guidelines that are appropriate for each discipline, noting that programs vary widely in their enrollments.

While I tend to disagree with this approach, primarily because I believe it is less flexible than what we have proposed with a straight SCH metric, construction of a number of classes metric consistent with Handbook language can be constructed. In the revised presentation, slides 13 through 15, I have constructed background material that includes guidance to Deans and DHs on minimum course load requirements. These requirements are consistent with Faculty Handbook, establish minimum enrollment requirements consistent with the Productivity matrix, and provide class size incentives for tenured faculty who are highly productive in terms of "scholarship." I note explicitly in this construction that, following the guidelines implicit in the Productivity matrix, I would allow highly productive faculty to reduce their course load commitments to 1+1, without the need to generate academic year charge out as required by the Handbook - an additional incentive and reward for our highly productive faculty.

2. Teaching should primarily be quantified by number of classes along with appropriate expectations for class sizes.

While I tend to disagree with this approach, primarily because I believe it is less flexible than what we have proposed with a straight SCH metric, construction of a number of classes metric consistent with Handbook language can be constructed. In the revised presentation, slides 13 through 15, I have constructed background material that includes guidance to Deans and DHs on minimum course load requirements. These requirements are consistent with Faculty Handbook, establish minimum enrollment requirements consistent with the Productivity matrix, and provide class size incentives for tenured faculty who are highly productive in terms of "scholarship." I note explicitly in this construction that, following the guidelines implicit in the Productivity matrix, I would allow highly productive faculty to reduce their course load commitments to 1+1, without the need to generate academic year charge out as required by the Handbook - an additional incentive and reward

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for our highly productive faculty.

3. Any measure of research should include publications (and quality of publications).

In units with active graduate programs and support through externally sponsored research activities, to be successful at Mines the unit as a whole must engage a broad range of activities. The Productivity matrix defines three components that are fundamental, but not exclusive, to this success: graduate student mentoring, success in external fundraising, and significant and impactful instructional activities. In addition, within these units faculty must also dedicate significant effort to things like management of graduate students and graduate programs, management of sponsored research dollars and creation of sponsored research reports, and publication and dissemination of research findings, to name a few. All of these activities are critical to unit success, all are important components of a faculty member's annual review process, and all are important components in the P&T process as defined by the Senate's P&T expectations document that is now part of the Academic Affairs procedures manual. For the unit, however, using measurements of SCH, amount of external research support, and number of graduate advisees is not an unreasonable proxy for the sum total of activities in which faculty engage. For example, while publications are not explicitly included, it would be difficult for the unit as a whole to be successful in recruiting graduate students or securing external funds without successful dissemination of its research activities.

In units that do not have graduate programs or can not raise externally sponsored research, I agree that the metrics used in the Productivity matrix (i.e., dollars and graduate advisees) are not appropriate measures of the level of "scholarship" being done in the unit. Deans have full authority to work with Department Heads to define additional, appropriate metrics to measure the level of "scholarship". As a boundary condition, however, I note that faculty in units with graduate programs and externally sponsored research engage in numerous activities that go beyond personal scholarship and publications. In a unit where funding for graduate students is not a prerequisite for conducting scholarly activities, many of the associated activities that accompany funded scholarship are not required. In such units, it is reasonable to then expect additional teaching or service activities from faculty. Equitability of expectations across units requires that we define expectations in units without graduate programs or externally sponsored research that recognize the additional efforts of these faculty and defines local expectations accordingly. As provided below, I encourage the Faculty Senate to engage in this discussion and provide Academic Affairs substantive and specific recommendations on this particular issue. In the absence of this, the Deans and Provost will be defining these expectations.

4. Productivity/workload guidelines must be aligned with Promotion and Tenure expectations.

Both quantity and quality of instruction, graduate student mentorship, and external fund raising are cornerstone expectations for promotion and tenure of faculty in units that have graduate programs and in which faculty have the expectation of raising external research support. As such, the Productivity matrix, while not being inclusive of all expectations, is aligned with several fundamental P&T expectations. In addition, the Senate produced a P&T expectations document that is now a part of the Procedures Manual that defines additional metrics used in evaluating candidate qualifications for promotion and/or tenure. Given that many of these metrics focus on the impact of activities in which a faculty member engages: e.g., teaching quality, publication impact, patents, invention disclosures, etc., I contend that the two documents, Productivity and P&T Expectations, are complementary in their focus to a faculty member's contributions to the institution, its students, and their discipline. The former document speaks to equity of workload while the latter document speaks to quality of contribution. While I know the Senate disagrees, I would argue that the development and application of both of these documents does in fact provide holistic guidance to faculty as to how they can be successful both internally and externally as they move forward in their careers at Mines. Indeed, the development of the P&T Expectations document, the Productivity model, the Budget Allocation model, and the Incentive model were all deliberately, seriously, and conscientiously considered as a unified and holistic

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approach to improving our processes, informed by each other and by the reality of the budget model we live under.

5. Productivity/workload models should be holistic and include all of the components that make a university successful. A committee should be formed to clarify what these components should be at Mines, and how they could be weighted.

While the Senate disagrees, as I mention above, I believe the four-component approach that I have advocated is in fact holistic in nature. Within this context, however, fundamental to a fair and equitable establishment of expectations for faculty across the institution is the establishment of the types and levels of activity that we use to determine whether or not a tenured faculty member is in fact "research active." In establishing teaching expectations, the Faculty Handbook provides reduced teaching expectations for faculty who are engaged in "scholarship" activities. The type and level of the activities that qualify as "scholarship" are undefined. As such, my observation is that virtually every tenured faculty member, regardless of the activities in which he or she engages believes he or she should qualify for reduced teaching loads because their "scholarship" activities are at such a level as to qualify them as being "research active," and vigorously argues this point with their Department Heads if asked to take on additional teaching responsibilities.

Given the course load mapping the Senate has requested and I have defined in the revised presentation, in units with graduate programs and the possibility of raising external support for these programs, the Productivity matrix defines "research active" faculty as those with total annual research expenditures of greater than $100k and 2 or more graduate students. That is, this is the level of activity that would qualify a faculty member for the 2+2 teaching load defined in the Faculty Handbook as appropriate for faculty engaged in "Teaching, Scholarship, and Service." Within these units, this level of activity is not an unreasonable expectation, and I would contend this level of activity is broadly applicable to units that have highly varied levels of funding opportunities and program sizes.

The difficulty is establishing appropriate and equivalent (both in impact and effort) expectations for faculty in departments that do not have graduate programs or can not raise external funds to support those programs. In this sense, I agree that the approach being proposed must be more holistic so that it can be applied more directly to these units. While I expect Deans and Department Heads to engage in a conversation that establishes appropriate expectations in these units, I would also encourage the Faculty Senate to form such a committee and provide substantive/concrete recommendations on, or specific alternatives to, the campus-wide productivity/workload model that we have been discussing across campus for the past year.

Productivity Guidelines and University Design Initiative

Tom Boyd
Interim Provost

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Moving the Institution Forward: A Four Component Approach

- Budget Model
  - Speaks to: **Resource allocation**, programmatic incentives, strategic intent (align resource deployment, expand resource base, drive program development)
- Promotion & Tenure Expectations
  - Speaks to: **Quality**, faculty incentives, strategic intent (faculty scholarship, curriculum development and delivery, institutional and professional service)
- Productivity Guidelines
  - Speaks to: **Quantity**, resource utilization and deployment, strategic intent (sponsored research, student scholarship, curriculum delivery)
- Holistic University Design
  - Speaks to: **Strategic Intent**, programmatic priorities (development, size, resources, support)

Faculty Productivity Guidelines - Intent

- Define transparent, equitable, and sustainable expectations for faculty across the institution
- Recognize activities that build institutional reputation
  - faculty engagement in quality instruction
  - PhD enrollment and scholarly activities
  - externally sponsored research
- Provide Provost and Deans mechanism to manage unit-level expectations
- Provide DHs a tool to better manage departmental resources
- Guide analysis and resourcing for University Design process

History of Faculty Productivity Guidelines Actions and Discussion

Historic Context

- 1999 – Creation of Faculty Handbook that defines Teaching, Scholarship and Service, and includes Teaching Assignment Guidelines
- Indeterminate – Undocumented policy requiring minimum registration for courses (5 – 10)

Current Effort

- Spring and Summer 2015 – Lack of consistency in research and SCH productivity identified as potential issue by faculty-led Research Task Force
- August 2015 – Faculty Conference, discussion of Task Force observations with broader campus community
- Fall 2015 – President distributes ASU productivity guidelines to Provost, Deans and DHs and asks for input
- Spring 2016 – DHs appoint subcommittee to review ASU guidelines and propose Mines-specific revisions. Faculty Senate provides administration guiding principles document
- Summer 2016 – Provost and Deans review DH task force recommendations, Senate document and present revised guidelines at Campus Conference
- Fall 2016 – Provost and DHs review and discuss Conference input, Provost presents to DHs newly revised set guidelines and collect further DH input
- December 2016 – Board input and discussion
- January 2017 – Senate input and discussion

Teaching Assignment Guidelines: Faculty Handbook Definition

- Defined in Handbook Section 6.1.2
- Presumed most tenured faculty distribute effort between, teaching, scholarship, and service (Section 6.1.1)

"The following table sets forth guidelines for the teaching assignments per semester applicable to tenured, tenure-track, and instructional faculty...

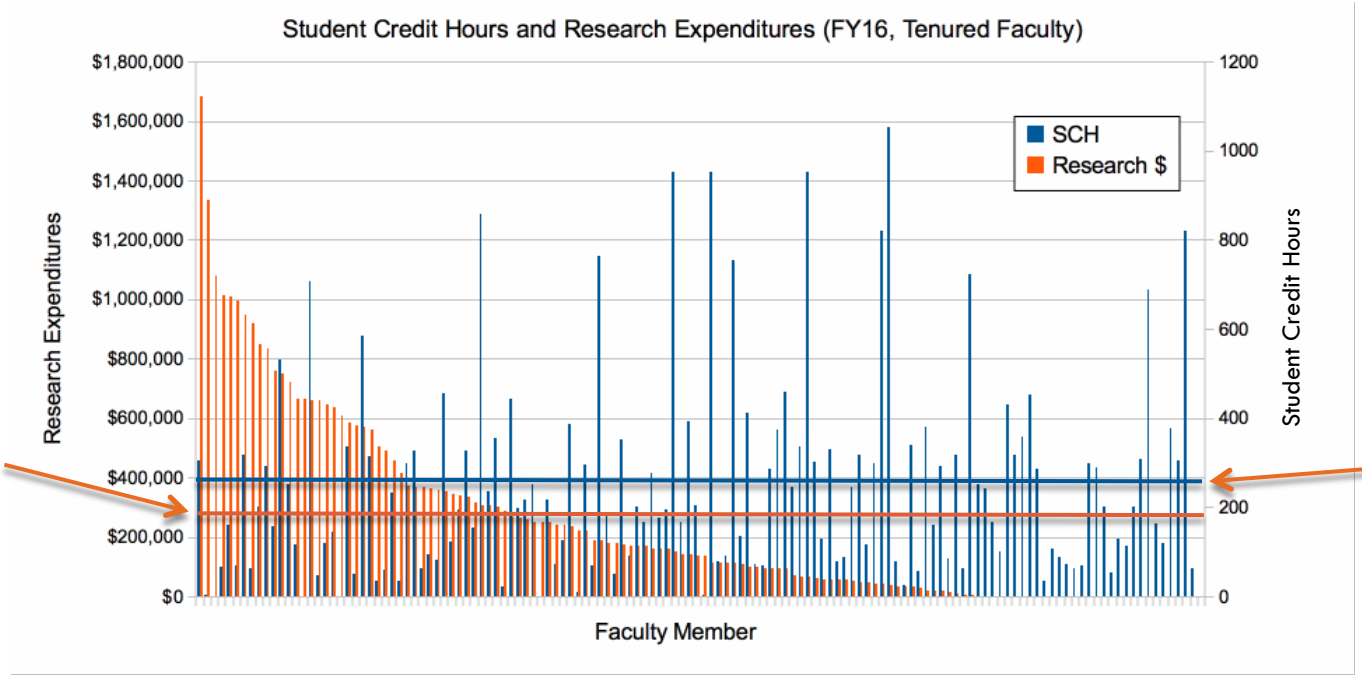
Total Assignment	Recommended Teaching Component
Teaching Only	12 credit-hours per semester
Teaching and Service	9 credit-hours per semester
Teaching, Scholarship, and Service (no AYC)	6 credit-hours per semester
Teaching, Scholarship, and Service (maximum AYC)	3 credit-hours per semester

Many combinations of courses, labs, senior design sections, special problems, and load rearrangements can be used to meet the teaching assignment guidelines, and special consideration may be given to new faculty members as part of their Professional Growth Plans..."

- Note – Scholarship and service expectations are undefined. In addition, there is no explicit tie between credit hours and number of students (e.g., does teaching one 3 credit-hour special topic course to 2 students meet a 3 credit-hour requirement as defined above?)
- Different departments and different DHs interpret expectations locally.

Distribution of Productivity: Example, Tenured Faculty

Average Expenditure ($278,295)



Average SCH (266)

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Building New Productivity Guidelines: Evolution of the Proposed Guidelines

November, 2015

January, 2017

Current Effort

Per Faculty Research/Mentoring Productivity Target*	Per Faculty Instructional		
	Proposed	Avg.	CASE
Teaching Faculty***	720 SCH		
Tenured Faculty			
<$25K and 1 or fewer externally funded thesis-based graduate students	720 SCH	750	879
$25K - $100K and 1 - 3 externally funded thesis-based graduate students	540 SCH	462	452
$100K - $200K and 2 - 4 externally funded thesis-based graduate students	360 SCH	366	418
$200K - $400K and 4 or more externally	270 SCH	231	201
		5	220
		7	279
			two courses
		0	300	270	200

ASU

Criteria (external resource generation* and Ph.D. student mentoring)	Base Instructional Load Target Per Year** before Buy-Out or Adjustment for Leadership Contribution
All Faculty (tenured, tenure-track, teaching)	
<$25K and 1 or fewer externally funded Ph.D. students	720 SCH
$25K - $100K and 1 - 3 externally funded Ph.D. students	540 SCH
$100K - $200K and 2 - 4 externally funded Ph.D. students	360 SCH
$200K - $400K and 4 or more externally funded Ph.D. students	270 SCH
>$400K and 4 or more externally funded Ph.D. students	180 SCH
Tenure-Track Faculty	
0 – 2 Years	180 SCH (or two courses)
2 – 5 Years	270 SCH (or three courses)

* - funding can be from external grants, gifts, royalties, etc.

** - exclusive of graduate research, dissertation, thesis, and independent study hours

Campus Conference

Instructional Load Target (Student Credit Hours per AY)

Tenured Faculty

Annual Research Expenditures	Thesis and Dissertation Advisees (as primary advisor)			
	≤ 1	2 - 3	4 - 5	>5
<$25k	**720**	660	600	540
$25k - $100k	675	**540**	440	440
$100k - $200k	630	500	**360**	340
$200k - $400k	585	460	330	**240**
> $400k	540	420	300	**180**

Tenure-Track Faculty

0 - 2 Years in Position	180
3 - 5 Years in Position	240

Teaching Faculty

840

Proposed

Instructional Load Target (SCH per AY)

Tenured Faculty

Annual Research Expenditures	Thesis and Dissertation Advisees (as primary advisor)			
	≤ 1	2 - 3	4 - 5	>5
<$25k	**630**	525	472	420
$25k - $100k	525	**472**	367	315
$100k - $200k	472	367	**315**	262
$200k - $400k	420	315	262	**210**
> $400k	315	262	210	**157**

Tenure-Track Faculty

0 - 2 Years in Position	157
3 - 5 Years in Position	262

Teaching Faculty

720

Student Credit Hour	Number of Research-Based Students Advised										
	3	4	5	6	7	8	9	10	11
	$129,587	-$120,405	-$111,224	-$102,042	-$92,861	-$83,680	-$74,498	-$65,317	-$56,135
	$112,079	-$102,898	-$93,716	-$84,535	-$75,353	-$66,172	-$56,990	-$47,809	-$38,627
	$94,571	-$85,390	-$76,209	-$67,027	-$57,846	-$48,664	-$39,483	-$30,301	-$21,120
	$77,064	-$67,882	-$58,701	-$49,519	-$40,338	-$31,156	-$21,975	-$12,793	-$3,612
	$59,556	-$50,375	-$41,193	-$32,012	-$22,830	-$13,649	-$4,467	$4,714	$13,896
	-$42,048	-$32,867	-$23,685	-$14,504	-$5,322	$3,859	$13,041	$22,222	$31,403
360	-$52,085	-$42,903	-$33,722	-$24,541	-$15,359	-$6,178	$3,004	$12,185	$21,367	$30,548	$39,730	$48,911
420	-$34,577	-$25,396	-$16,214	-$7,033	$2,149	$11,330	$20,512	$29,693	$38,875	$48,056	$57,237	$66,419
480	-$17,070	-$7,888	$1,293	$10,475	$19,656	$28,838	$38,019	$47,201	$56,382	$65,564	$74,745	$83,927
540	$438	$9,620	$18,801	$27,983	$37,164	$46,346	$55,527	$64,709	$73,890	$83,071	$92,253	$101,434
600	$17,946	$27,127	$36,309	$45,490	$54,672	$63,853	$73,035	$82,216	$91,398	$100,579	$109,761	$118,942
660	$35,454	$44,635	$53,817	$62,998	$72,180	$81,361	$90,542	$99,724	$108,905	$118,087	$127,268	$136,450
720	$52,961	$62,143	$71,324	$80,506	$89,687	$98,869	$108,050	$117,232	$126,413	$135,595	$144,776	$153,958
780	$70,469	$79,651	$88,832	$98,014	$107,195	$116,376	$125,558	$134,739	$143,921	$153,102	$162,284	$171,465
840	$87,977	$97,158	$106,340	$115,521	$124,703	$133,884	$143,066	$152,247	$161,429	$170,610	$179,792	$188,973

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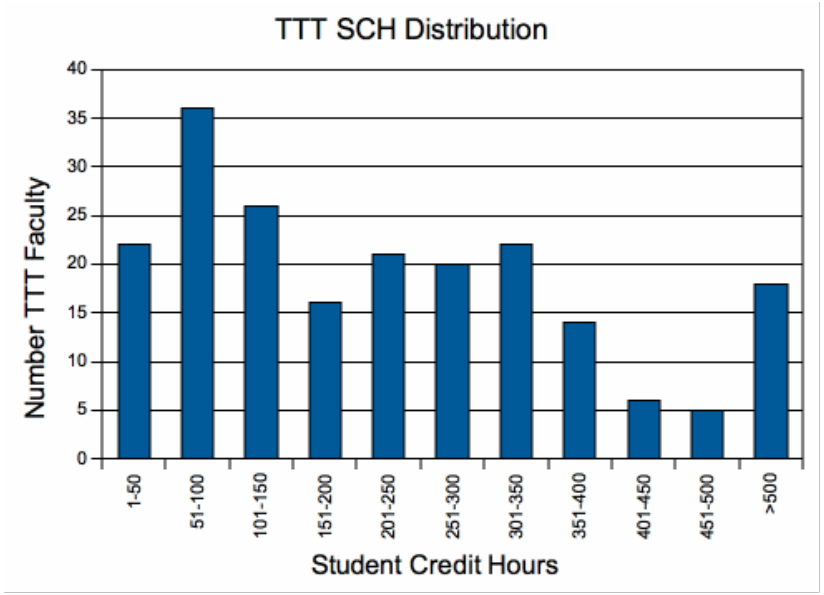
Productivity Baseline*: Where are we now?

- SCH / TTT (Avg : Median)
  - **266 : 198**
- SCH / Teaching Faculty
  - **958 : 654**
- Graduate Advisees / TTT
  - **4.7 : 3**
- Research Expenditures / TTT
  - **$278,295 : $148,353**



*AY 2016 academic metrics; FY 2016 financial metrics

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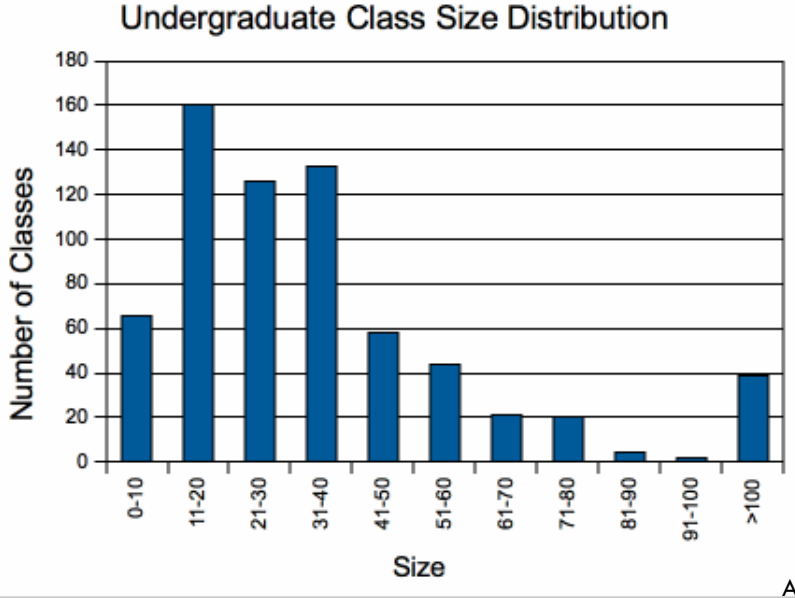
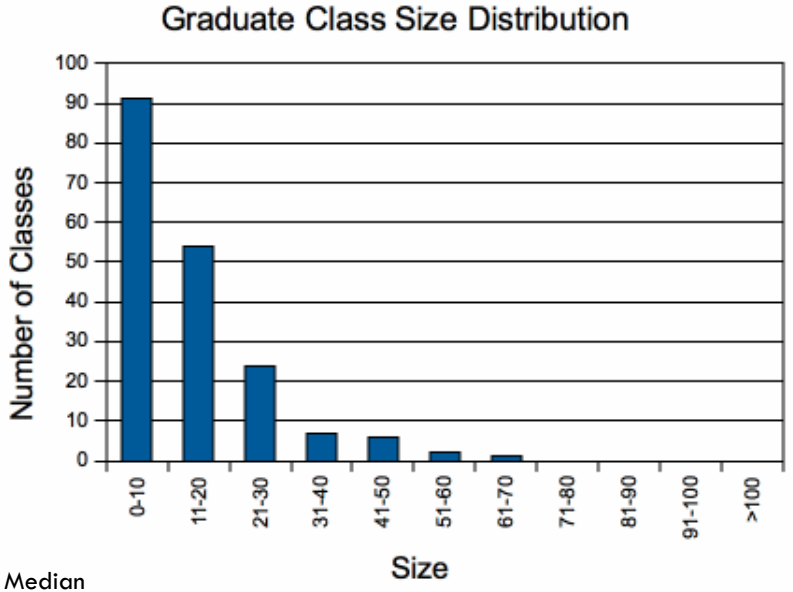
Class Size Baseline*: Where are we now?





Average : Median

- Overall – 32 : 25
- Undergraduate – 37 : 29
- Graduate – 15 : 11

*Fall, 2015

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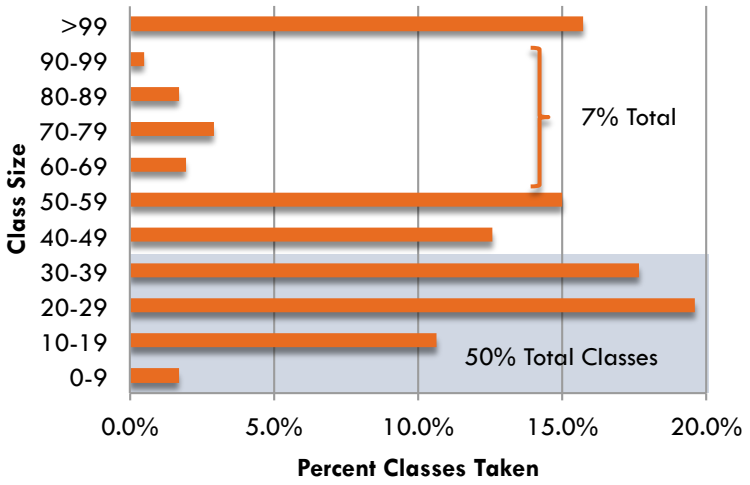
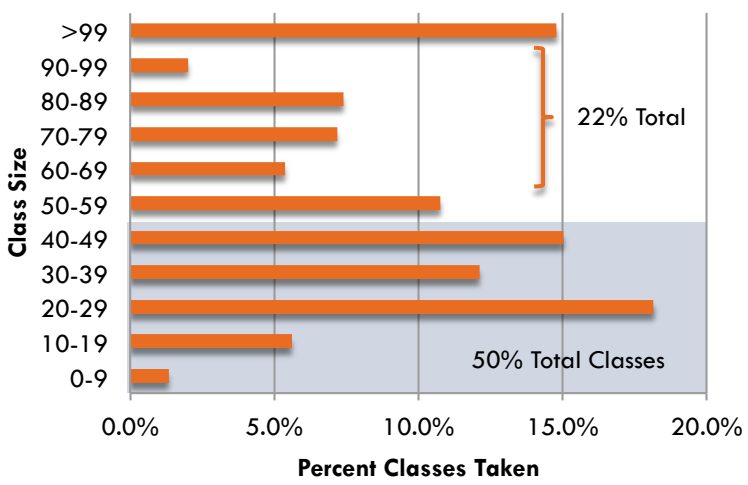
Student Experience Inequities: Class Size Distributions





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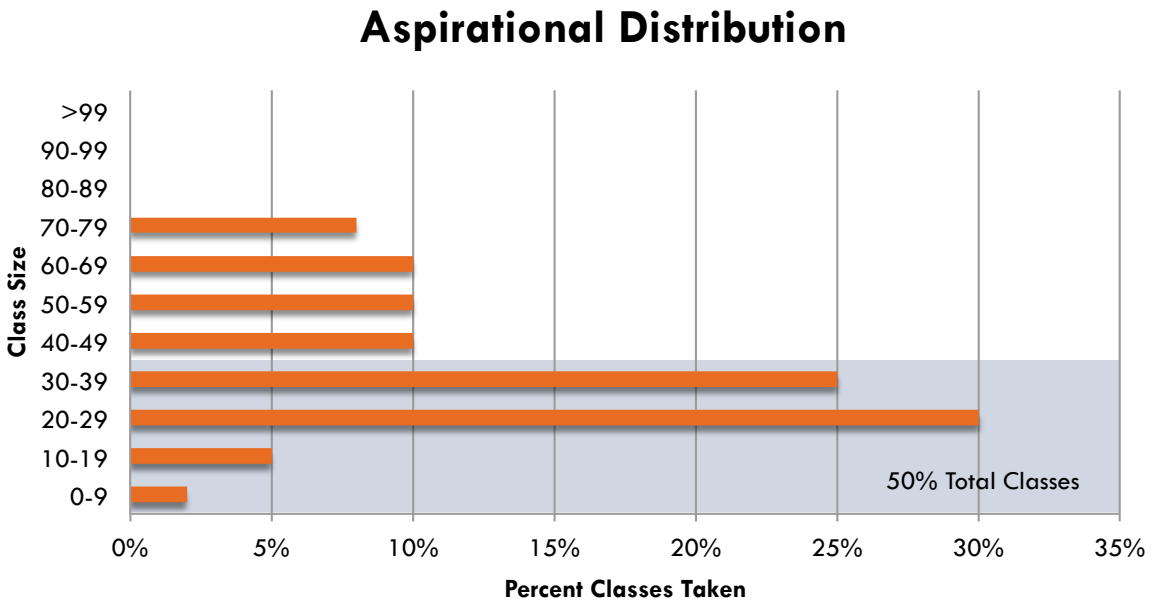
Student Experience: Aspirational Class Size Distribution

- No course sections over 80 students.
- Provide bulk of classroom instruction in sections of 20 to 40 students.
- Most "large" section classes have 40 to 70 students.



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Proposed Productivity Guidelines

- Based on modified ASU model
- Reflects current average productivity
- Metrics – Student credit hours (SCH), graduate advisees, and sponsored research. Recognizes importance of faculty engagement in:
  - quality classroom instruction
  - scholarship with graduate students
  - resource acquisition through externally funded research
- Metrics assume 20% service load. For faculty engaged in teaching only, SCH expectation is 840 (Tenured) and 960 (Teaching)

Instructional Load Target (SCH per AY)

Tenured Faculty

		Thesis and Dissertation Advisees (as primary advisor)			
		≤ 1	2 - 3	4 - 5	>5
Annual Research Expenditures	<$25k	**630**	525	472	420
	$25k - $100k	525	**472**	367	315
	$100k - $200k	472	367	**315**	262
	$200k - $400k	420	315	262	**210**
	> $400k	315	262	210	**157**

Tenure-Track Faculty

0 - 2 Years in Position	157
3 - 5 Years in Position	262

Teaching Faculty

720

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Productivity Guidelines: What Would Implementation Look Like?

- The University Design Initiative (described below) leads to aggregate college- and unit-level expectations (e.g., instruction, research, leadership of Mines strategic initiatives, etc.) and faculty resourcing that are on average self-consistent with productivity guidelines.
- Deans and Department Heads determine how to manage their portfolios to best meet the aggregate expectations, with flexibility for a diverse range of faculty assignments that may deviate on an individual basis from the guidelines table.
- The resulting expectations for individual faculty are equitable and ideally of equivalent value across faculty.
- While productivity guidelines speak to quantity, quality must be recognized and rewarded. P&T guidelines speak to quality. Annual evaluations and merit raises based both on productivity expectations and quality with which these are delivered.

Departmental Productivity Analysis: Sample Departments

Departmental average based on productivity of all tenured faculty.

Tables include only six representative tenured faculty from each department who are illustrative of the range of activities faculty undertake in the department.

Department 1				
Tenured Faculty Member	Research	Advisees	Target SCH	Actual SCH
1	$0	4	472	386
2	$437,134	9	157	328
3	$309,029	7	210	48
4	$230,402	5	262	21
5	$514,089	4	210	336
6	$926,726	14	157	292
Average	**$509,615**	**8**	**157**	**290**

Department 2				
Tenured Faculty Member	Research	Advisees	Target SCH	Actual SCH
1	$30,704	4	367	245
2	$105,905	2	367	754
3	$193,455	4	315	951
4	$168,256	2	367	723
5	$682,005	3	262	708
6	$422,778	7	157	81
Average	**$312,730**	**3**	**315**	**398**

Department 3				
Tenured Faculty Member	Research	Advisees	Target SCH	Actual SCH
1	$239,112	3	315	126
2	$373,438	11	210	300
3	$39,158	3	472	1053
4	$92,710	3	472	459
5	$1,631	4	472	252
6	$847,139	2	262	201
Average	**$189,163**	**4**	**315**	**342**

Department 4				
Tenured Faculty Member	Research	Advisees	Target SCH	Actual SCH
1	$399,415	8	210	62
2	$168,598	8	262	10
3	$106,485	3	367	92
4	$74,483	2	472	351
5	$589,682	5	210	0
6	$69,628	1	472	3
Average	**$312,985**	**4**	**262**	**104**

Faculty Handbook: How to Quantify when faculty are "Research Active"

Scholarship Considerations and Attainment of Research Active Status

As defined in the P&T guidelines, many activities in which faculty engage may contribute to demonstrations of scholarship. This includes, but is not limited to publications, books, patents, use of research and entrepreneurial output by others, successful external fund raising, etc. As part of these activities consideration to the Productivity Model should be given as follows:

- In programs with a graduate presence and the ability to raise external research support, significant weight in evaluating faculty attainment of "research active" status will be given to external fund raising and graduate student productivity as indicated in the Productivity Model.
- In programs without a graduate presence, scholarship activities necessary to achieve "research active" status must mirror levels of effort of those performed by faculty in other programs that have a graduate presence.

"The following table sets forth guidelines for the teaching assignments per semester applicable to tenured, tenure-track, and instructional faculty...

Total Assignment	Recommended Teaching Component
Teaching Only	12 credit-hours per semester
Teaching and Service	9 credit-hours per semester
Teaching, Scholarship, and Service (no AYC)	6 credit-hours per semester
Teaching, Scholarship, and Service (maximum AYC)	3 credit-hours per semester

Many combinations of courses, labs, senior design sections, special problems, and load rearrangements can be used to meet the teaching assignment guidelines, and special consideration may be given to new faculty members as part of their Professional Growth Plans..."

While variations in expectations can exist across departments, the Deans shall ensure that workload expectations across departments are equitable and that aggregate college productivity meets the Provost's expectations.

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Mapping Productivity to Course Workload: Handbook Definitions

Assumptions:

- Average class size: 35 and 17 (UG and Grad)
- Assume 3 credit classes
- Listed as classes per semester
- Classes may be a combination of undergraduate and graduate
- Handbook mapping based on total credit hours required per semester
- Allow high levels of advising and research support to substitute for academic year chargeout (AYC)

Student Course Workload Targets (Courses per AY)

Tenured Faculty

Teaching and Service

Research Expenditures	Funded thesis-based graduate students			
	≤ 1	2 - 3	4 - 5	≥ 5
<$25k	3+3	3+2	3+2	2+2
$25k - $100k	3+2	3+2	2+2	2+1
$100k - $200k	3+2	2+2	2+1	2+1
$200k - $400k	2+2	2+1	2+1	1+1
> $400k	2+1	2+1	1+1	1+1

Teaching, Scholarship, and Service (Max AYC)

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Handbook Mapping: Course Load and Size Expectations

Teaching Only

- 4 + 4 (by Handbook Policy - 24 credit hours total)
- 40 seat undergraduate course
- 25 seat graduate course

Teaching and Service

- 3 + 3 (by Handbook Policy - 18 credit hours total)
- at least 1 undergraduate and 1 graduate course
- 35 seat undergraduate course
- 20 seat graduate course

Teaching, Scholarship, and Service (No AYC)

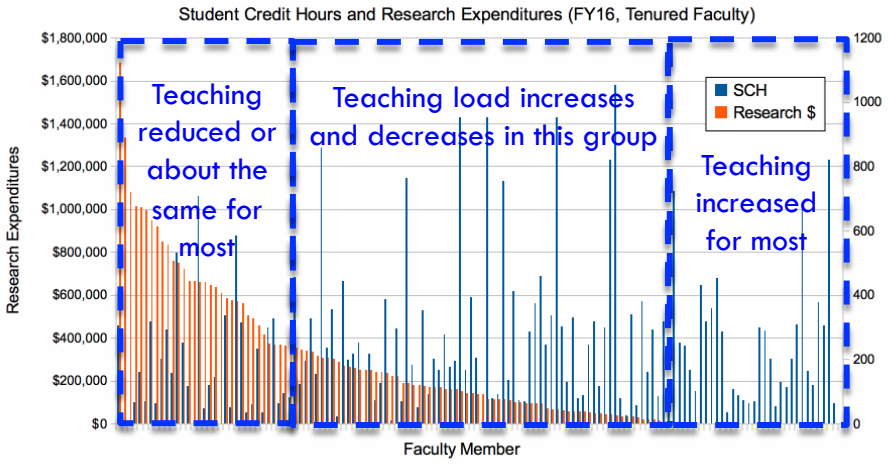
- 2 + 2 (by Handbook Policy - 12 credit hours total)
- at least 1 undergraduate and 1 graduate course
- 30 seat undergraduate course
- 15 seat graduate course

Teaching, Scholarship, and Service (Max AYC)

- 1 + 1 (by Handbook Policy - 6 credit hours total)
- 1 undergraduate and 1 graduate course
- 25 seat undergraduate course
- 10 seat graduate course

Workload Guidelines: Provost's Short-Term Priorities

- Ensure equitable and valued assignments for all faculty
- Recognize faculty contributing to core education and innovation missions
- Provide time for faculty to lead initiatives of strategic importance (new programs, large grants, etc.)
- Increase median and overall SCH productivity by increasing non-thesis/professional-education graduate enrollment. Additional revenue used to incentivize and support research-based, graduate programs.
- Increase median and overall research expenditure. Work with VPRTT to assist programs with "developing" research profiles to enhance productivity.
- At undergraduate level, maintain average class size of 35-40 students while reducing overall number of large (>80 student) classes.



- At graduate level, increase median and overall class size to about 20 students.

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University Design Exercise: Overall Program Design Aspirations and Use of Productivity

University Design Process – Step 1:

- Ask Departments to define their own aspirational objectives. Initial ask, limited to easily defined departmental metrics (e.g., faculty size, student size, research productivity).
- Only boundary conditions provided Departments were:
  - Research aspirations for each program should be at least equivalent to Top 20 programs in each discipline (or Top 5 programs in more specialized areas)
  - [Aggregate research expenditure goal]/[total T/TT faculty] across all programs should be similar to, or better than, average for Top 30 engineering colleges
  - Faculty demographics should be consistent with productivity guidelines presented above
- Institutional check on Step 1 limited to: 1) verifying total resources needed are supported by tuition revenue available, 2) total projected SCH can be delivered under proposed productivity guidelines

Departmental Design Aspirations: Staffing, Research, and Advisees

Design aspirations as supplied by Departments

	Design Aspirations									
	Student Head Count			Faculty Head Count			Research		Thesis Advisees	
	BS	MS	PhD	TTT	Teaching	PoP	Raw	Per/TTT	Raw	Per/TTT
Applied Math & Statistics	130	80	32	16	10	0	$960,000	$60,000	41	2.6
Chemical & Biological Engineer	650	50	84	21	7	0	$9,996,000	$476,000	94	4.5
Chemistry	150	50	90	20	5	0	$8,000,000	$400,000	101	5.1
Civil & Environmental Enginrng	500	200	65	22	7	0	$7,920,000	$360,000	88	4.0
Computer Science	460	120	32	16	10	0	$3,200,000	$200,000	43	2.7
Economics and Business	60	150	30	12	5	0	$1,000,000	$83,333	34	2.8
Electrical Engineering	350	120	35	13	5	0	$2,600,000	$200,000	41	3.2
Geology	200	200	65	18	2	0	$5,400,000	$300,000	158	8.8
Geophysics	200	90	60	12	0	2	$6,480,000	$540,000	87	7.3
Mechanical Engineering	1,000	180	96	32	8	0	$10,240,000	$320,000	124	3.9
Metallurgical & Materials Eng	200	120	90	19	1	1	$9,500,000	$500,000	128	6.7
Mining	150	90	55	10	0	4	$3,500,000	$350,000	66	6.6
Petroleum	360	100	60	12	4	3	$6,480,000	$540,000	97	8.1
Physics	300	32	90	20	7	0	$8,000,000	$400,000	95	4.8
	4,710	1,582	884	**243**	**71**	**10**	**$83,276,000**	**$337,810**		
			7,176			324*				

*Does not include EPICS or HASS

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Credit Distribution: Percent Credits Taken by Each Major in Each Department

Course Department	Major Department: Applied Math & Statistics	Chemical & Biological Engineer	Chemistry	Civil & Environmental Enginrng	Computer Science	Economics and Business	Electrical Engineering	Geology	Geophysics	Mechanical Engineering	Metallurgical & Materials Eng	Mining	Petroleum	Physics
Applied Math & Statistics	53.8%	8.9%	10.6%	11.8%	14.9%	16.3%	14.3%	9.0%	13.2%	13.5%	9.4%	9.8%	7.7%	11.6%
Chemical & Biological Engineer	0.9%	43.5%	10.3%	3.0%	2.5%	5.8%	1.3%	1.1%	0.9%	1.6%	2.0%	0.6%	0.4%	4.0%
Chemistry	4.4%	16.9%	42.7%	6.4%	3.0%	7.2%	3.8%	7.2%	2.8%	4.6%	6.1%	7.4%	7.4%	5.0%
Civil & Environmental Enginrng	0.9%	0.2%	0.8%	31.1%	0.5%	0.8%	2.8%	8.0%	1.1%	4.5%	4.2%	3.6%	3.1%	0.7%
Computer Science	12.6%	0.3%	0.9%	2.2%	45.4%	1.5%	13.2%	0.3%	5.9%	2.9%	1.1%	0.3%	2.5%	3.4%
Economics and Business	5.9%	5.1%	2.2%	3.8%	3.6%	35.2%	3.1%	4.2%	2.8%	5.1%	6.5%	4.7%	7.7%	2.9%
Electrical Engineering	0.0%	0.0%	0.3%	2.1%	1.6%	0.0%	30.7%	0.0%	0.0%	4.8%	0.5%	1.7%	0.1%	4.4%
Epics	3.0%	4.6%	2.4%	4.9%	3.1%	3.5%	4.4%	4.5%	4.8%	4.4%	4.4%	3.9%	4.4%	4.4%
Geology	1.7%	0.3%	1.1%	3.3%	2.1%	2.6%	1.7%	40.4%	10.9%	1.6%	1.8%	7.0%	6.9%	1.1%
Geophysics	0.5%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%	36.6%	0.0%	0.1%	0.0%	0.1%	0.1%
Liberal Arts & Intern'l Study	12.3%	11.1%	10.9%	11.2%	11.7%	10.7%	10.9%	10.6%	11.0%	10.9%	10.0%	9.2%	8.2%	10.1%
Mechanical Engineering	0.7%	0.0%	1.4%	15.6%	0.6%	0.7%	9.7%	0.1%	0.3%	33.5%	0.9%	3.3%	1.5%	1.1%
Metallurgical & Materials Eng	0.0%	0.0%	1.9%	0.1%	0.0%	0.2%	0.1%	0.0%	0.0%	2.3%	42.7%	0.2%	0.1%	1.2%
Mining	0.1%	0.0%	2.4%	1.6%	0.1%	1.1%	0.6%	4.0%	0.3%	0.7%	0.7%	38.1%	1.2%	0.3%
Other	3.1%	2.9%	3.8%	2.9%	2.3%	4.7%	3.3%	2.5%	2.2%	2.5%	2.3%	3.3%	3.0%	2.7%
Petroleum	0.0%	0.1%	0.1%	0.0%	2.9%	3.1%	0.0%	0.8%	0.3%	1.1%	0.1%	0.6%	39.6%	0.0%
Physics	0.0%	6.1%	8.1%	0.0%	5.8%	6.6%	0.0%	7.1%	6.8%	5.8%	7.4%	6.1%	6.1%	47.1%

Reality Check: Modeled SCH, Total Revenue Estimates, and Faculty Cost Estimates

- Based on aspirational enrollment, model gross SCH.
- From gross SCH, project gross tuition revenue.
- From departmental requests for new faculty, project gross faculty costs.
- Fraction of gross tuition revenue used to support faculty salary and benefits is consistent with current practices.
- To first order, Design Model works financially.

	Total Course Credits	Faculty Head Count		
		TTT	Teaching	PoP
Applied Math & Statistics	21,554	16	10	0
Chemical & Biological Engineer	13,759	21	7	0
Chemistry	13,840	20	5	0
Civil & Environmental Enginrng	12,904	22	7	0
Computer Science	14,060	16	10	0
Economics and Business	10,834	12	5	0
Electrical Engineering	8,755	13	5	0
Geology	10,028	18	2	0
Geophysics	4,398	12	0	2
Mechanical Engineering	19,585	32	8	0
Metallurgical & Materials Eng	6,422	19	1	1
Mining	5,183	10	0	4
Petroleum	7,765	12	4	3
Physics	13,223	21	7	0
	162,310	**243**	**66**	**10**
Revenue and Salary Estimates	$133,081,000	$37,341,810	$7,606,665	$1,536,700
			Total Salaries	$46,485,175
		Fraction Revenue used for Salaries		0.35

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Reality Check: Faculty Capacity Using Straight Productivity (SCH/Faculty)

- SCH load based on enrollment targets.
- Faculty SCH capacity based on Productivity Model
- Overall, expected SCH delivery by faculty does not meet expect SCH requirement
- Possible solutions:
  - 1) hire additional permanent faculty, current model could support additional faculty, or
  - 2) continued institutional commitment of about $1.4M in adjunct support, or

		SCH Per Faculty			Capacity		
	Total Course Credits	TTT	Teaching	PoP	Total	Gap	Adjunct Needs
Applied Math & Statistics	21,554	472	958		17,132	-4,812	$240,576
Chemical & Biological Engineer	13,759	210	958		11,116	-2,776	$138,778
Chemistry	13,840	210	958		8,990	-5,016	$250,795
Civil & Environmental Enginrng	12,904	262	958		12,470	-457	$22,848
Computer Science	14,060	367	958		15,452	1,278	$0
Economics and Business	10,834	472	958		10,454	-476	$23,795
Electrical Engineering	8,755	315	958		8,885	-16	$805
Geology	10,028	210	958		5,696	-4,368	$218,403
Geophysics	4,398	157		480	2,844	-1,558	$77,908
Mechanical Engineering	19,585	262	958		16,048	-3,574	$178,692
Metallurgical & Materials Eng	6,422	157	958	480	4,421	-2,039	$101,957
Mining	5,183	210		480	4,020	-1,175	$58,732
Petroleum	7,765	157	958	480	7,156	-609	$30,471
Physics	13,223	262	958		11,946	-1,111	$55,560
	162,310				136,630	-26,709	$1,399,319

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Reality Check: Faculty Capacity Using Number and Size Expectation for TTT Faculty

- SCH load based on enrollment targets.
- For TTT faculty, SCH capacity based on proposed min class sizes and productivity mapping:
  - 3+2 = 4 ug + 1 grad (35 + 20 stu) = 480 SCH
  - 2+2 = 3 ug + 1 grad (30 + 15 stu) = 315 SCH
  - 2+1 = 2 ug + 1 grad (30 + 15 stu) = 225SCH
  - 1+1 = 1 ug + 1 grad (25 + 10 stu) = 105 SCH
- Closer to student experience aspiration (i.e., more small classes). Requires additional teaching support

			SCH Per Faculty			Capacity		
	Total Course Credits	TTT Course Load	TTT	Teaching	PoP	Total	Gap	Adjunct Needs
Applied Math & Statistics	21,554	**3+2**	**480**	958		17,260	-4,684	$234,176
Chemical & Biological Engineer	13,759	**1+1**	**105**	958		8,911	-4,981	$249,028
Chemistry	13,840	**1+1**	**105**	958		6,890	-7,116	$355,795
Civil & Environmental Enginrng	12,904	**2+1**	**225**	958		11,656	-1,271	$63,548
Computer Science	14,060	**2+2**	**315**	958		14,620	446	$0
Economics and Business	10,834	**3+2**	**480**	958		10,550	-380	$18,995
Electrical Engineering	8,755	**2+2**	**315**	958		8,885	-16	$805
Geology	10,028	**1+1**	**105**	958		3,806	-6,258	$312,903
Geophysics	4,398	**1+1**	**105**		480	2,220	-2,182	$109,108
Mechanical Engineering	19,585	**2+1**	**225**	958		14,864	-4,758	$237,892
Metallurgical & Materials Eng	6,422	**1+1**	**105**	958	480	3,433	-3,027	$151,357
Mining	5,183	**1+1**	**105**		480	2,970	-2,225	$111,232
Petroleum	7,765	**1+1**	**105**	958	480	6,532	-1,233	$61,671
Physics	13,223	**1+1**	**105**	958		8,806	-4,251	$212,560
	162,310					121,403	-41,936	$2,119,069

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University Design Exercise: Programs of Distinction

University Design Process – Step 2:

- Departments provide a three-page summary of their departmental design objectives. Due date 06/01/17. Keeping in mind the institutional goals provided in Step 1 of the Design process, this summary should include a brief description of the aspirational programs to be developed (educational, research, and scholarship), and a business case for how these programs will contribute to institutional goals and make departments distinctive from other similarly named departments.
- The Executive Team review these design summaries in the context of University aspirations and the staffing/student aspirations defined by departments, assign ET priorities for program development an augmentation, and then working with Departments develop a plan for supporting deployment of resources necessary to further departmental plans.