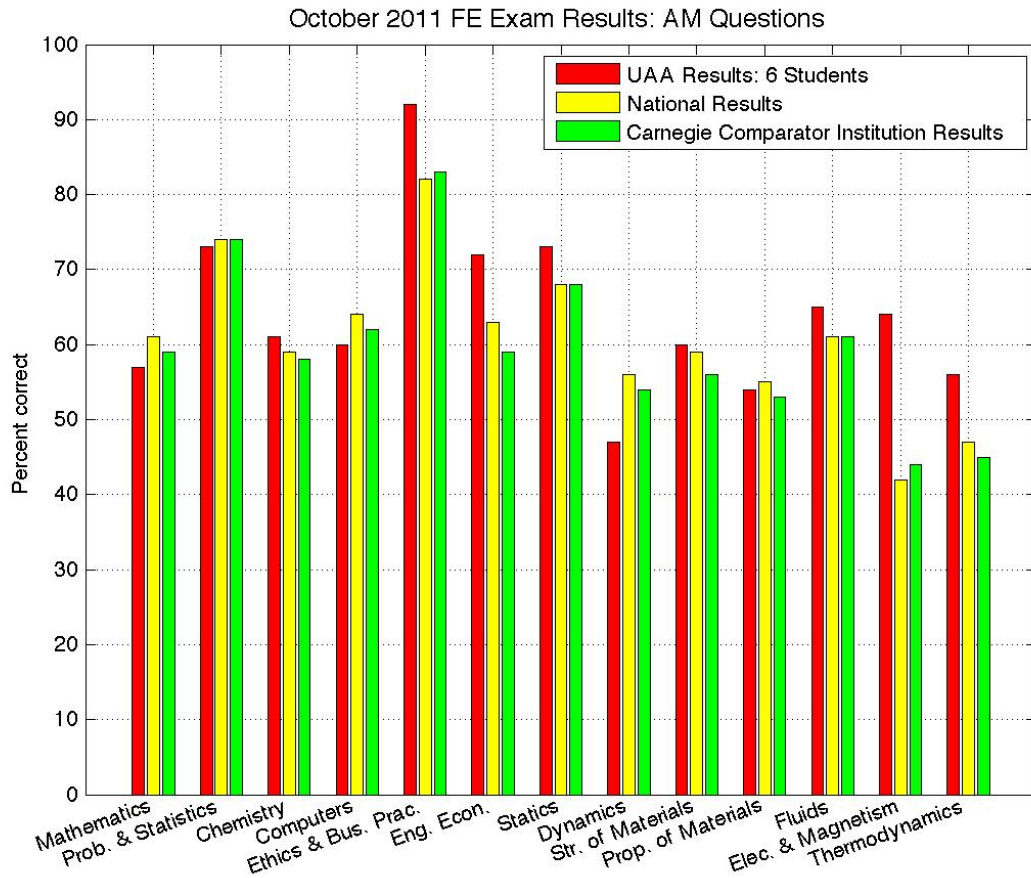


UAA PERFORMANCE ON THE FE EXAM FROM 2006-11



Prepared by
ROBLANG
 Department of Civil Engineering
 University of Alaska Anchorage
 Anchorage, AK

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Rob Lang

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A

Introduction

The purpose of this report is 1) to summarize the results of the performance of students and graduates from the CE program on the Fundamentals of Engineering (FE) Exam during the time period October 2005 – October 2011, for which the complete data set is available from NCEES, and 2) to summarize recommended changes that the CE faculty agree may wish to consider to the CE program based on these results.

B

NCEES Reports

NCEES makes available to Deans of accredited programs the summary results for both enrolled students and graduates who have taken either the April or October FE exam. These results include not only the exam pass rate, but also the percentage of correct answers for each category of question on the AM and PM exams for students from the institution. NCEES also provides summary performance data for students nationally who are enrolled in CE programs, and for CE students who are enrolled in “Carnegie comparator” institutions – i.e., for UAA these comparator institutions includes CE Departments that offer the BSCE and the MSCE but not the PhD in CE.

The cohorts of UAA CE students who have taken the FE exam are further divided into those who have taken the “General” PM exam, and those who have taken the “Civil” PM exam. A summary of the number of students from UAA CE who have taken the FE Exam is given in Table 1.

Table 1: Numbers of UAA CE students (197 total) who have taken the FE Exam between October 2005 – October 2011

Exam Date	Number of UAA CE Students Taking Given FE Exam			
	Enrolled		Graduated	
	CE PM Exam	General PM Exam	CE PM Exam	General PM Exam
Oct-05	4	4	2	1
Apr-06	8	1	4	1
Oct-06	1	9	2	4
Apr-07	10	7	1	1
Oct-07	2	7	4	2
Apr-08	6	6	1	2
Oct-08	2	6	1	4
Apr-09	10	6	5	0
Oct-09	8	8	1	1
Apr-10	8	6	2	1
Oct-10	12	2	3	1
Apr-11	6	5	0	0
Oct-11	6	1	1	1
TOTAL	83	68	27	19

It is evident that the majority of UAA CE students taking the FE exam are currently enrolled, and is quite possible that a significant number of those taking the exam as graduates failed the exam during an initial attempt while currently enrolled as students.

During the five academic years from 2005-06 to 2010-11, there were 172 CE BS graduates, and 144 students who took the FE exam, representing 84% of the students. There is no requirement that students take or pass the exam as part of UAA's BSCE graduation requirements.

The remainder of this report will focus on the performance of the largest category of students, UAA CE students who take the exam while currently enrolled as students, and who choose to take the CE PM exam. As a side note, the CE faculty currently recommend that students take the CE PM exam, although in the past different advice may have been given.

C

FE exam pass rates

The FE exam pass rates for UAA CE, National CE, and Masters level CE institutions nationally are summarized in Table 2, which shows that UAA students perform significantly above average on the exams overall. Although these results are encouraging, they provide no useful information about possible changes to improve performance in individual subject areas.

Table 2: Pass rates on the FE exam for UAA CE enrolled students who chose to take the CE PM exam

Exam Date	Pass Rate, %		
	UAA	National	Masters
Oct-05	75	67	51
Apr-06	100	72	57
Oct-06	100	71	57
Apr-07	80	76	60
Oct-07	50	72	60
Apr-08	67	71	60
Oct-08	100	68	58
Apr-09	90	79	N/A
Oct-09	100	74	74
Apr-10	62	75	68
Oct-10	92	69	67
Apr-11	83	78	73
Oct-11	100	77	72
Weighted average	86	72	63

D

Performance on the AM exam

The last set of FE exam results from NCEES are for the October 2011 exam. Performance by UAA CE students on the AM portion of that exam, shown in Figure 1, typify their performance on all exams from 2005-2011, i.e. achieving a higher pass rate than both the average National and average Carnegie comparator institutions. Appendix A includes the complete set of data for these AM exams.

Because 1) the performance consistently exceeds the National average – which in general is higher than performance among UAA’s Carnegie comparator (Masters level) institutions, and 2) performance lower than National average only occurs sporadically and without any discernible pattern, no further scrutiny of the AM subject areas appears necessary at this time.

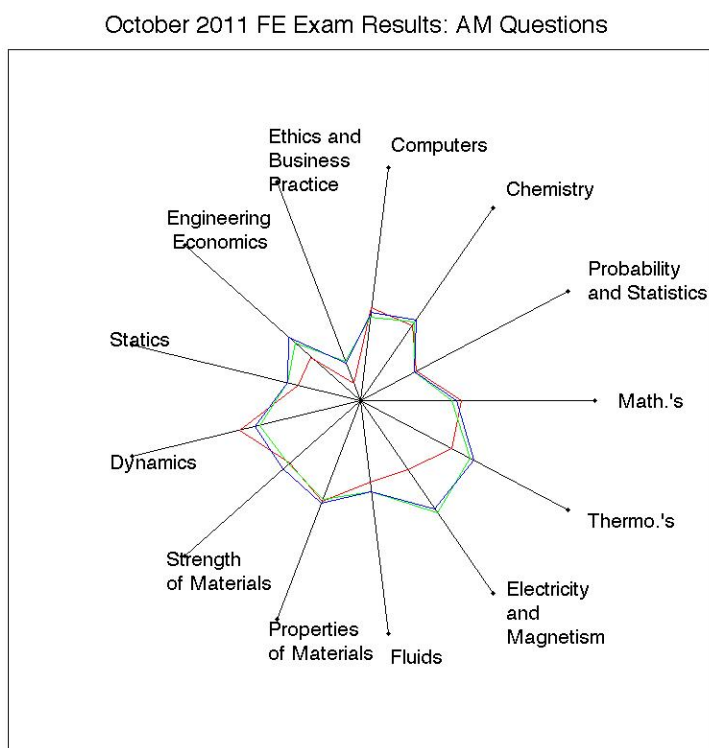


Figure 1. UAA enrolled CE student performance on October 2011 FE AM exam relative to National average and Carnegie comparator institution CE student performance. The hub represents 100% correct answers, and the outer radius corresponds to 0% correct answers, in the given subject areas. UAA CE student performance is indicated by the red line.

E

PM exam results

Performance by UAA CE students on the PM portion of the October 2010 and 2011 exams, shown in Figure 2 and 3, typify the variable performance shown on PM exam questions.

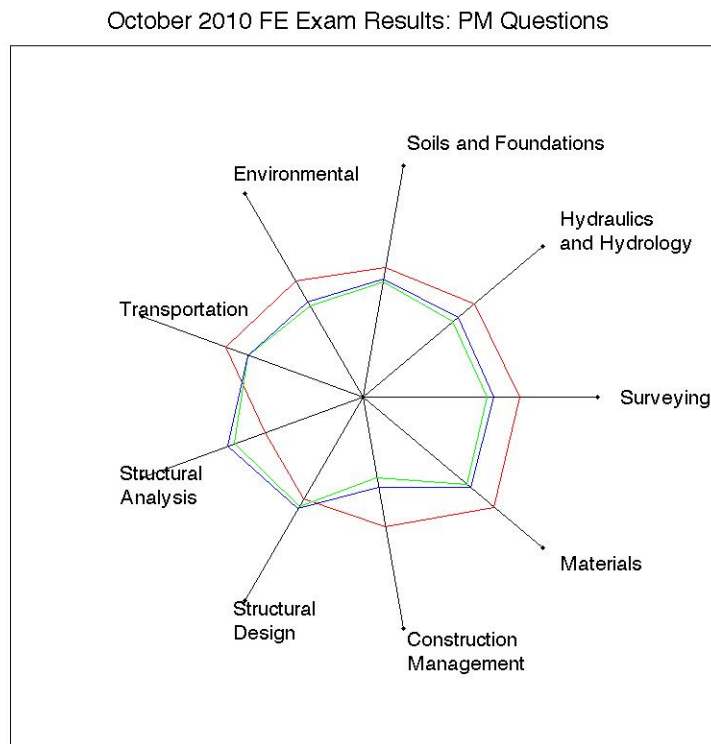


Figure 2. UAA enrolled CE student performance on October 2010 FE PM exam relative to National average and Carnegie comparator institution CE student performance. In lower radar plot, the hub represents 100% correct answers, and the outer radius corresponds to 0% correct answers, in the given subject areas. UAA performance is indicated by the red line.

October 2011 FE Exam Results: PM Questions

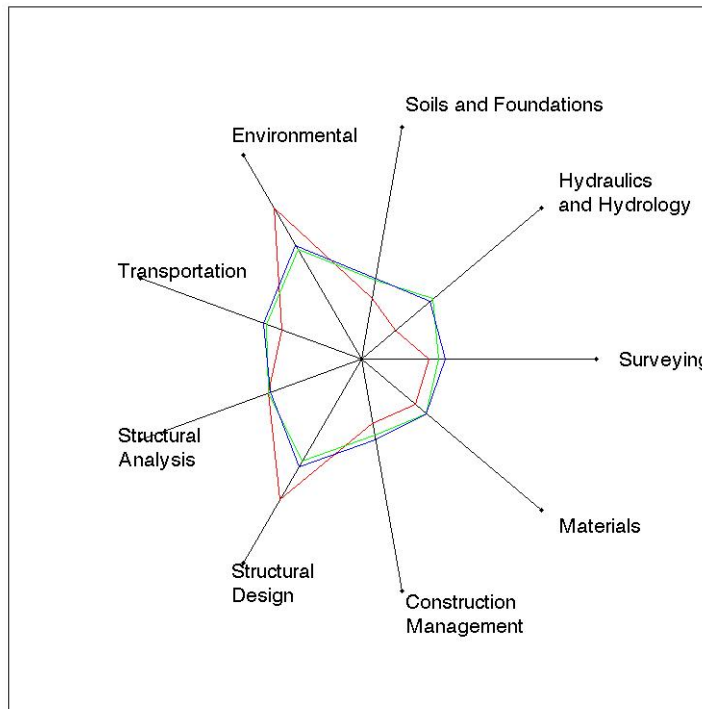


Figure 3. UAA enrolled CE student performance on October 2011 FE PM exam relative to National average and Carnegie comparator institution CE student performance. In lower radar plot, the hub represents 100% correct answers, and the outer radius corresponds to 0% correct answers, in the given subject areas. UAA performance is indicated by the red line.

Because no general conclusion can be drawn about CE student performance on the PM subject areas, a detailed analysis of performance in each PM subject area will be made.

A summary of the performance on FE PM questions for UAA CE students and National CE students are included as Tables 3 and 4. A graphical representation of this data is included as Appendix B.

Because of the decision by UAA's CE faculty to benchmark performance of UAA CE students vis-à-vis National CE students, and because of the temporal variability in the performance in each PM subject area, the ratio of CE:National performance was calculated as a quality control measure, as recorded in Table 5.

Table 3: Performance of UAA CE students on FE PM exam questions

PM Exam Subject	Percent Correct (UAA CE Students)												
	Oct 05	Apr 06	Oct 06	Apr 07	Oct 07	Apr 08	Oct 08	Apr 09	Oct 09	Apr 10	Oct 10	Apr 11	Oct 11
Surveying	68	48	71	64	28	62	50	58	66	50	73	67	71
Hydraulics and Hydrologic Systems	75	61	14	44	50	43	64	67	73	61	65	60	81
Soil Mechanics and Foundations	53	64	33	60	33	46	56	53	63	50	64	61	74
Environmental Engineering	61	48	71	57	64	60	100	81	73	61	65	60	26
Transportation	61	62	29	54	36	45	72	57	80	64	58	55	64
Structural Analysis	50	54	67	43	75	44	42	55	44	52	67	58	58
Structural Design	62	31	50	58	42	61	33	55	62	67	60	72	31
Construction Management	83	65	83	65	42	61	50	72	65	46	67	56	72
Materials	50	40	40	64	40	67	60	66	82	65	47	70	70
Number of students	4	8	1	10	2	6	2	10	8	8	12	6	6

Table 4: Performance of National CE students on FE PM exam questions

PM Exam Subject	Percent Correct (National CE Students)												
	Oct 05	Apr 06	Oct 06	Apr 07	Oct 07	Apr 08	Oct 08	Apr 09	Oct 09	Apr 10	Oct 10	Apr 11	Oct 11
Surveying	59	53	55	59	43	57	59	51	57	49	54	59	67
Hydraulics and Hydrologic Systems	69	63	52	50	63	50	42	62	63	57	60	61	60
Soil Mechanics and Foundations	54	60	45	54	56	54	51	45	62	56	60	59	66
Environmental Engineering	58	55	65	64	64	70	55	73	66	66	65	61	46
Transportation	62	64	58	51	43	53	65	53	72	59	54	51	57
Structural Analysis	46	51	49	42	54	45	47	48	44	62	53	51	58
Structural Design	41	42	29	48	46	52	44	51	59	53	52	63	50
Construction Management	68	64	59	69	51	63	56	72	61	60	69	65	67
Materials	49	49	44	55	57	63	63	59	67	57	53	62	64

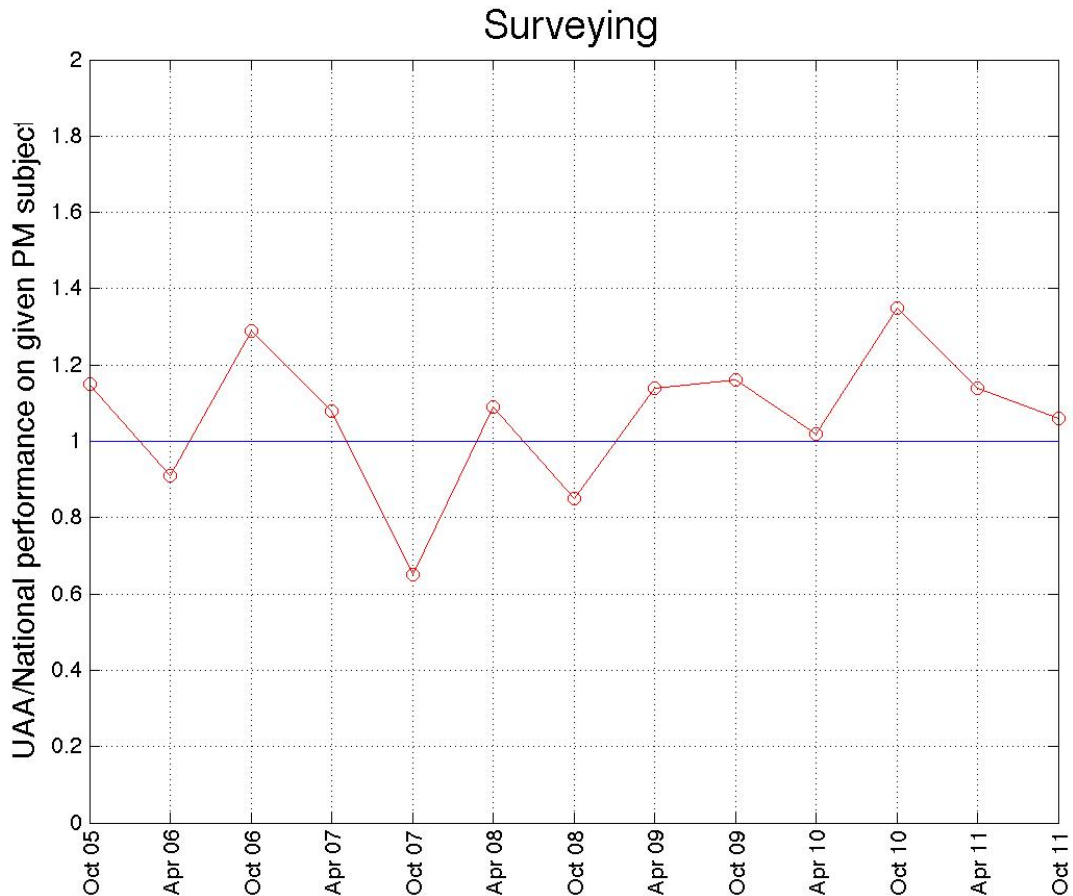
Table 5: Ratio of UAA CE student performance to National CE student performance on FE PM exam questions

PM Exam Subject	Performance Ratio: UAA/National												
	Oct 05	Apr 06	Oct 06	Apr 07	Oct 07	Apr 08	Oct 08	Apr 09	Oct 09	Apr 10	Oct 10	Apr 11	Oct 11
Surveying	1.15	0.91	1.29	1.08	0.65	1.09	0.85	1.14	1.16	1.02	1.35	1.14	1.06
Hydraulics and Hydrologic Systems	1.09	0.97	0.27	0.88	0.79	0.86	1.52	1.08	1.16	1.07	1.08	0.98	1.35
Soil Mechanics and Foundations	0.98	1.07	0.73	1.11	0.59	0.85	1.10	1.18	1.02	0.89	1.07	1.03	1.12
Environmental Engineering	1.05	0.87	1.09	0.89	1.00	0.86	1.82	1.11	1.11	0.92	1.00	0.98	0.57
Transportation	0.98	0.97	0.50	1.06	0.84	0.85	1.11	1.08	1.11	1.08	1.07	1.08	1.12
Structural Analysis	1.09	1.06	1.37	1.02	1.39	0.98	0.89	1.15	1.00	0.84	1.26	1.14	1.00
Structural Design	1.51	0.74	1.72	1.21	0.91	1.17	0.75	1.08	1.05	1.26	1.15	1.14	0.62
Construction Management	1.22	1.02	1.41	0.94	0.82	0.97	0.89	1.00	1.07	0.77	0.97	0.86	1.07
Materials	1.02	0.82	0.91	1.16	0.70	1.06	0.95	1.12	1.22	1.14	0.89	1.13	1.09

Time series plots for each of the nine PM subjects areas will be presented, along with observations and recommendations that follow from the data.

1. Surveying

The performance of UAA CE students on the Surveying subject area is shown relative to National CE student performance in Figure 4 below:



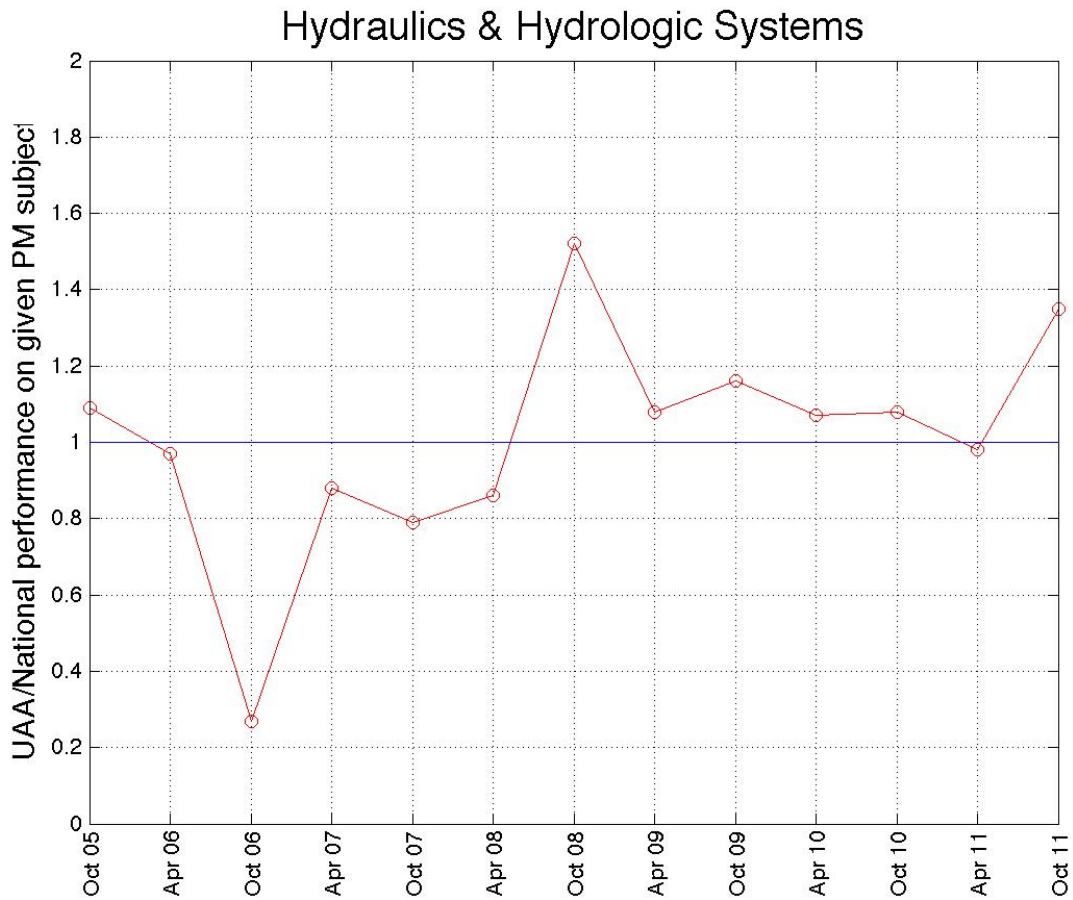
Observation: Performance in recent years has been consistently above the national average.

Discussion: Several years ago the CE Department made an introductory surveying course a mandatory requirement for all CE students. The Department offering the course, Geomatics, hired a professor (John Bean) who is not only a surveyor but also a licensed civil engineer. His teaching of the introductory course for CE students in recent years appears to have had a positive effect.

Recommendations: No change is recommended.

2. Hydraulics and Hydrologic Systems

The performance of UAA CE students on the Hydraulics and Hydrologic Systems subject area is shown relative to National CE student performance in Figure 5 below:

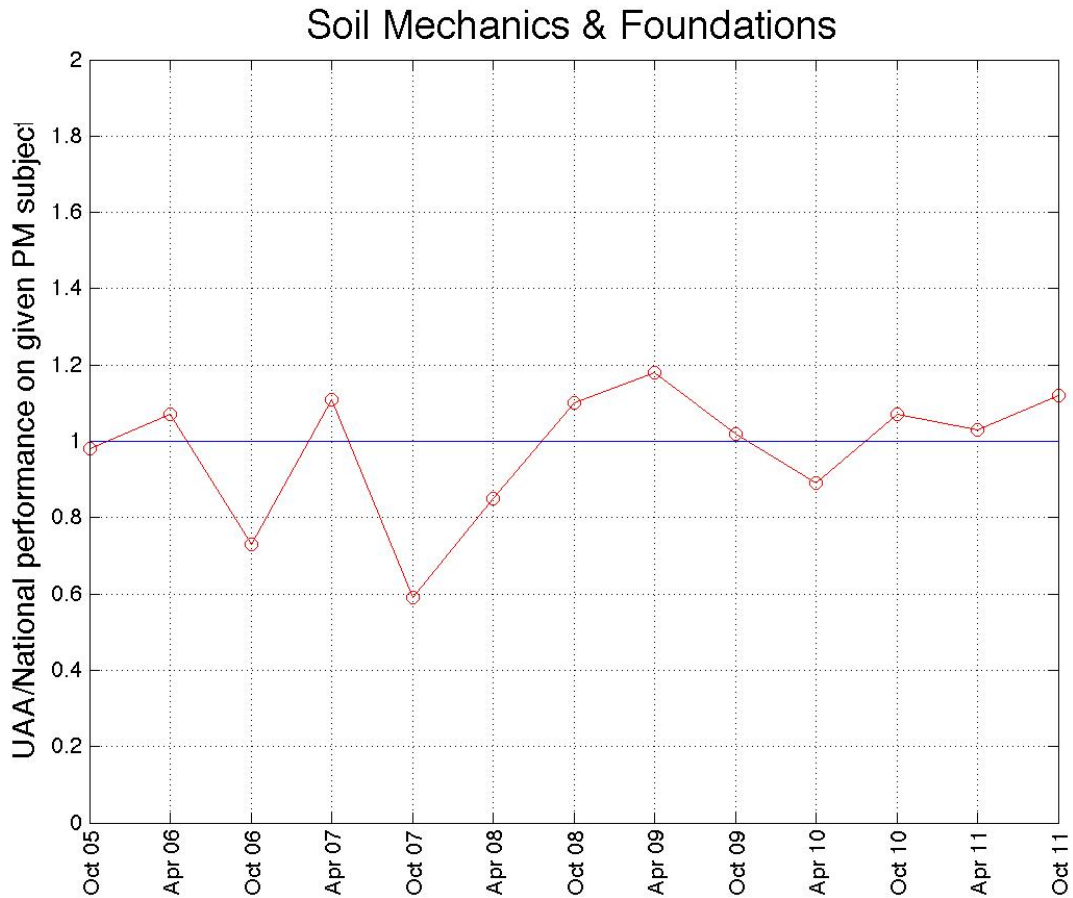


Observation:For the past three years, student performance has been consistently above the National average.

Discussion:The Department hired additional faculty in this area, and has tried to minimize reliance on adjunct faculty.

Recommendations:No change is recommended at this time.

3. Soil Mechanics and Foundations

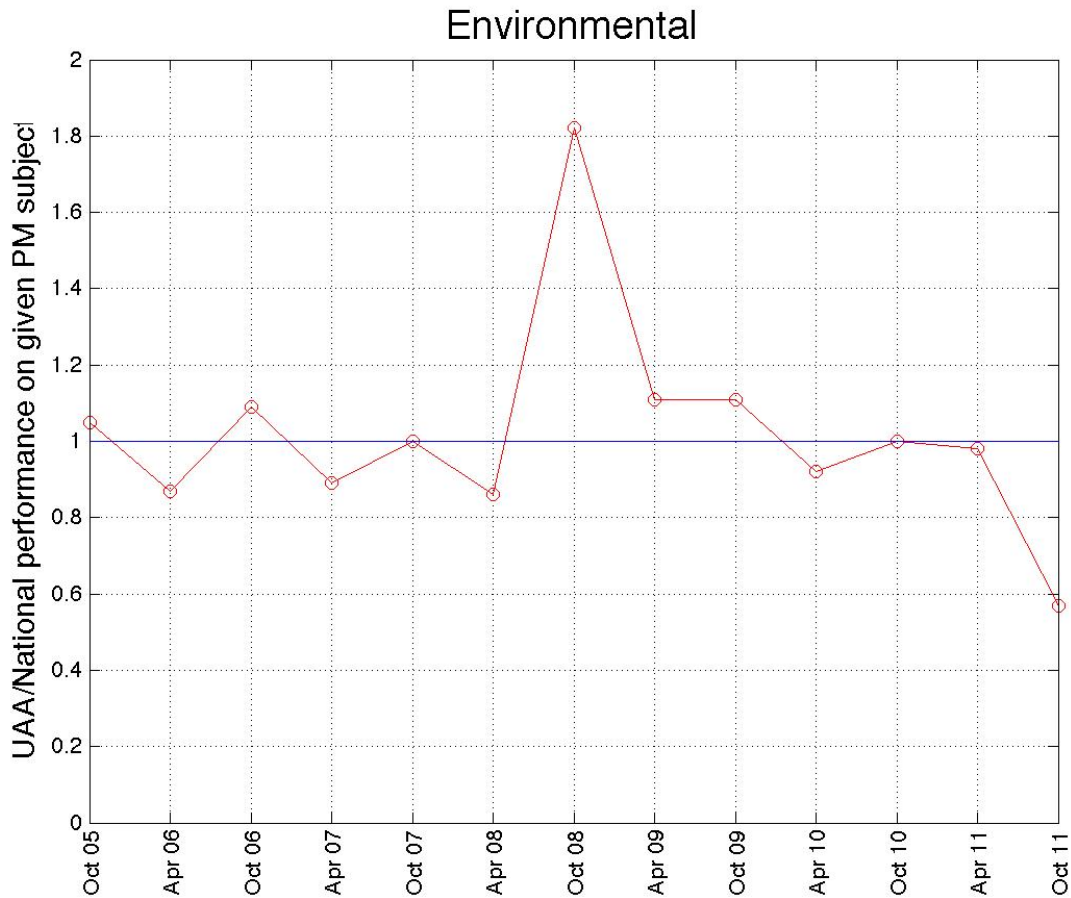


Observation: Performance has generally improved in the period 2008-11 compared with 2005-08, although the April 2010 performance is 11% below the National average.

Discussion: The required course in Soil Mechanics is offered in Spring of the junior year, while the Foundation Engineering course is offered in Fall of the senior year. Performance on the exam may depend on whether or not the students have taken both courses.

Recommendations: Although no action is recommended, performance on the April 2012 exam should be checked in this area (results not available as of publication date).

4. Environmental Engineering

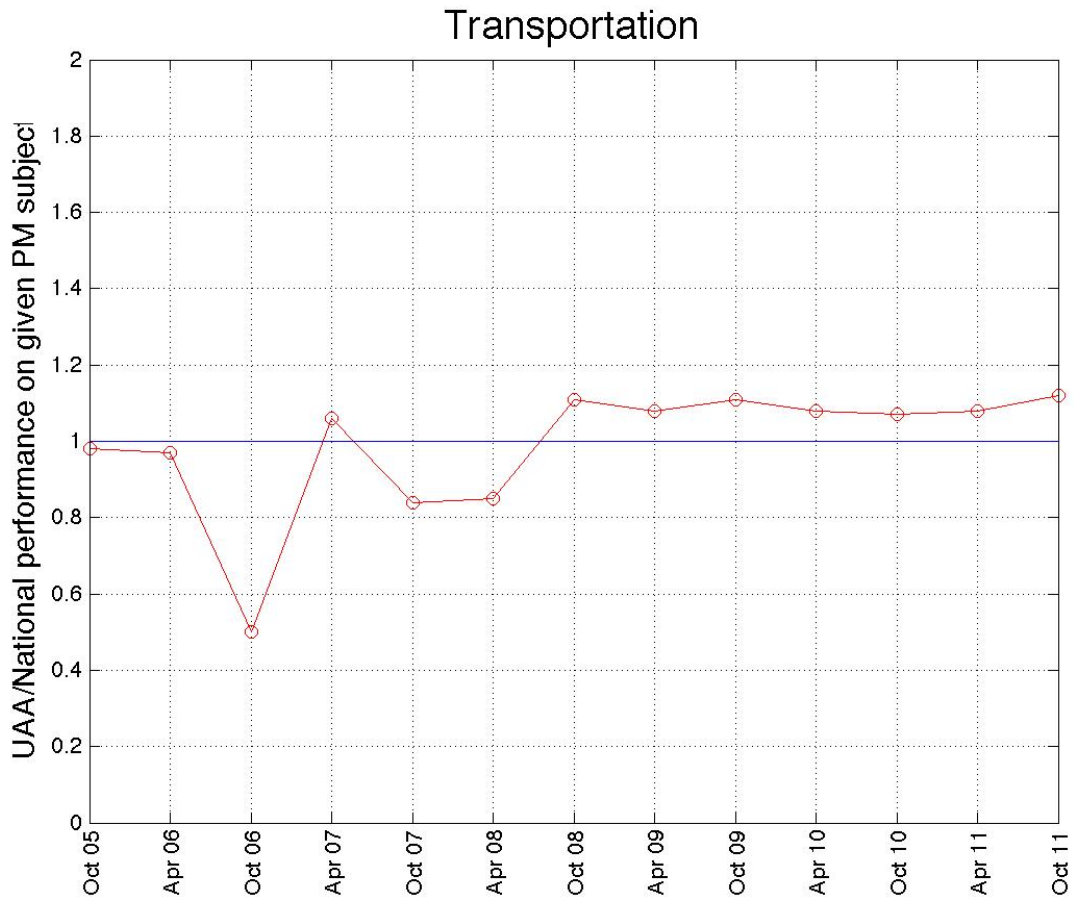


Observation: Performance in the Environmental subject area has generally been near the National average. The spike in Oct. 2008 corresponds to a time when only two students from UAA took the CE PM exam, and is therefore anomalous. The decline in the Oct. 2011 result corresponds to the performance of six students, and is a matter of concern.

Discussion: The CE Department has been short on faculty until recently when Prof. Aaron Dotson was hired. It is expected that with his able help student performance will quickly improve in the Environmental area. It should be noted that the curriculum only requires a single introductory Environmental Engineering course, taught in the Fall semester, which may not provide enough preparation time for this FE topic.

Recommendations: Review the results of the April 2012 exam to see if performance has improved.

5. Transportation

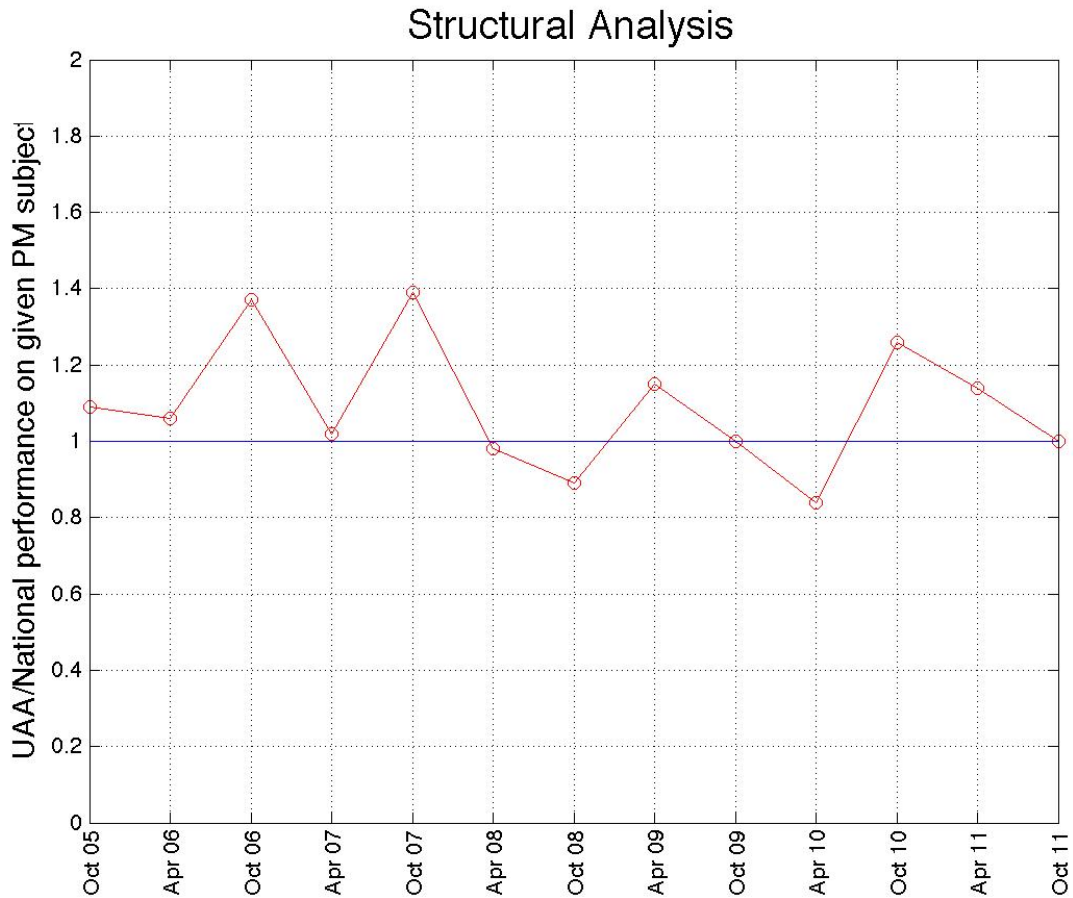


Observation: Beginning with the October 2008 exam, performance has consistently been significantly above the National average.

Discussion: Transportation specialist Prof. Osama Abaza was hired in 2007, and after a short lag time student performance in Transportation rose to a new level. The CE Department has been authorized to hire an additional Transportation faculty member.

Recommendations: No change recommended based on this data.

6. Structural Analysis

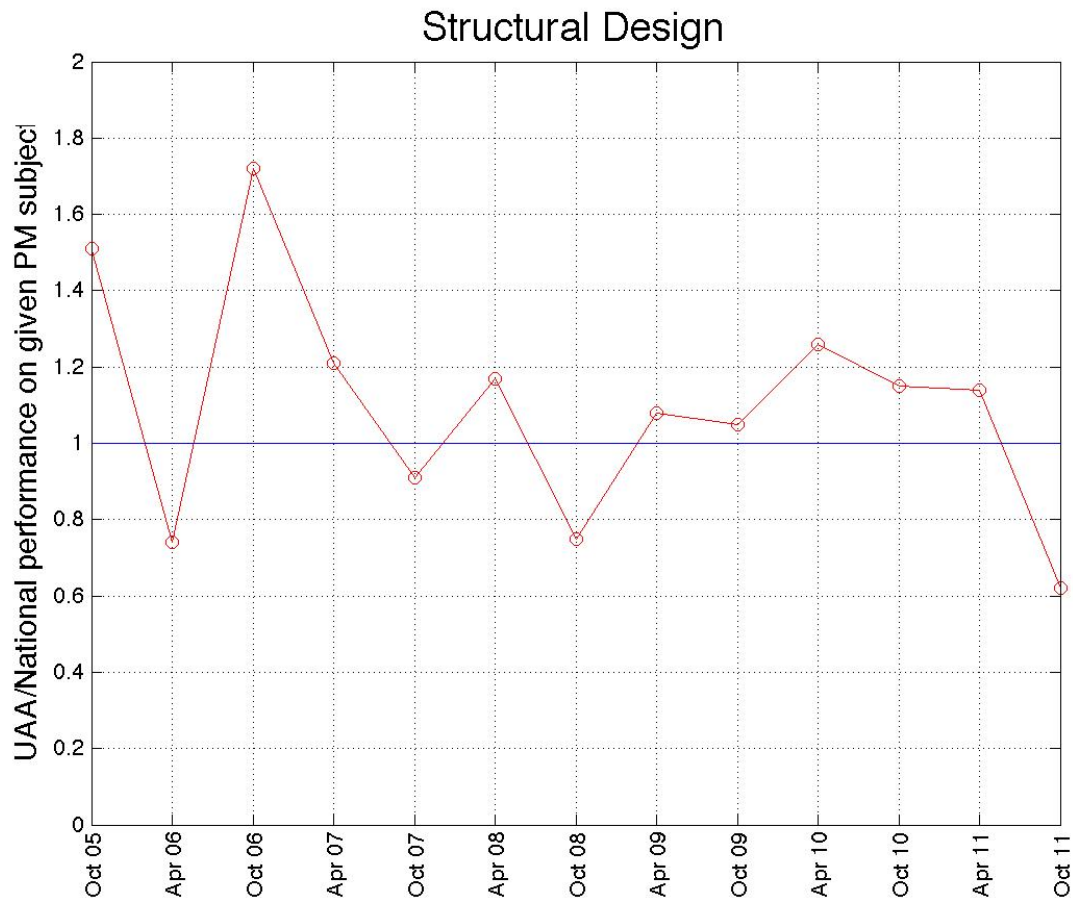


Observation: Although the low performance (84% of the National average) by eight students in April 2010 is troubling, overall performance during the past three years is above the National average.

Discussion: No immediate explanation is available for the low April 2010 scores.

Recommendations: Should the April 2012 results be below 90% of the National average, some curricular change should be considered by the structural faculty.

7. Structural Design



Observation: Although student performance has generally been excellent during the past two years, the low performance by six students in October 2011 is worrisome.

Discussion: Until recently the CE Department has been shorthanded in the area of structural design, because Prof. Bart Quimby has had a number of assignments in the Provost's office that have taken him away from teaching design courses. However the Department has recently added Prof. Scott Hamel, a PE who has significant design experience, and so it is expected that after a lag time performance of CE students will increase in the structural design area.

Recommendations: No change is recommended.

8. Construction Management

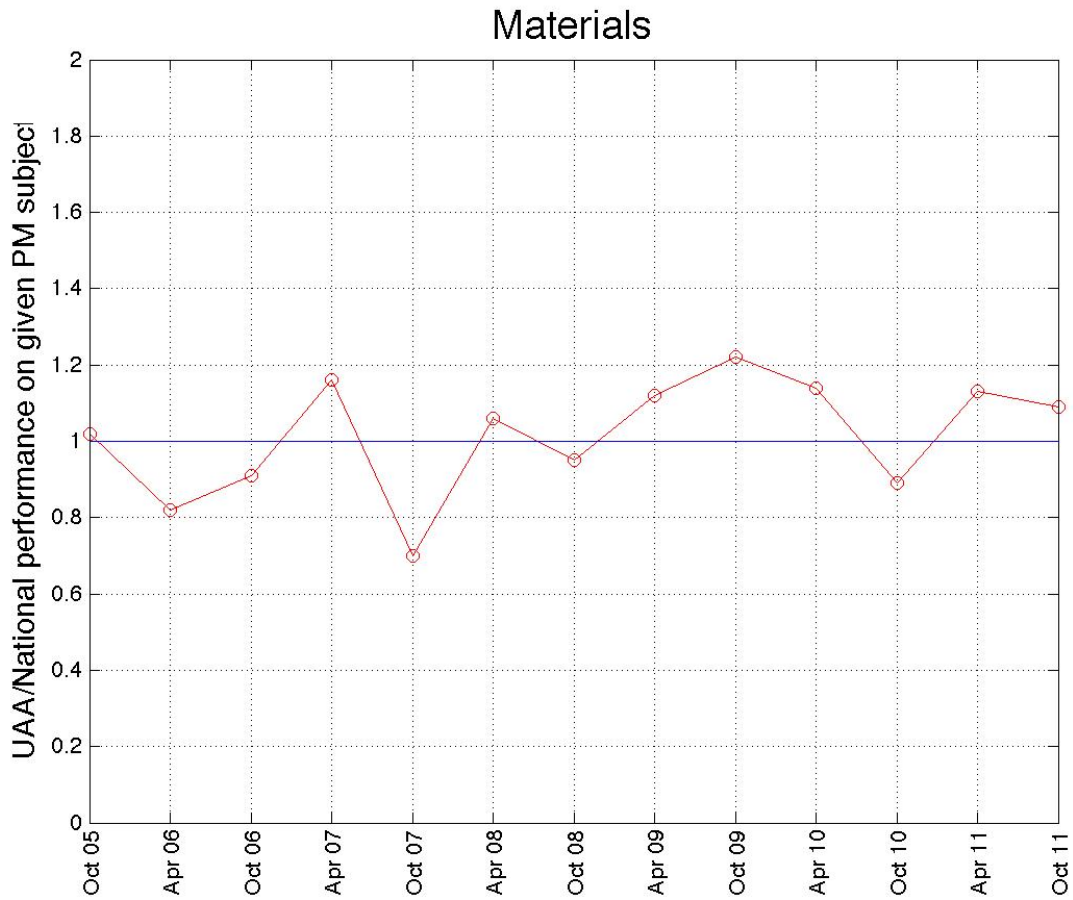


Observation:For the past five years student performance in this area has tended to lag the National average.

Discussion:No courses in Construction Management are part of the CE curriculum.

Recommendations:At the CE faculty retreat in Fall 2012, the faculty should consider ways of incorporating this topic area into appropriate upper division design courses, and modify the CCG's as necessary to reflect the changes.

9. Materials



Observation: Performance in the Materials subject area has generally improved during 2008-11 compared with 2005-08.

Discussion: After joining the faculty, Prof. Abaza improved both the Transportation and Materials labs significantly.

Recommendations: No changes are recommended.

Appendix A

AM Exam Results

All graphs show UAA enrolled CE student performance on the FE AM exam relative to National average and Carnegie comparator institution CE student performance. In lower radar plots, the hub represents 100% correct answers, and the outer radius corresponds to 0% correct answers, in the given subject areas. UAA performance is indicated by the red line.

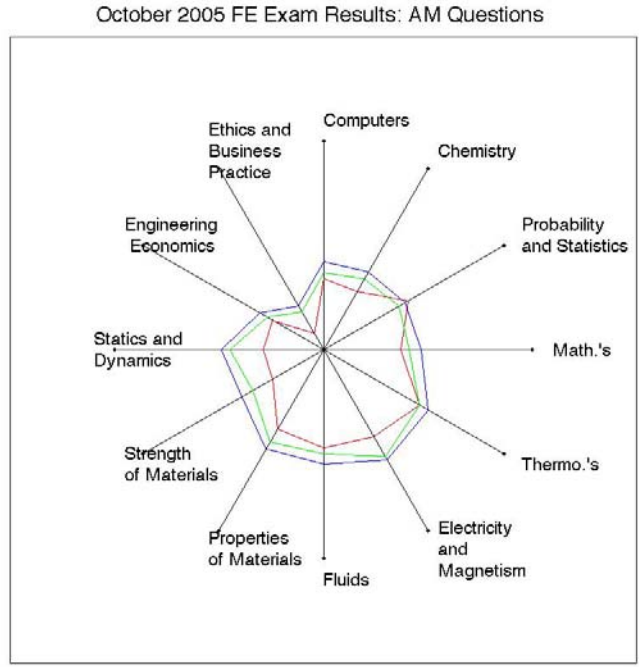
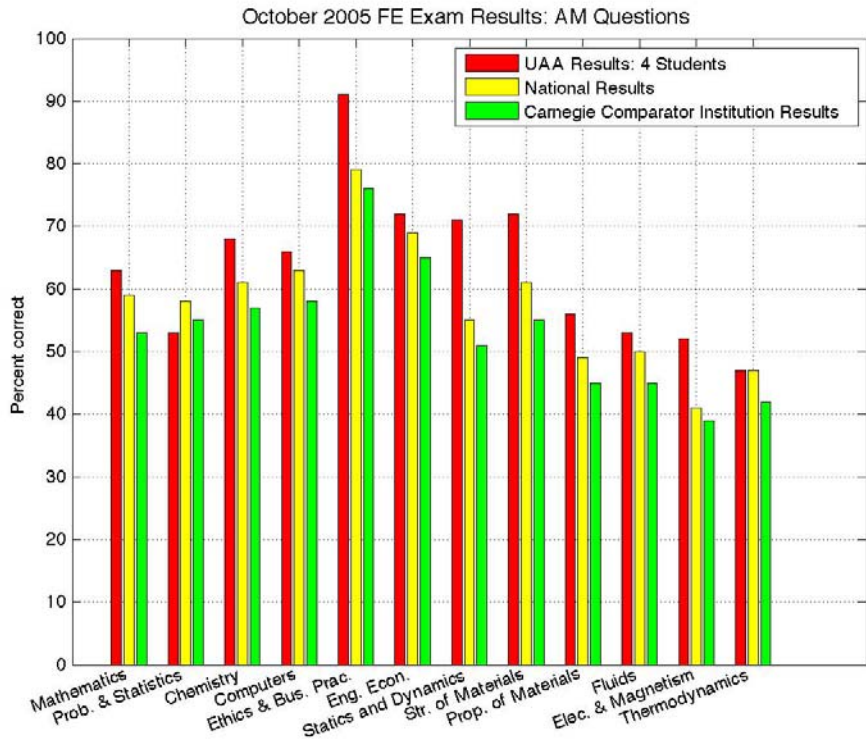


Figure A1. UAA enrolled CE student performance on October 2005 FE AM exam

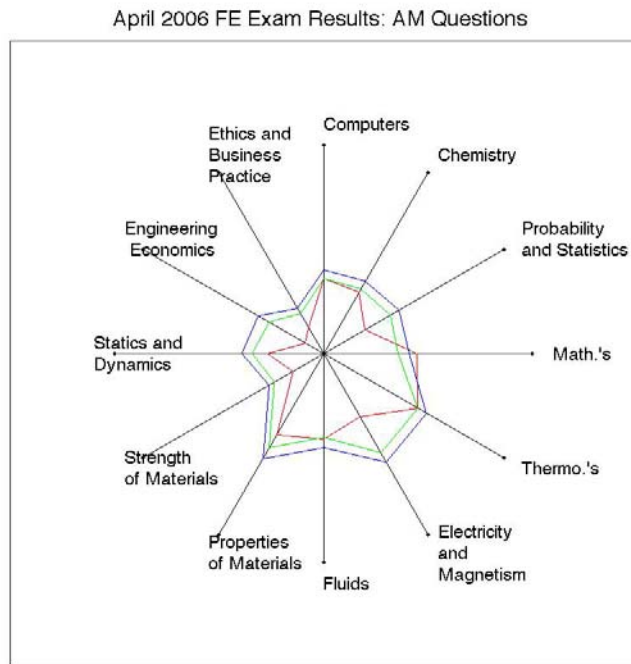
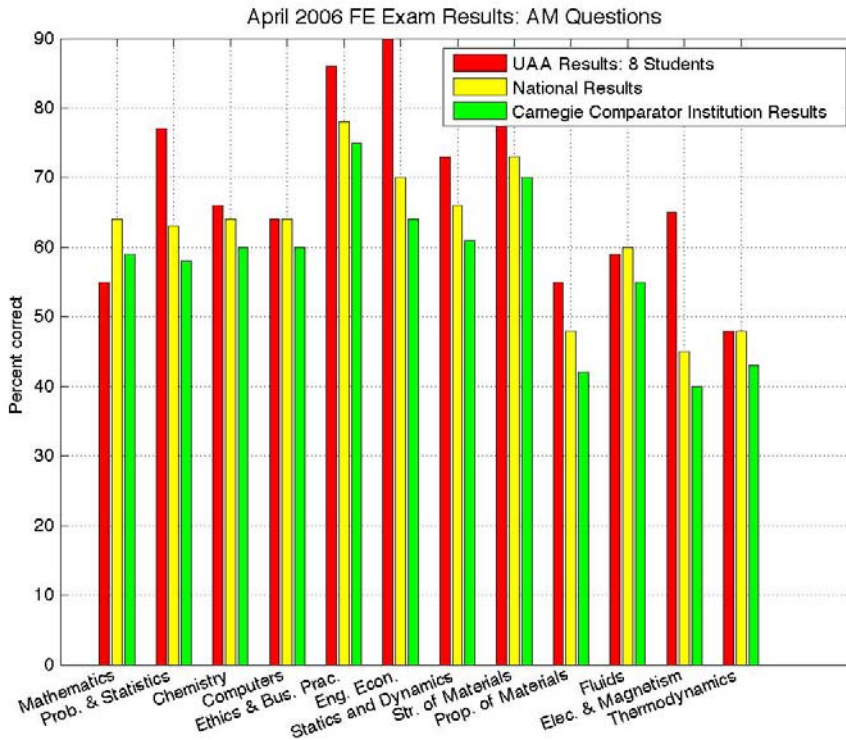


Figure A2. UAA enrolled CE student performance on April 2006 FE AM exam

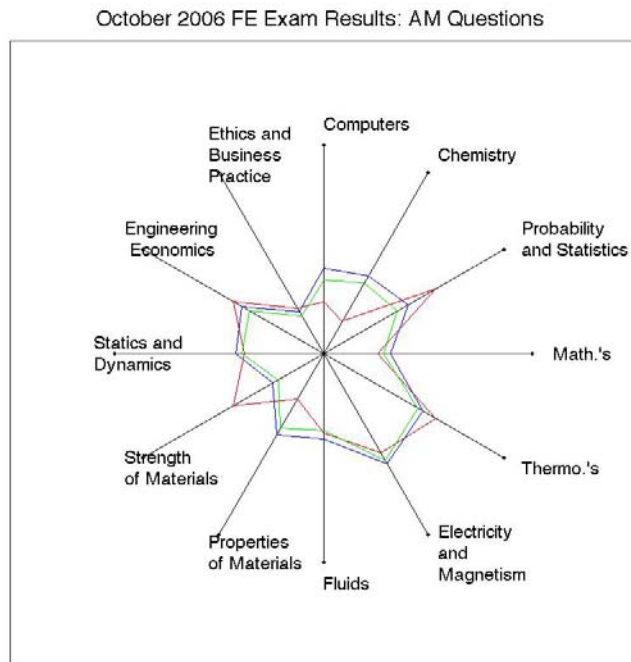
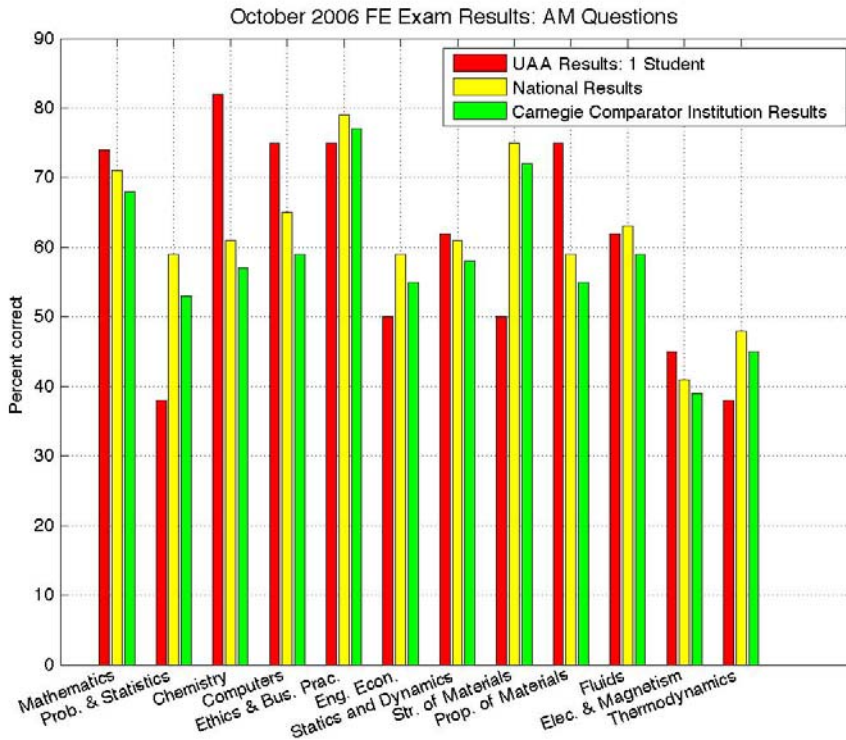


Figure A3. UAA enrolled CE student performance on October 2006 FE AM exam

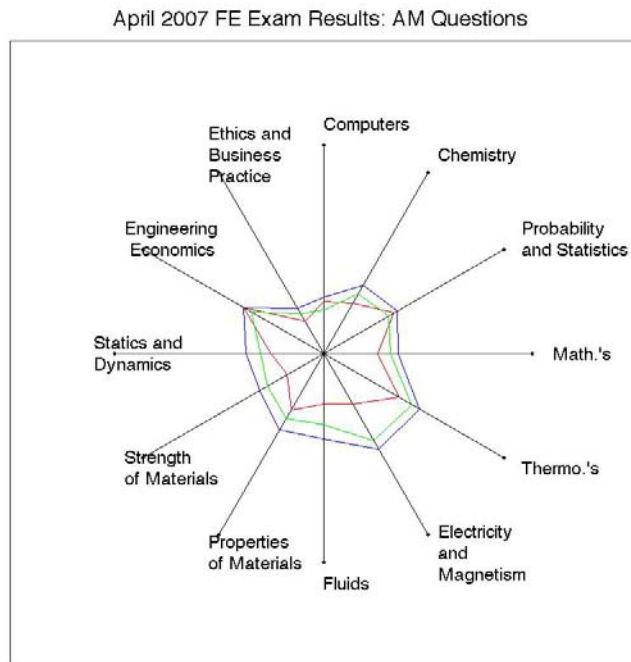
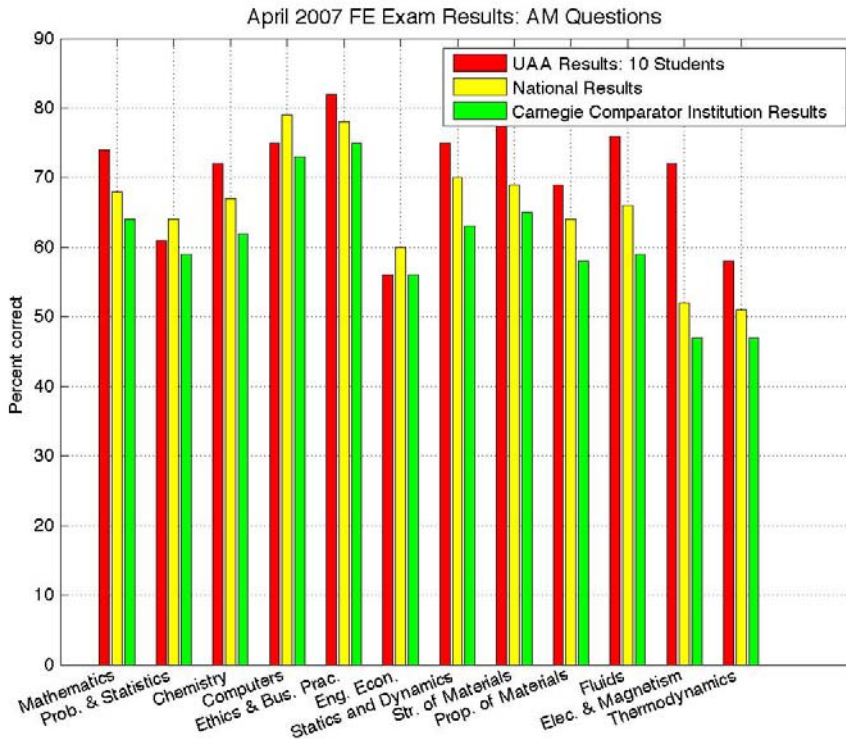


Figure A4. UAA enrolled CE student performance on April 2007 FE AM exam

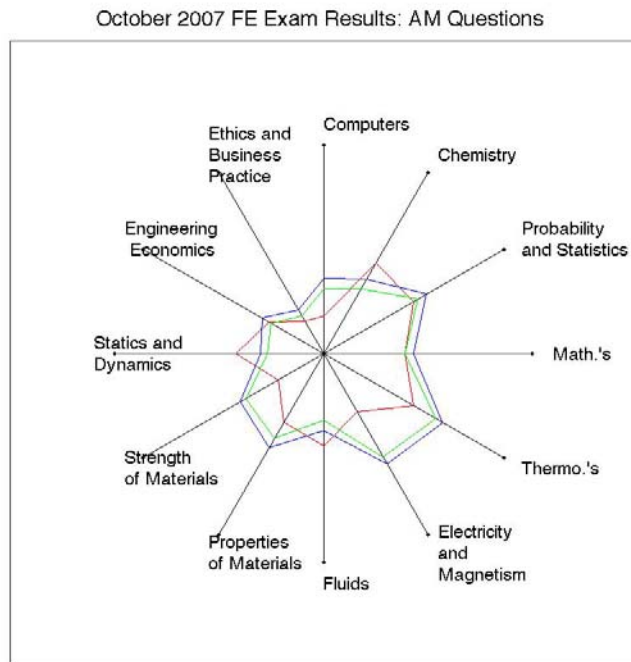
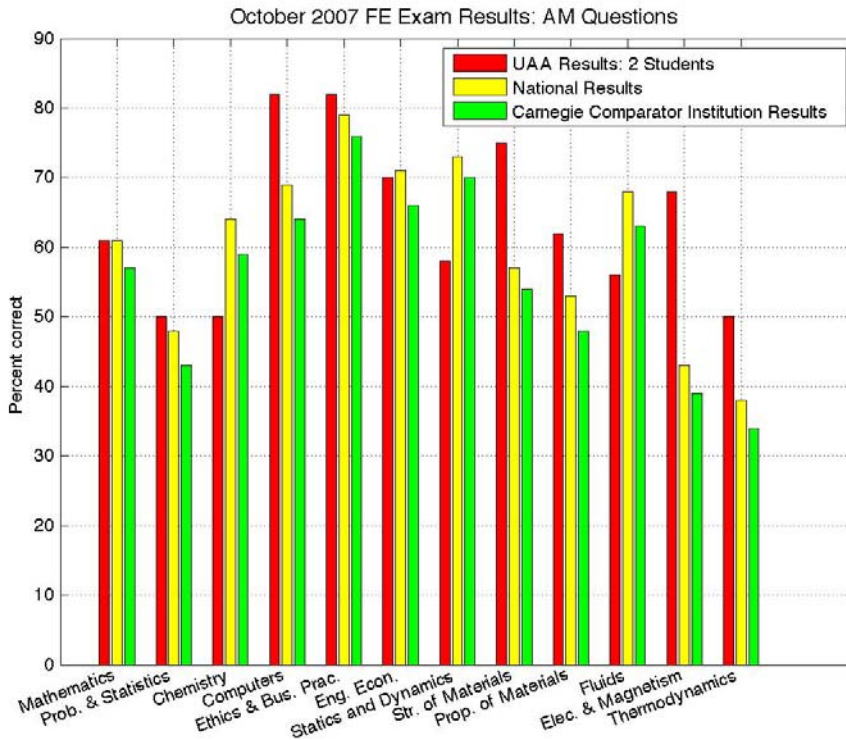


Figure A5. UAA enrolled CE student performance on October 2007 FE AM exam

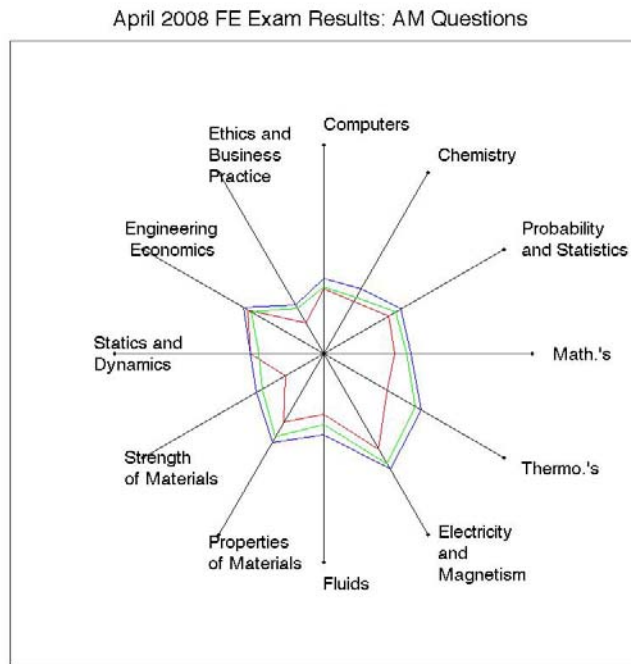
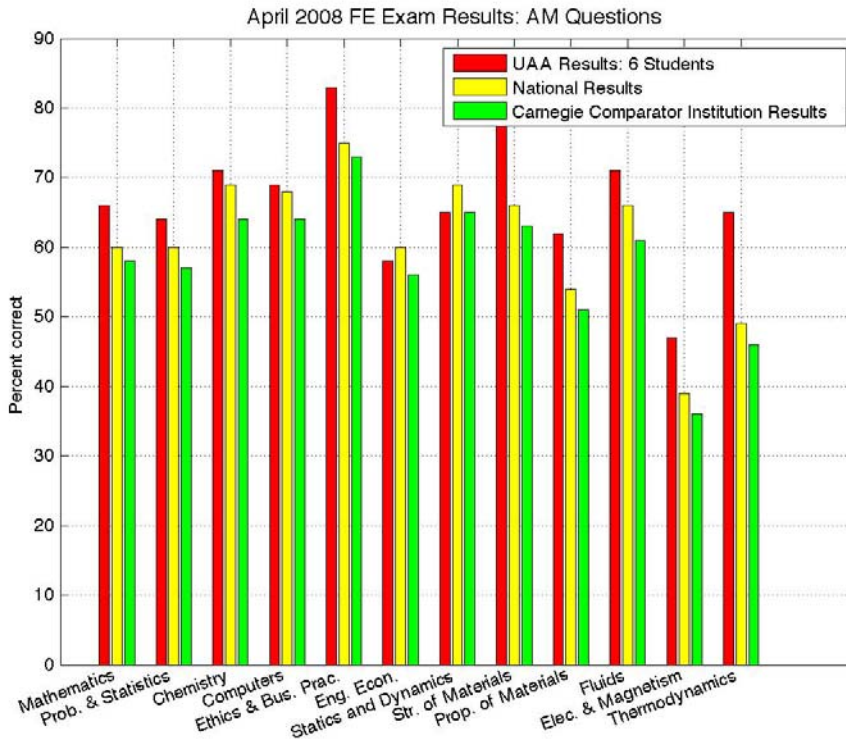


Figure A6. UAA enrolled CE student performance on April 2008 FE AM exam

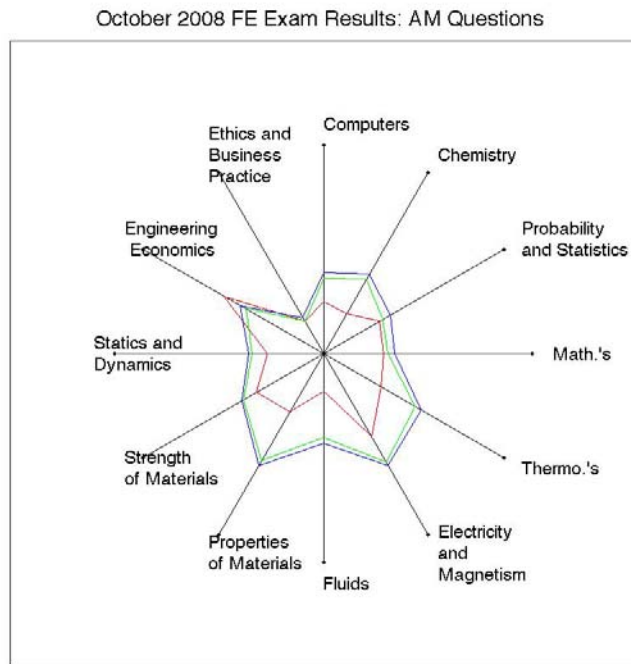
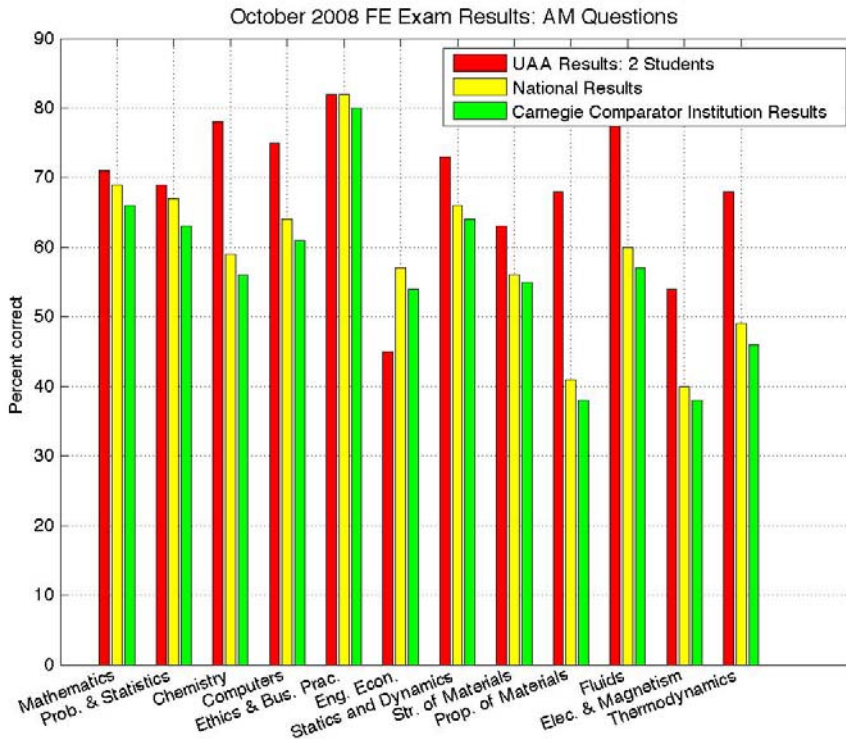


Figure A7. UAA enrolled CE student performance on October 2008 FE AM exam

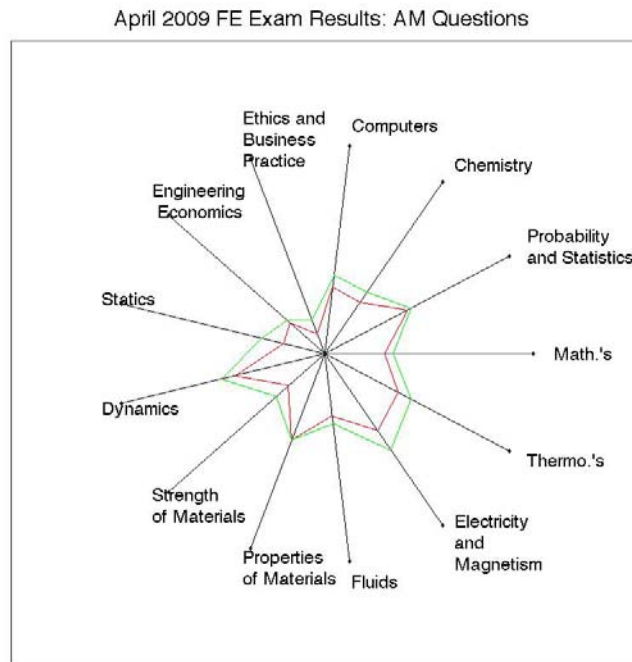
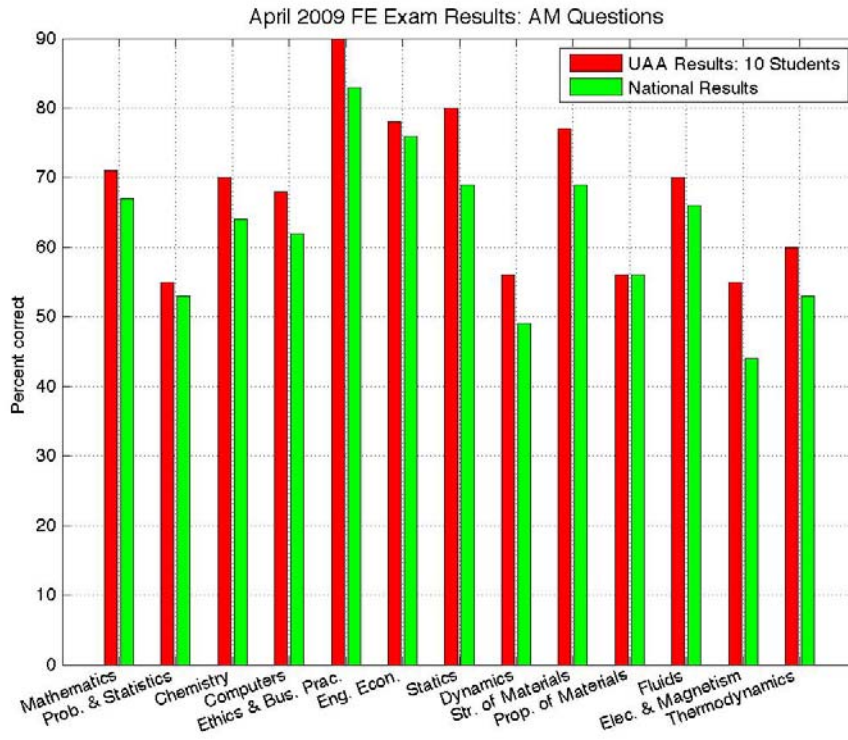


Figure A8. UAA enrolled CE student performance on April 2009 FE AM exam

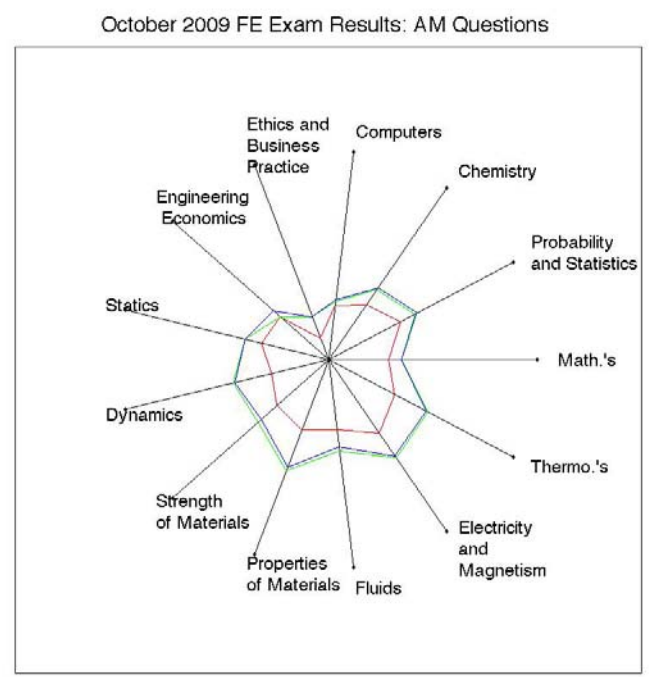
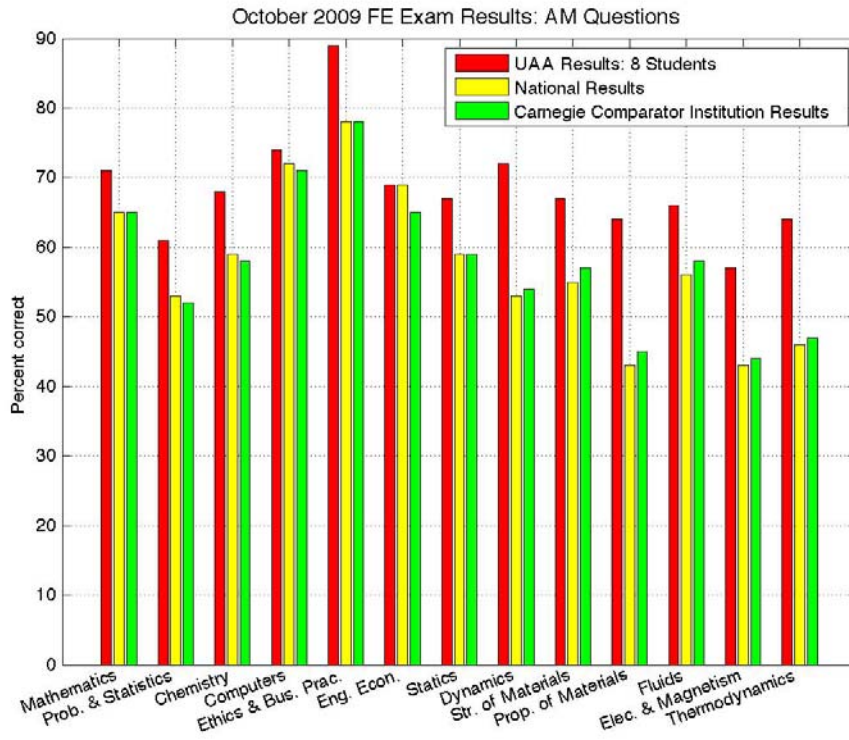


Figure A9. UAA enrolled CE student performance on October 2009 FE AM exam

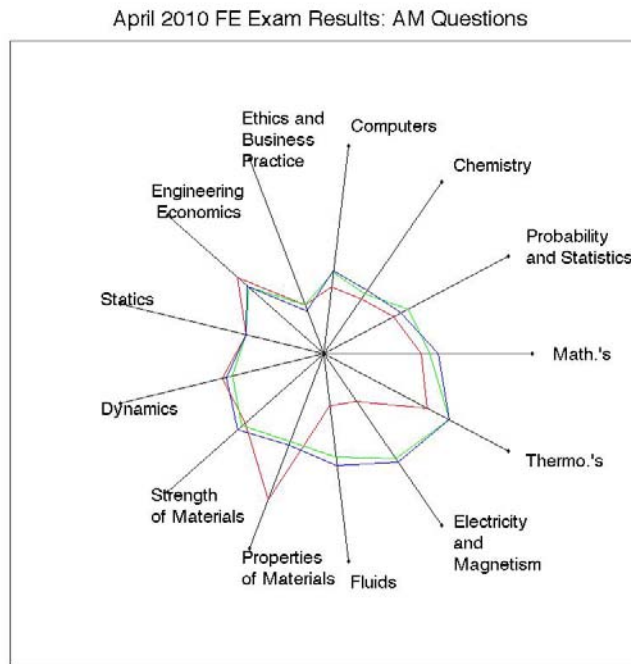
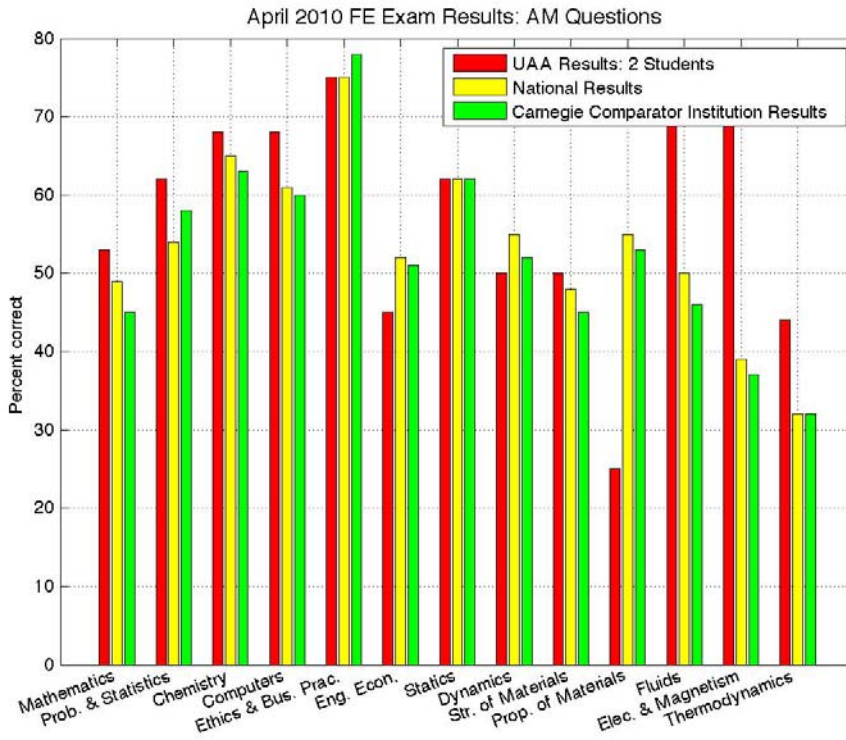


Figure A10. UAA enrolled CE student performance on April 2010 FE AM exam

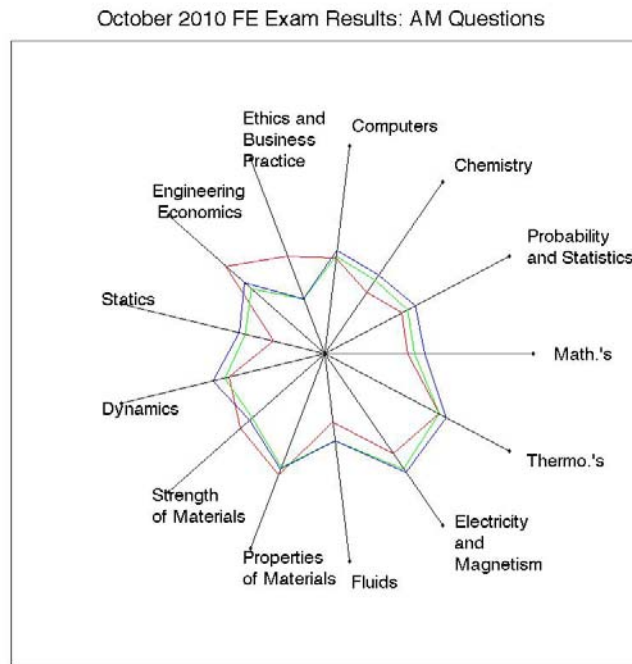
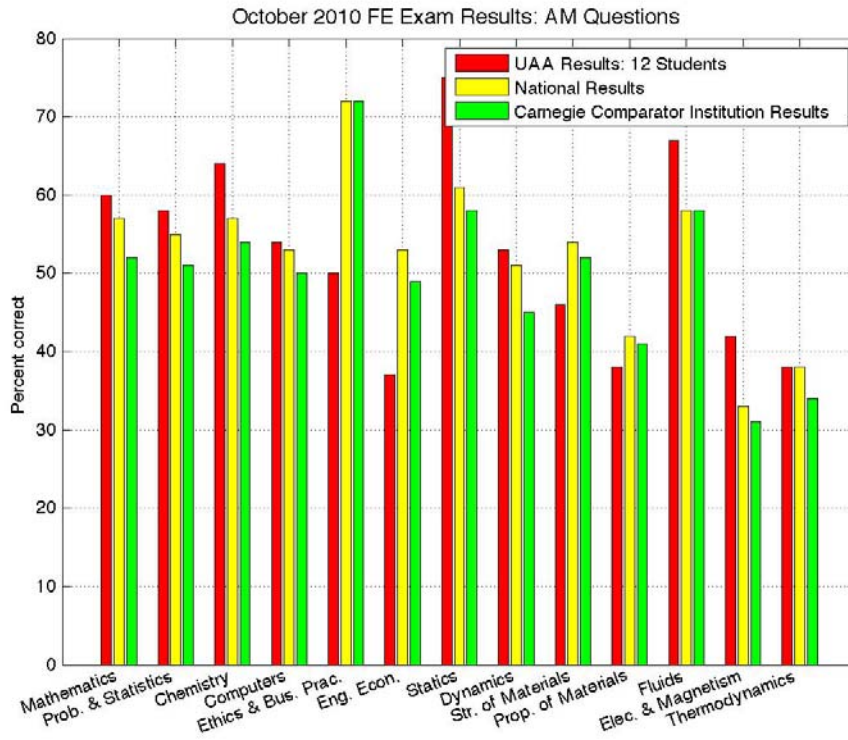


Figure A11. UAA enrolled CE student performance on October 2010 FE exam

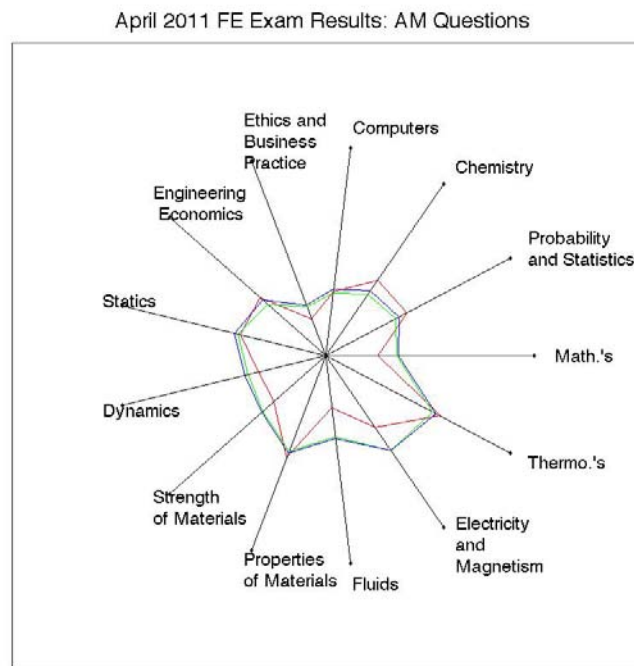
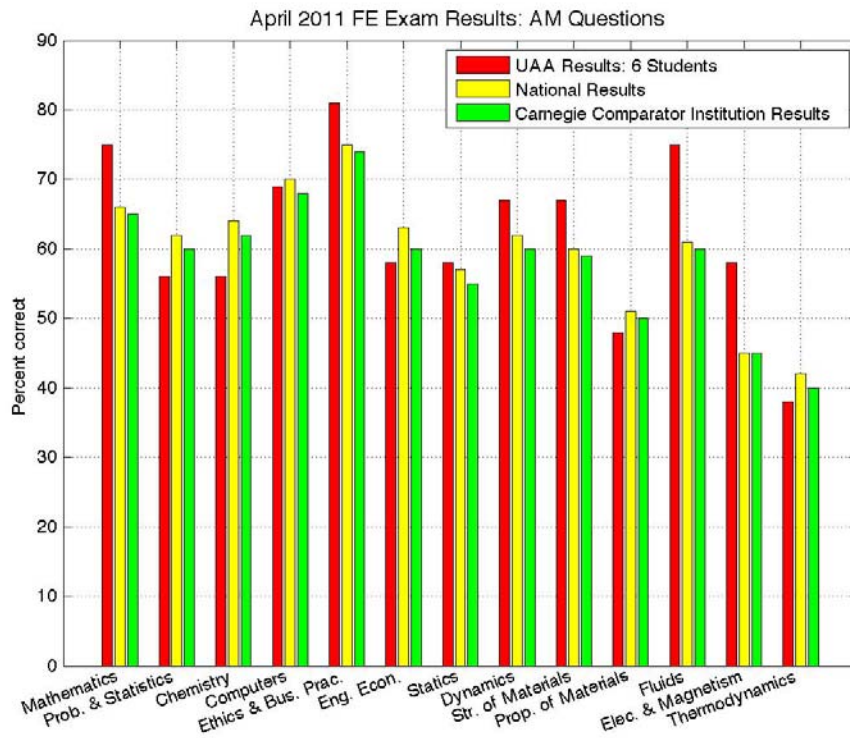


Figure A12. UAA enrolled CE student performance on April 2011 FE AM exam

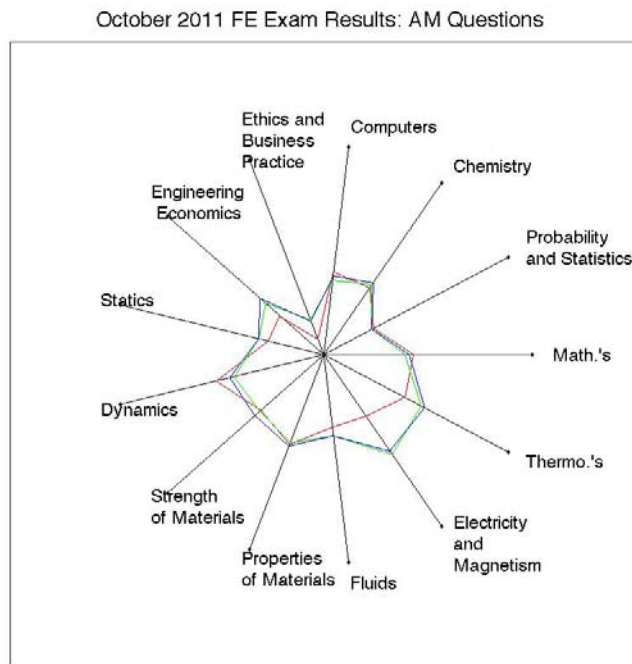
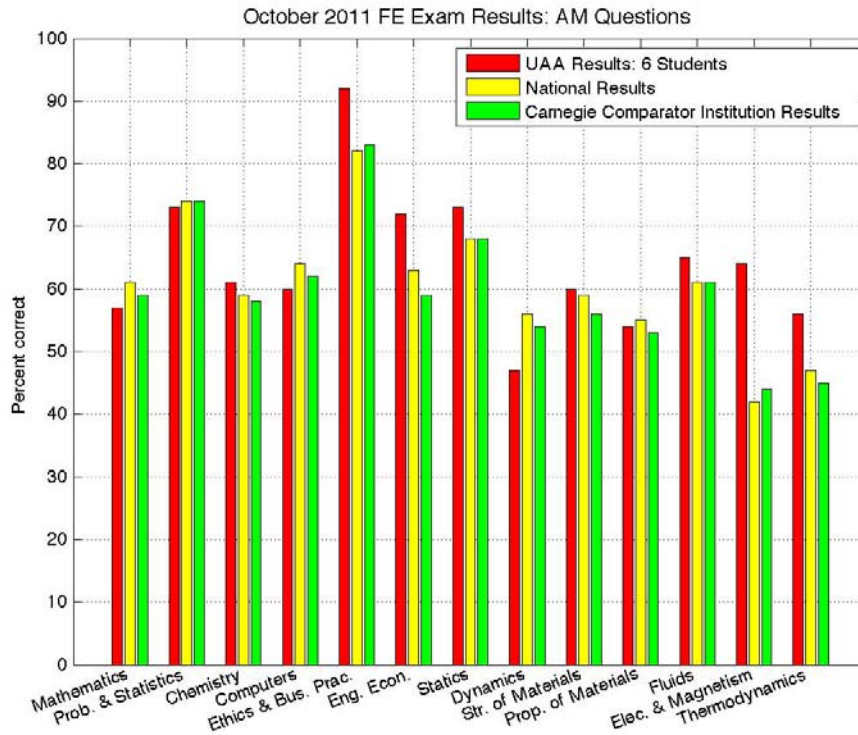


Figure A13. UAA enrolled CE student performance on October 2011 FE AM exam

Appendix B

PM Exam Results

All graphs show UAA enrolled CE student performance on the FE PM exam relative to National average and Carnegie comparator institution CE student performance. In lower radar plots, the hub represents 100% correct answers, and the outer radius corresponds to 0% correct answers, in the given subject areas. UAA performance is indicated by the red line.

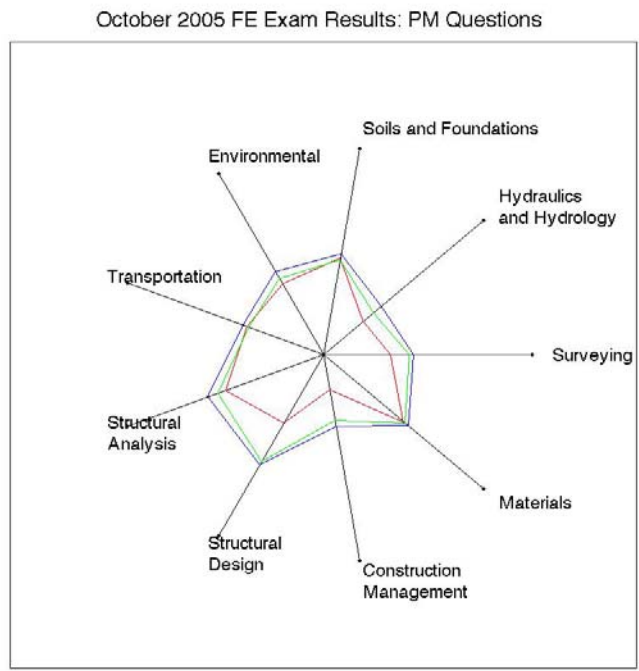
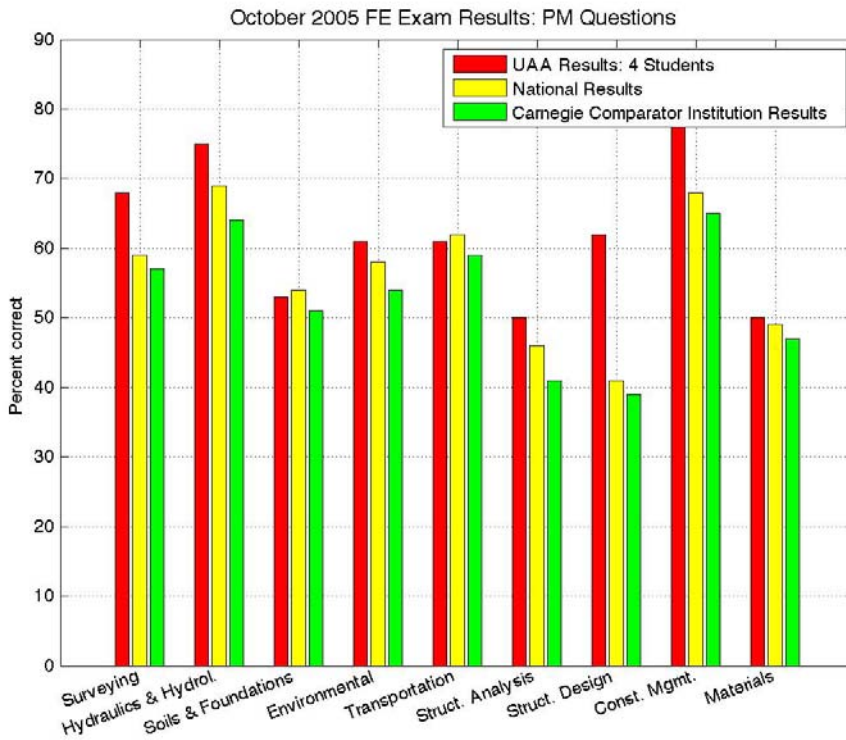


Figure B1. UAA enrolled CE student performance on October 2005 FE PM exam

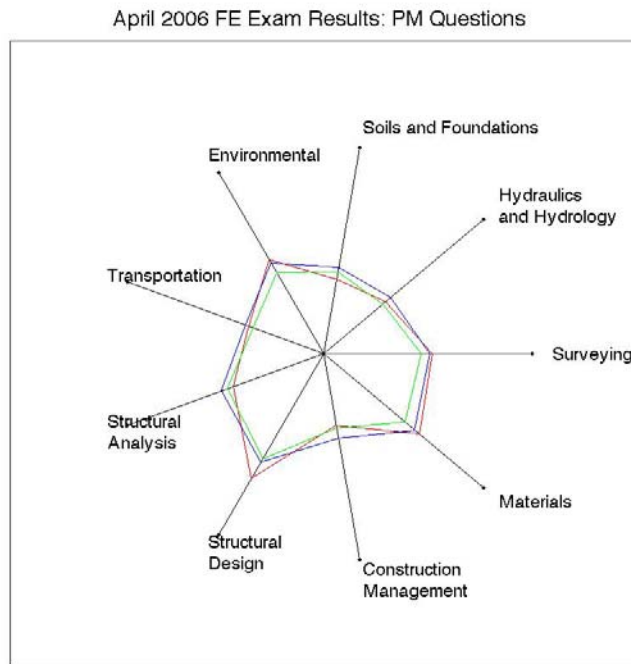
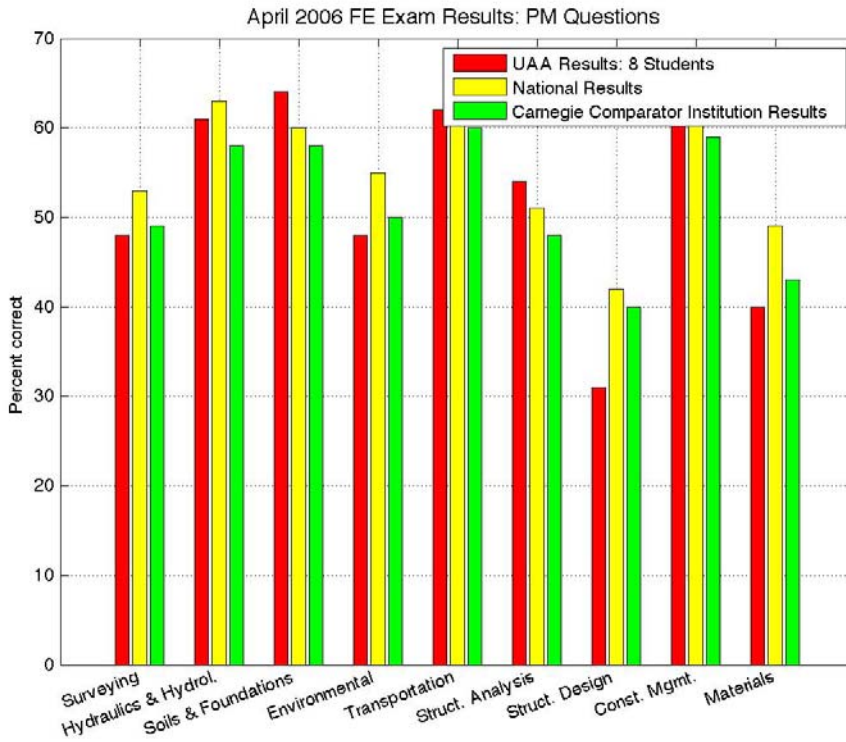


Figure B2. UAA enrolled CE student performance on April 2006 FE PM exam

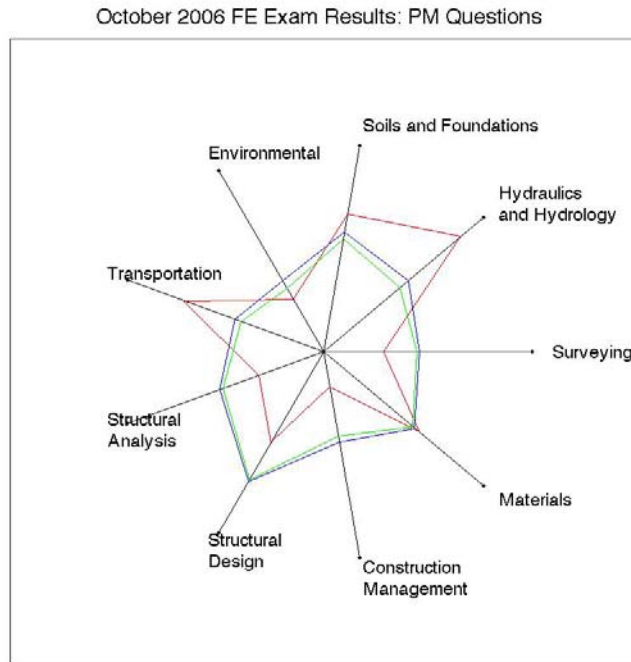
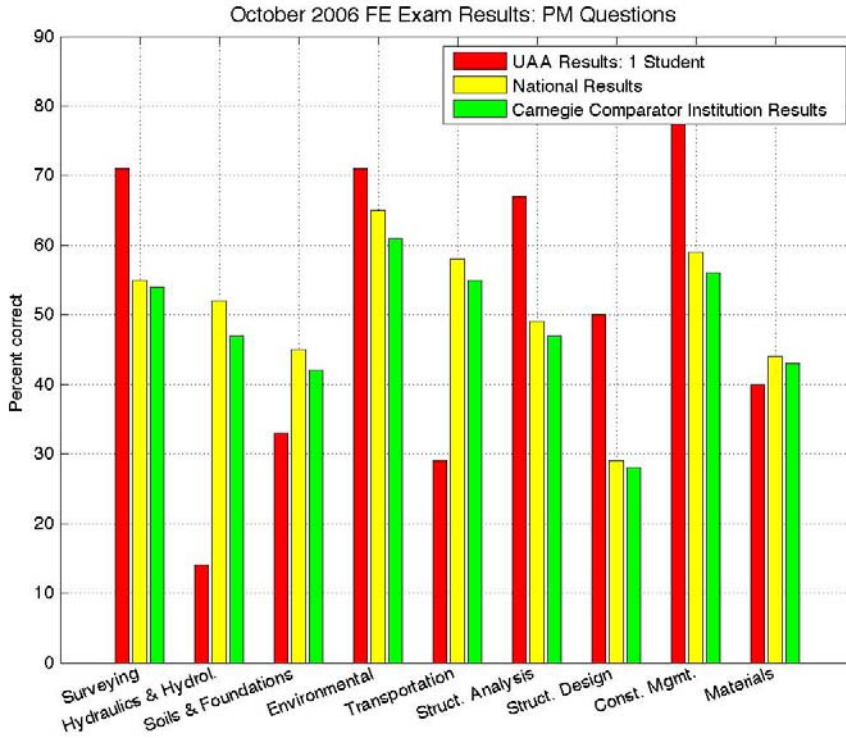


Figure B3. UAA enrolled CE student performance on October 2006 FE PM exam

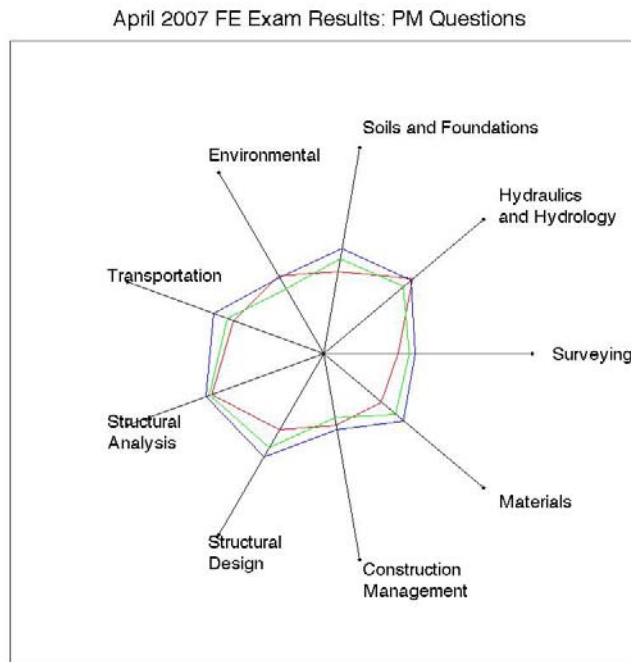
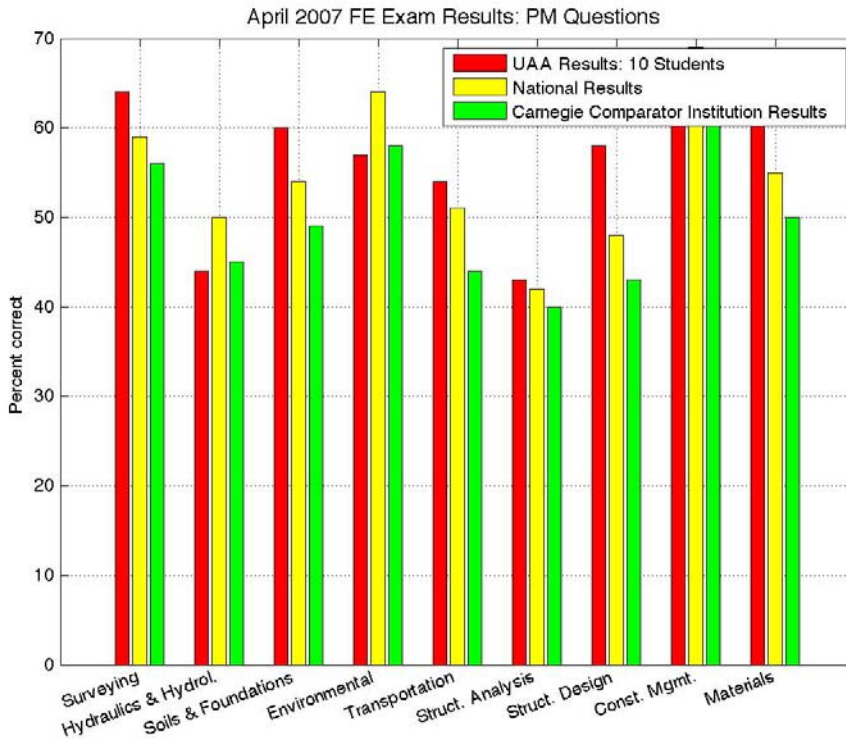


Figure B4. UAA enrolled CE student performance on April 2007 FE PM exam

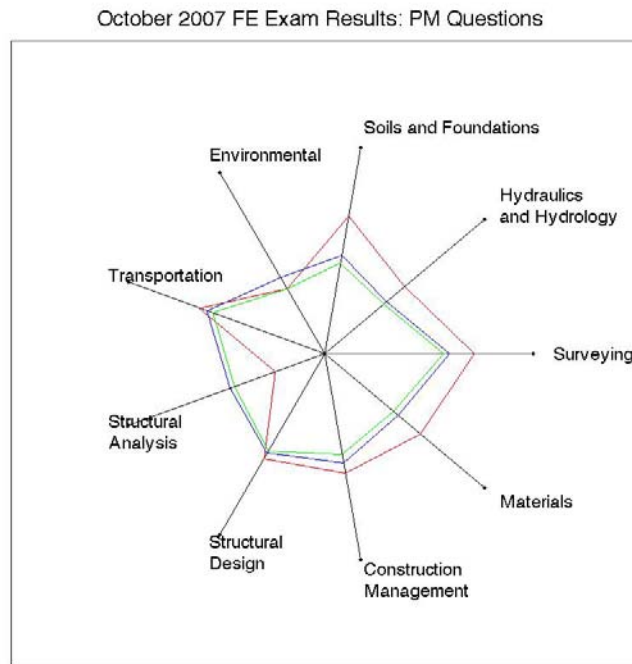
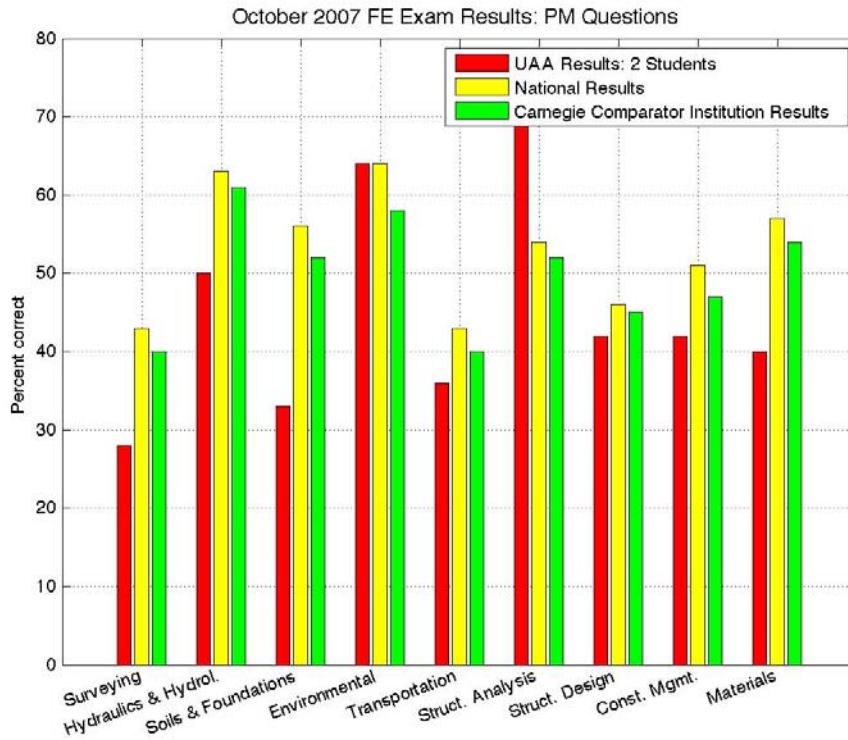


Figure B5. UAA enrolled CE student performance on October 2007 FE PM exam

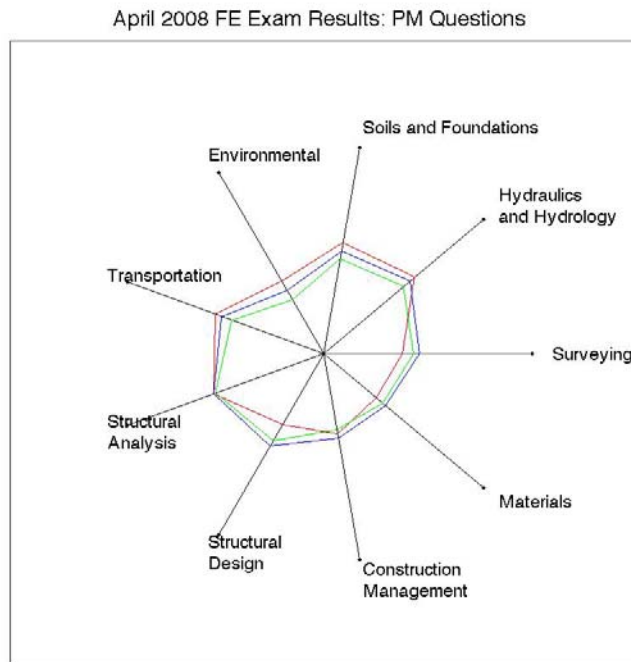
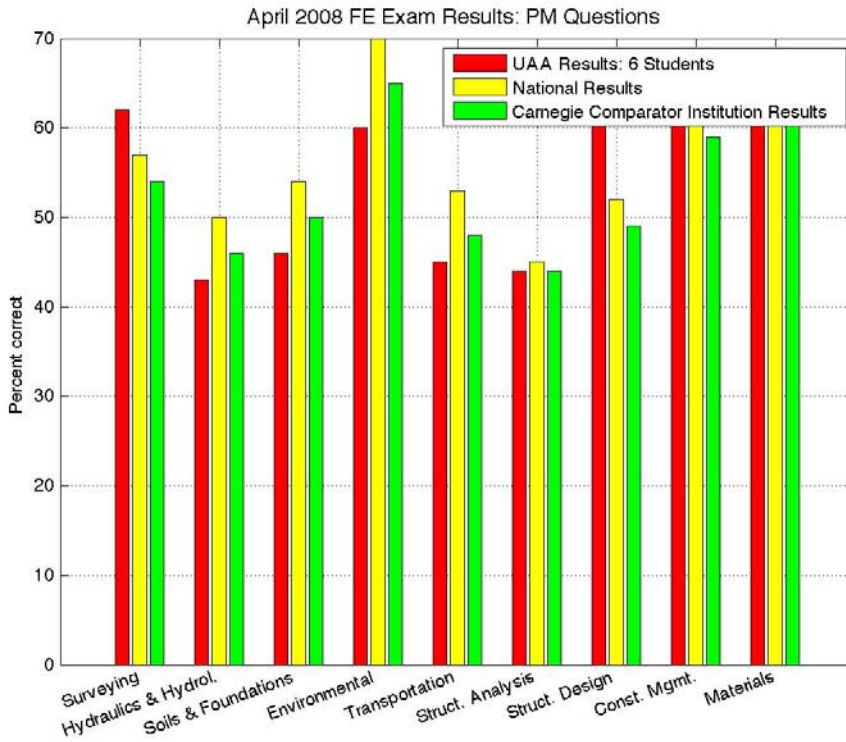


Figure B6. UAA enrolled CE student performance on April 2008 FE PM exam

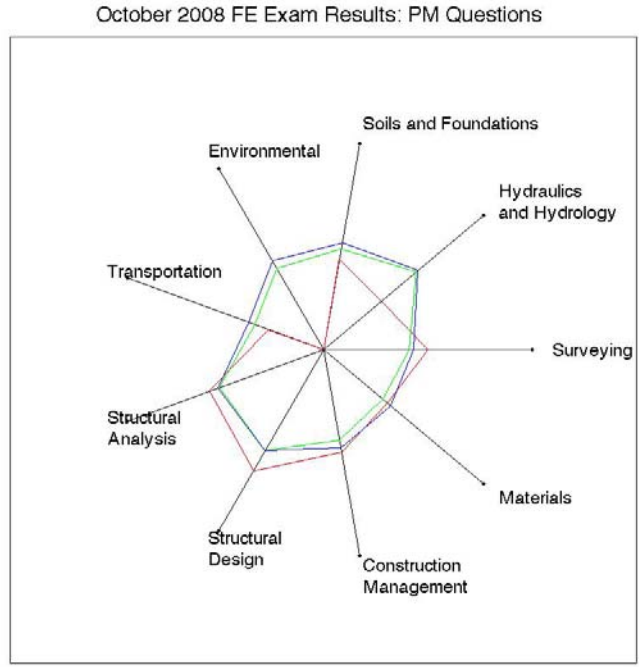
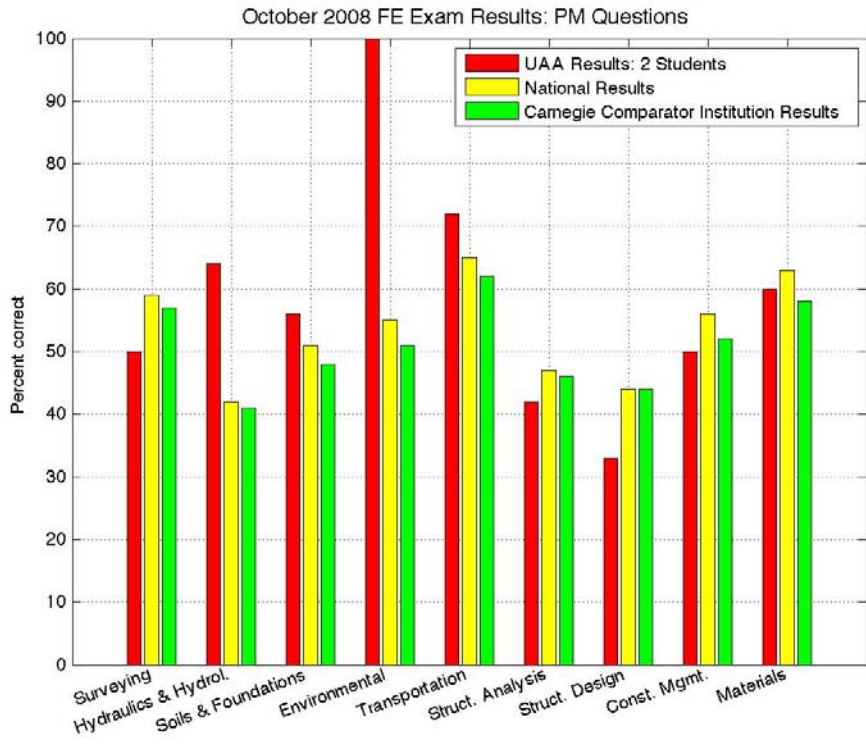


Figure B7. UAA enrolled CE student performance on October 2008 FE PM exam

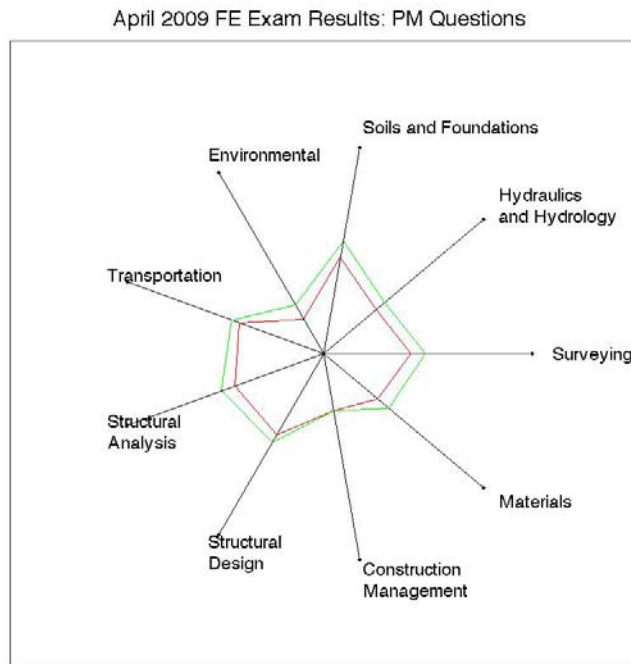
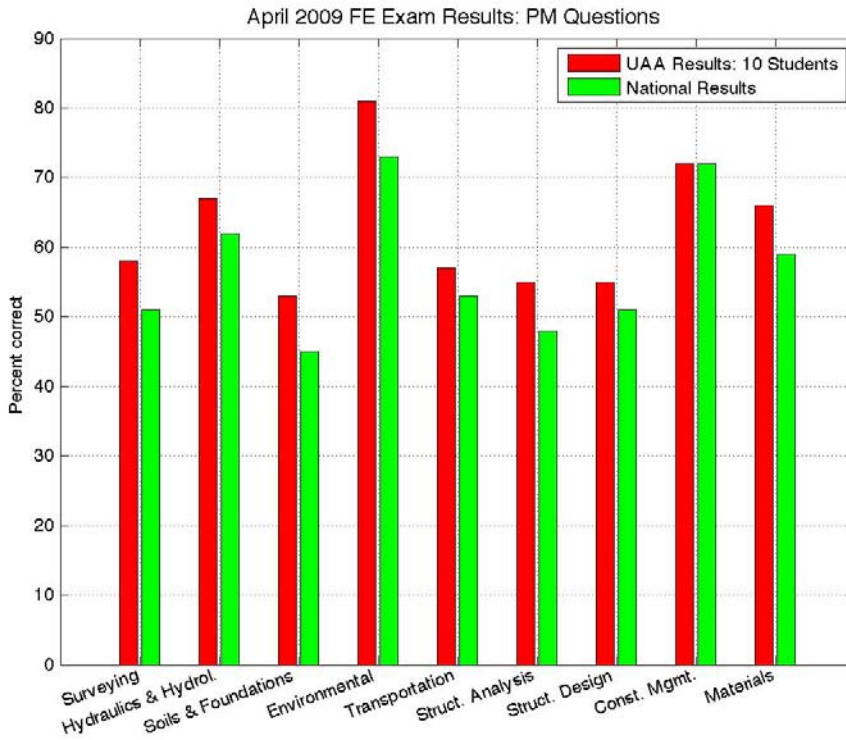


Figure B8. UAA enrolled CE student performance on April 2009 FE AM exam

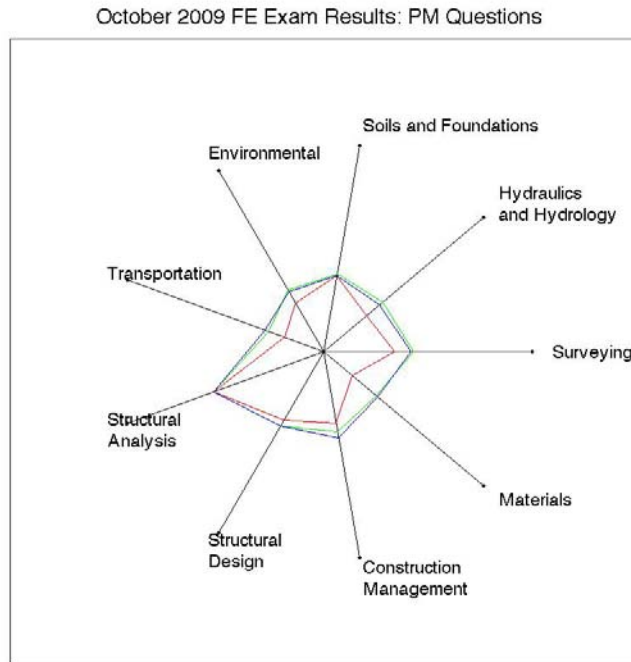
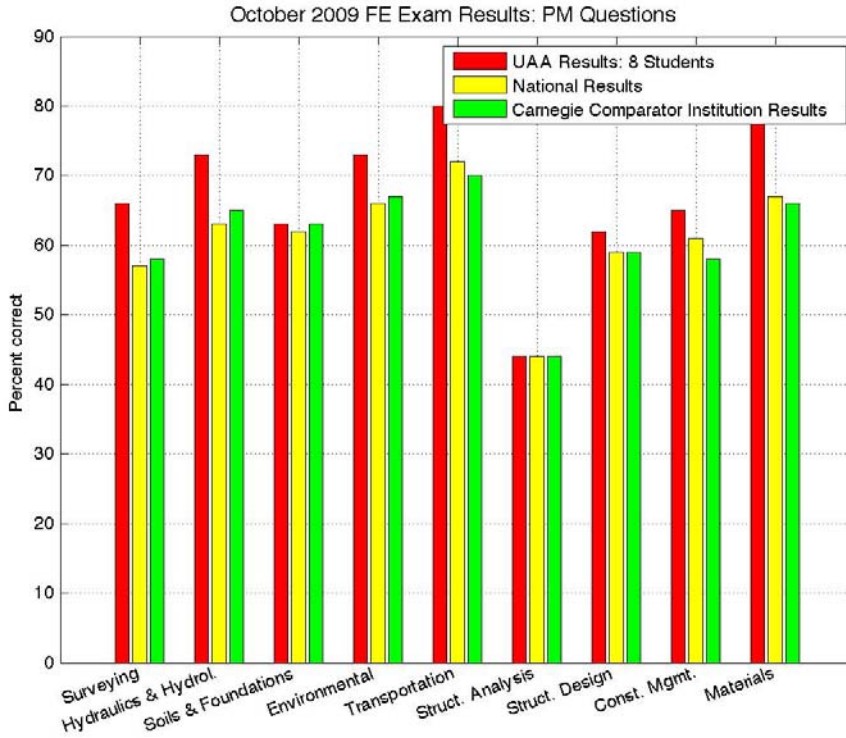


Figure B9. UAA enrolled CE student performance on October 2009 FE PM exam

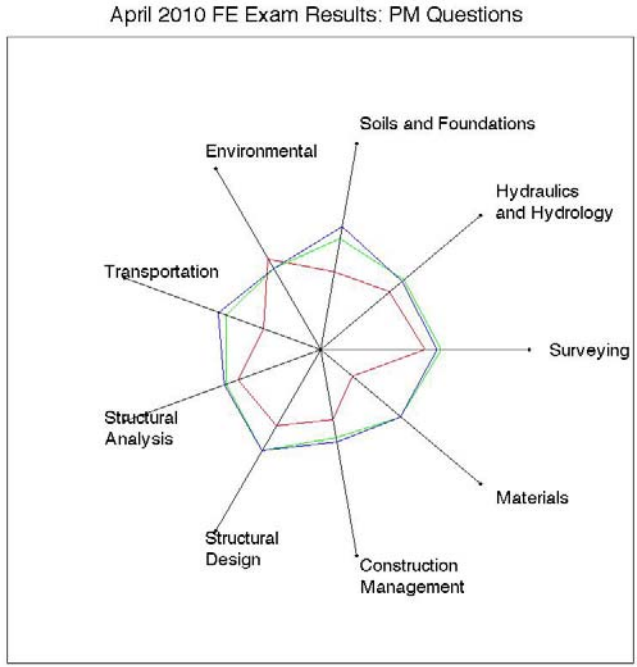
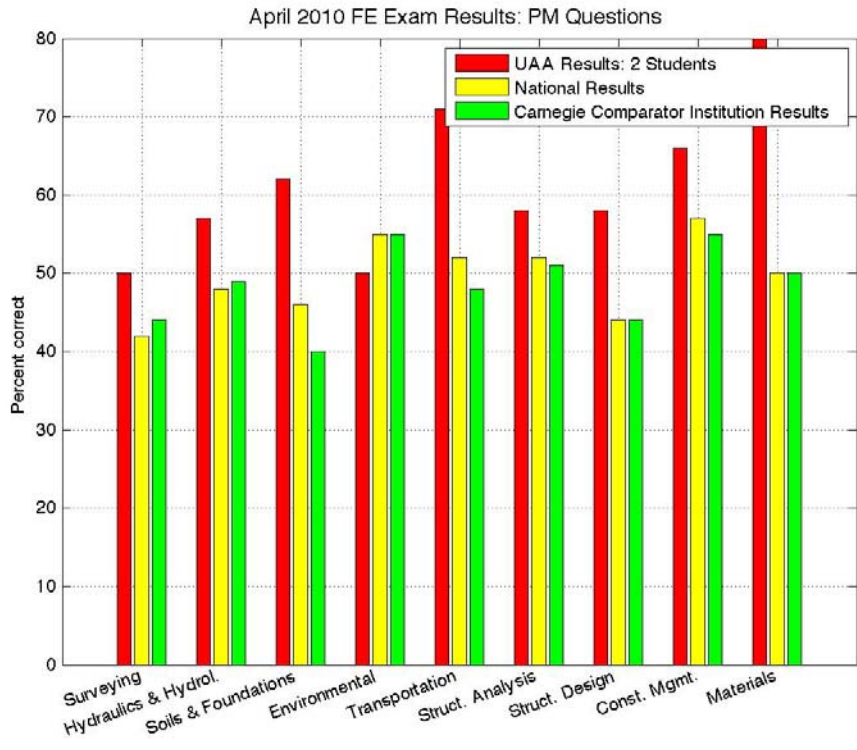


Figure B10. UAA enrolled CE student performance on April 2010 FE PM exam

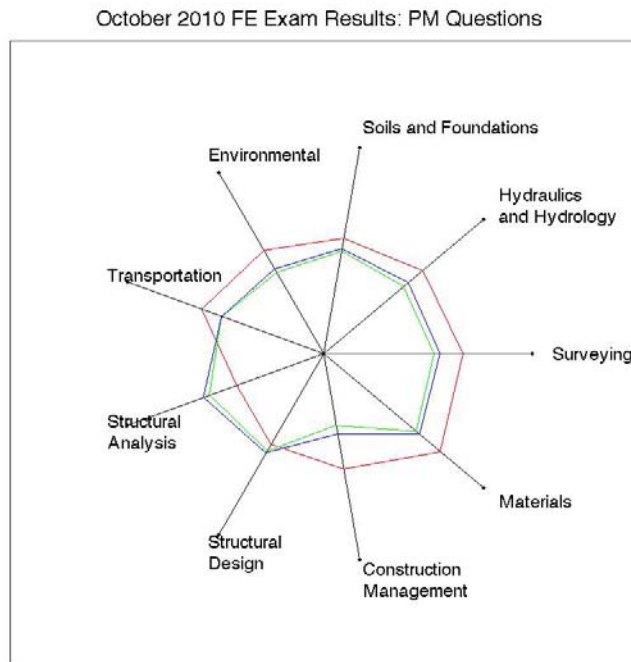
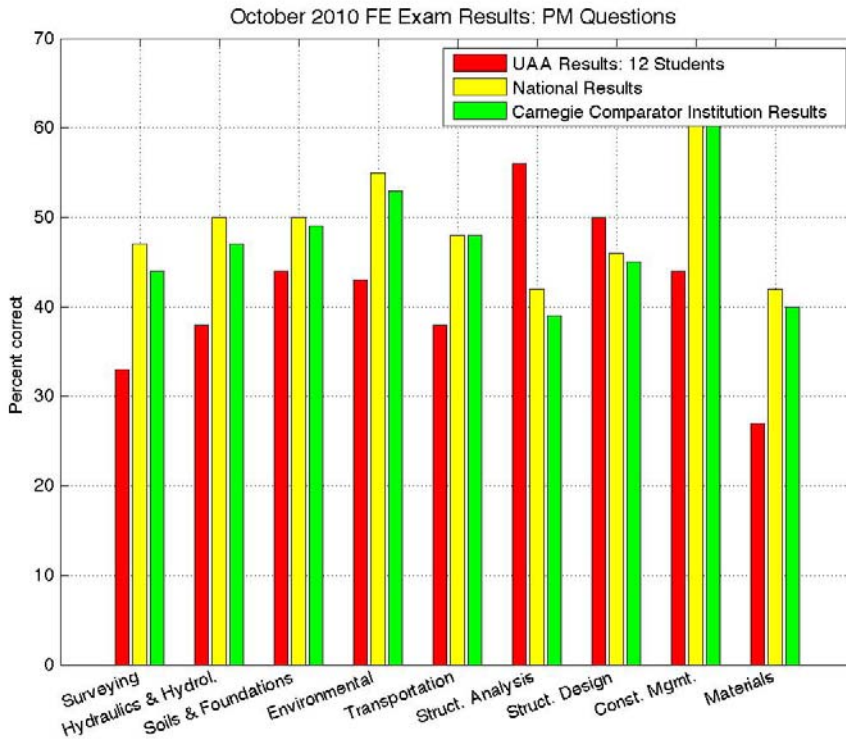


Figure B11. UAA enrolled CE student performance on October 2010 FE PM exam

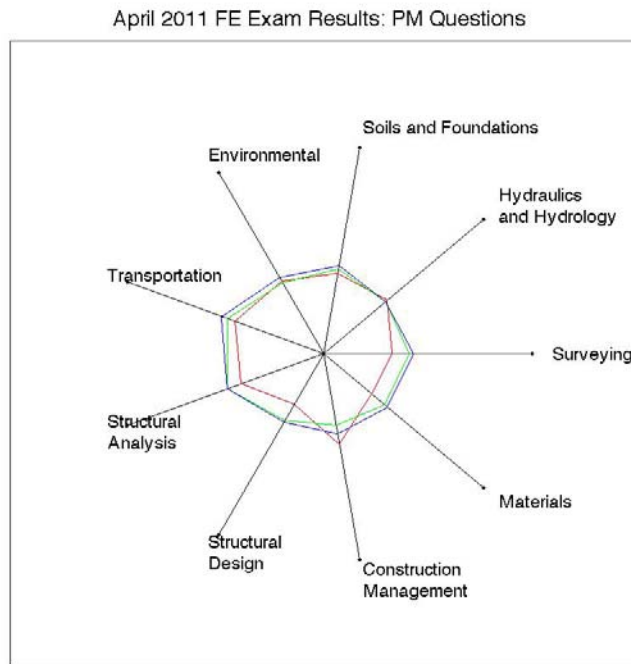
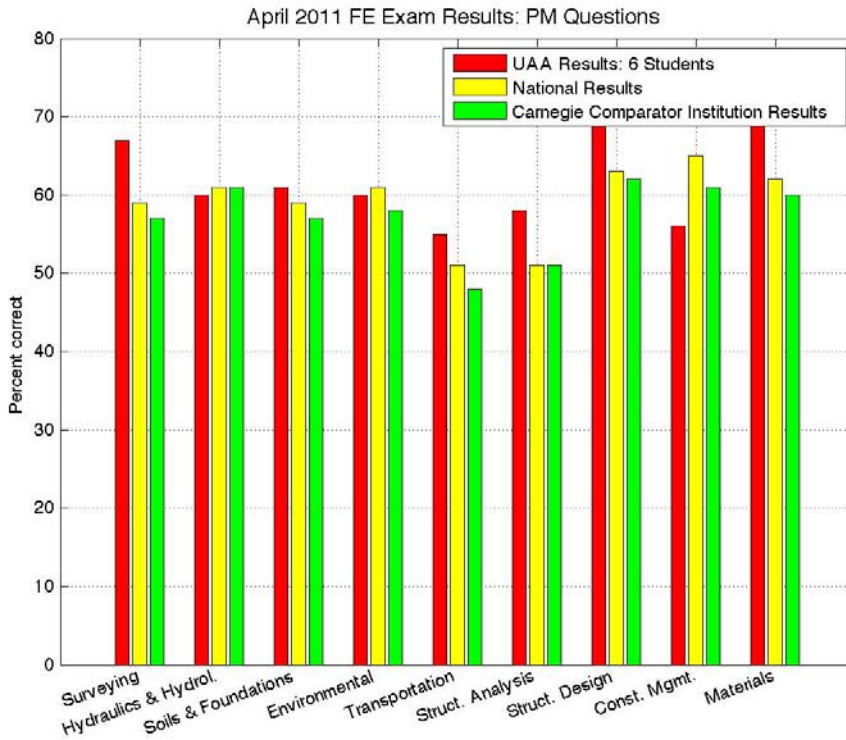


Figure B12. UAA enrolled CE student performance on April 2011 FE AM exam

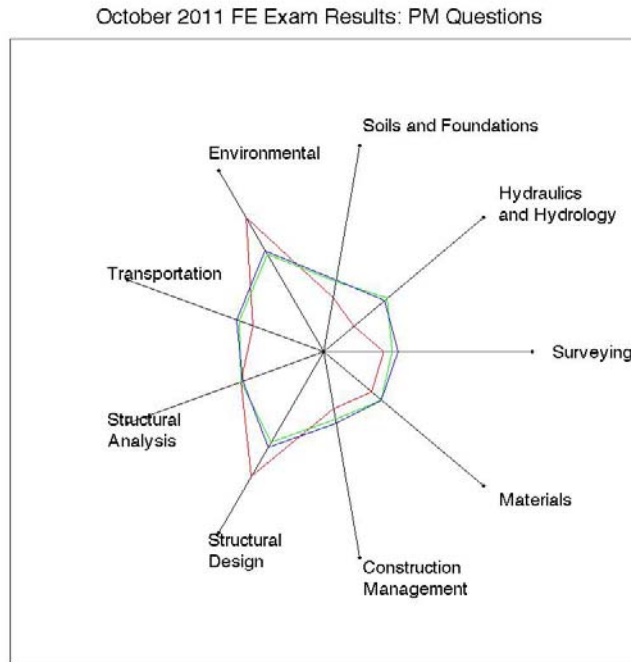
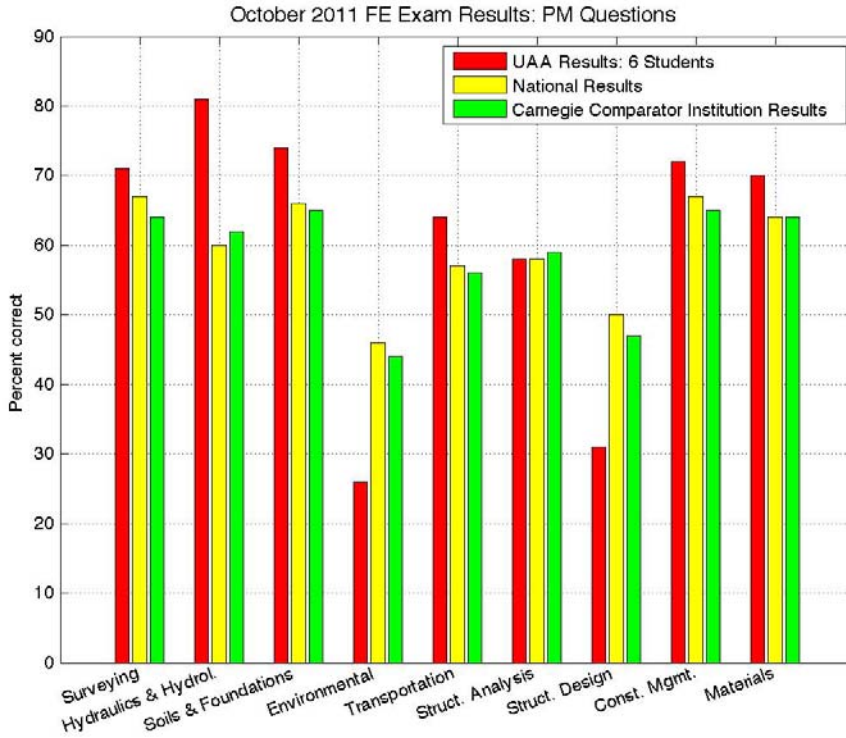


Figure B13. UAA enrolled CE student performance on October 2011 FE PM exam