

**Program Review - 2007**

**Associate of Science  
Physics and Pre-Engineering  
Degree Program**

**Program Instructors: Luka Kapkiai,**

## **Introduction:**

The Associate of Science with emphasis in Physics and Pre-Engineering is a two year degree track for students who intend to transfer to a four-year university and major in physics and engineering.

## **Section 1: Alignment of program mission and purposes with mission and purposes of NCCC.**

The Associate of Science degree in Physics and Pre-Engineering Program upholds all the missions and purpose of Neosho County Community College (NCCC). The mission of Physics and Pre-Engineering emphasis here at NCCC offer firm foundations of scientific methods to our students by helping them understand the basic principles of physics and engineering required when they transfer to four year colleges and provide an opportunity of courses in Physics, Engineering, and Mathematics for all our students at NCCC.

### **NCCC Purpose 1**

- **student learning through**
  - the meeting of students' needs,
  - quality educational programs, and
  - effective assessment processes;

Students desiring to pursue an associate of science degree in Physics and Pre-Engineering program at NCCC are required to take all the courses listed in section 2 under program courses. Each and every course offered in this program is assessed every semester that the course is offered. The assessment process is adapted from the guidelines outlined for assessing courses here at NCCC.

### **NCCC Purpose 2**

- **student success through**
  - providing personal attention,
  - individualized advising, and
  - the opportunity to meet personal goals;

Our class sizes for all the courses in this program are small and thus the instructors and students get to be familiar with each other at a professional level. Due to our small class sizes, instructors can offer one-on-one advising which helps students make better decisions to meet their educational goals.

### **NCCC Purpose 3**

- **ensuring access through**
  - affordability,
  - flexible delivery and scheduling methods,
  - responsive student services, and
  - safe and comprehensive facilities;

The courses for Physics and Pre-Engineering program are always scheduled and in accordance with the course rotation schedule. This enables our students to know what courses are offered each semester and our instructors are always willing to help advise our students of the courses being offered. Although our physical science laboratory needs some improvements, new equipment has been budgeted for.

#### **NCCC Purpose 4**

- **responsiveness to our stakeholders through**
  - open communication,
  - ethical management of resources,
  - accountability, and
  - the development of leaders;

Physics and Pre-Engineering program instructors at NCCC communicate to the department chair and to the administration about the needs, changes, progress, and even weakness that the program is facing. All the resources available for use in the program are used accordingly and a record of supplies (such as lab consumables and apparatus) is kept for accountability. Laboratory courses offer the instructors the opportunity to engage students in groups during lab experiments for instance which helps them develop leadership among themselves.

#### **NCCC Purpose 5**

- **meeting community needs through**
  - collaboration and innovation,
  - lifelong learning opportunities,
  - cultural enrichment, and
  - the providing of an educated workforce.

The division of applied science (Chemistry and Physics) is still exploring ways of forging collaboration with local companies such as Chanute manufacturing, Ash Grove and etc to offer internships or training opportunities for those students who plan on joining the work force as soon as they finish their associate degrees or want to gain some experience.

## **Section 2: Curriculum of Program and Outcomes Assessment**

### **Program Outcomes**

Upon completion of Physics and Pre-Engineering program, learners should be able to:

1. Demonstrate an understanding in measuring, mechanics of motion, the mechanical and thermal properties of matter, by application in problem solving.
2. Demonstrate an understanding in waves, simple harmonic motion, Electricity, magnetism, and optics, by application in problem solving.
3. Formulate problems in physics using the tools of mathematics.

4. Utilize graphing calculators in math and physics lab analysis.
5. Complete calculations in three-dimensional coordinate systems.
6. Use scientific method in lab work settings.
7. Identify and analyze experimental error in lab work and relate it to lab measurement.

### **Courses in Program**

1. PHYS 104 – Engineering Physics I
2. PHYS 105 – Engineering Physics II
3. PHYS 140 – Engineering Physics I lab
4. PHYS 145 – Engineering Physics II Lab
5. MATH 122 – Plane Trigonometry
6. MATH 143 – Elementary Statistics
7. MATH 150 – Analytic Geometry and Calculus I
8. MATH 155 – Analytic Geometry and Calculus II
9. MATH 253 – Analytic Geometry and Calculus III

### **Assessments**

The courses in the associate of science in Physics and Pre-Engineering program were all assessed during the five year period. Each course offered under this category was assessed on its specific course outcomes and the program outcomes were assessed as a whole based on the particular course outcomes matrix. Two methods of assessments were used in the assessment process. Method 1 uses the percentage of students meeting the course outcome while method 2 uses the weighted average of the students. The summary of the program outcomes assessment is shown in the table below.

#### **Assessment Method 1**

	<u>CO #</u>	<u># ASMNTS</u>	<u># ASMNTS MET</u>	<u>% ASMNTS MET</u>
PROGRAM OUTCOME GRAND TOTALS	48	276	214	78%

#### **Assessment Method 2**

	<u>CO #</u>	<u># ASMNTS</u>	<u>WEIGHTED AVG %</u>	<u>GOALS MET</u>	<u>GOALS UNMET</u>
OTCM GRAND TOTALS	48	266	79	23	9

In general, there are 48 course outcomes for the Physics and Pre-Engineering track. During this 5 year period students are passing the course outcomes with 78 % using method 1 and while using method 2 students have a weighted average of 79 %. The data therefore suggest that the students are learning and passing the outcomes. At this time there are no program changes. Although some new equipments and apparatus for physics have been ordered to help demonstrate to students the concepts learned during lectures, we still need more to fully adapt to the changing technologies in teaching physics and engineering courses.

## Transferability of Program and Program Courses

Table 1: Course Transfer Equivalencies to Regents Universities

NCCC Course	University of Kansas	Kansas State University	Emporia State University	Pittsburgh State University	Wichita State University	Fort Hays State University	Washburn University
PHYS 104	PHSX 211	PHYS 213	PH 190	PHYS 104	???	PHYS 211	PS 281
PHYS 105	PHSX 212	PHYS 214	PH 193	PHYS 105	???	PHYS 212	PS 282
PHYS 140	PHSX 211	PHYS 213	PH 191	PHYS 130	???	PHYS 211L	LDE
PHYS 145	PHSX 212	PHYS 214	PH 194	PHYS 131	???	PHYS 212L	LDE
MATH 122	MATH 103	MATH 150	MA110	MATH 122	???	MATH 122	???
MATH 143	MATH 365	MATH 325	MA 120	MATH 143	???	MATH 250	???
MATH 150	MATH 121	MATH 220	MA 161	MATH 150	???	MATH 234	???
MATH 155	MATH 122	MATH 221	MA 262	MATH 155	???	MATH 235	???
MATH 253	N	MATH 222	MA 263	MATH 253	???	MATH 236	???

Note: \*LDE = lower division elective

???? = No information was collected from that particular course

Most of our courses are transferring smoothly to the University of Kansas, Kansas State University, Pittsburg State University and Emporia State University. Further transfer guidelines to other regent universities will be evaluated later.

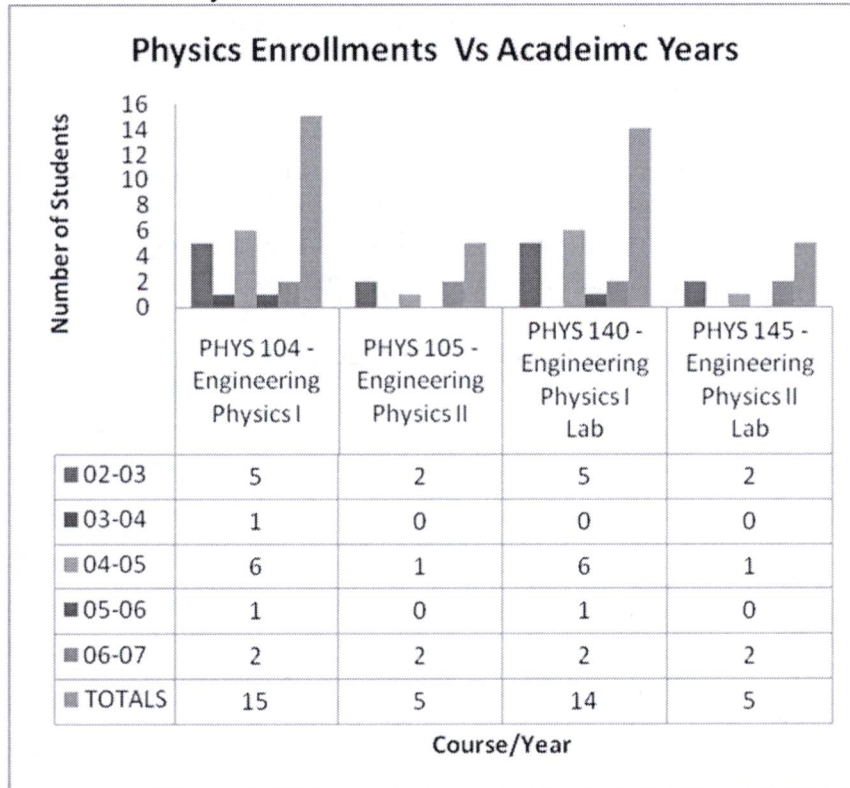
### Efforts to stay current in curriculum

The associate of science Physics and Pre-Engineering program faculty are actively involved in a number of professional activities on and off campus in an effort to stay current in the curriculum. Some of the ways are being able to attend conferences (such as League of Innovations), participate in college sponsored workshops (such as in-service), engage in the revisions of syllabi, taking graduate courses, and keeping up to date with new scientific developments by reading scientific literatures. In particular Luka Kapkiai is taking graduate courses such as philosophy of education, applied statistics geared towards a degree in Education.

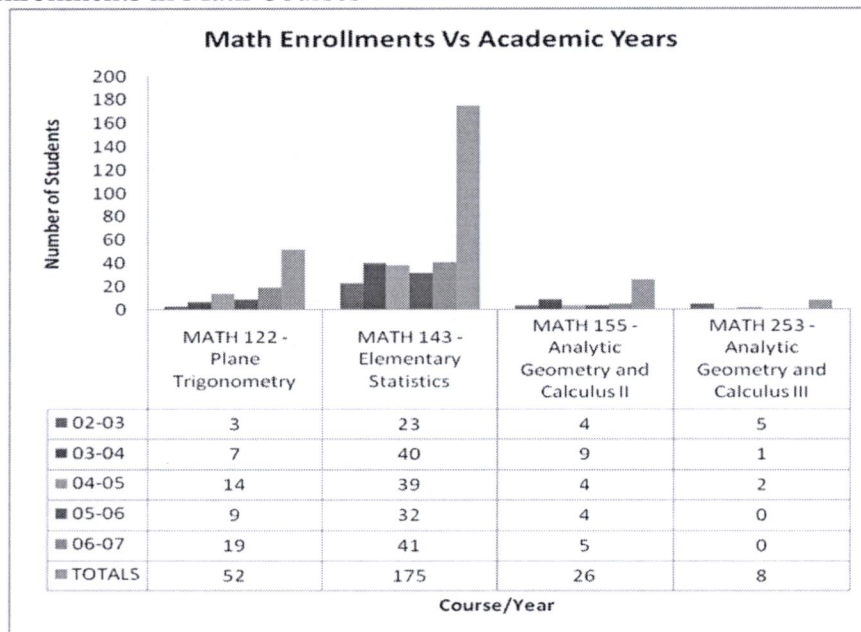
### Section 3: Data – Enrollment and Costs

The graphs represented below indicate the enrollment numbers per year for the last five years for each course listed for this review.

Graph 1: Enrollments in Physics Courses



Graph 2: Enrollments in Math Courses



The data above indicates that enrollments in Engineering Physics have not been steady from year to year. Also about 67 % of students enrolling in Engineering Physics I are not continuing with Engineering Physics II and this might be due to transfer to other colleges. Enrollments in elementary Statistics have been fairly steady with an average of

35 students enrolling each year. There is however, a low enrollment in Analytic Geometry and Calculus III with zero enrollments for the years 05-06 and 06-07.

### **Students in Physics and Pre-Engineering Major**

An associate of science in Physics and pre- engineering is not listed as a major here at NCCC. So during the five year period 2000 – 2005, there were no students pursuing an associate of science degree in Physics and Pre-Engineering. There is also no information on the number of students that changed majors.

### **Withdraw numbers and percentages from each course**

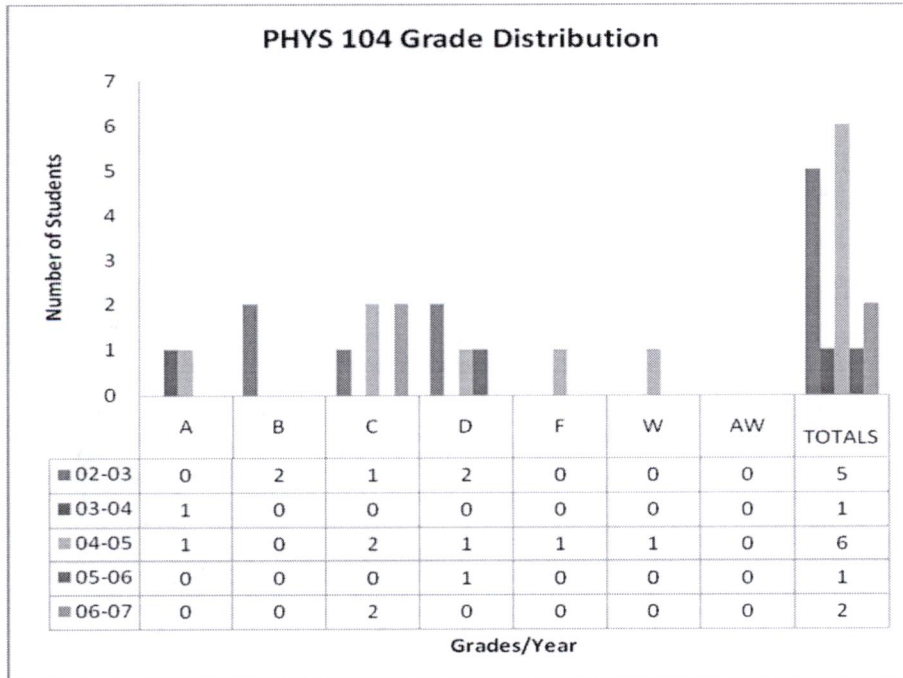
The data presented below indicate the percentage of students who withdrew or were withdrawn from the course.

	Withdrawals	% Withdrawn
PHYS 104	1	7%
PHYS 105	0	0%
PHYS 140	1	7%
PHYS 145	0	0%
MATH 122	2	4%
MATH 155	2	8%
MATH 143	20	11%
MATH 253	0	0%

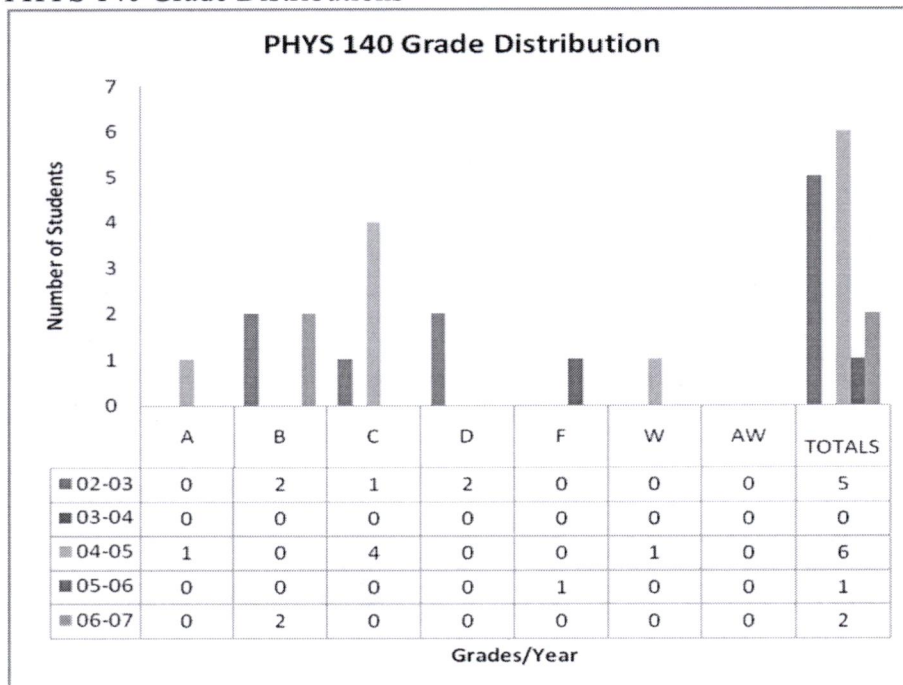
### **Grade Distributions**

The graphs shown in this section represent the letter grades given out for the various courses in this program review for the last five years (period 2000 – 2005). The data indicate that majority of the students are achieving grades better than a C.

Graph 1: PHYS 104 Grade Distributions

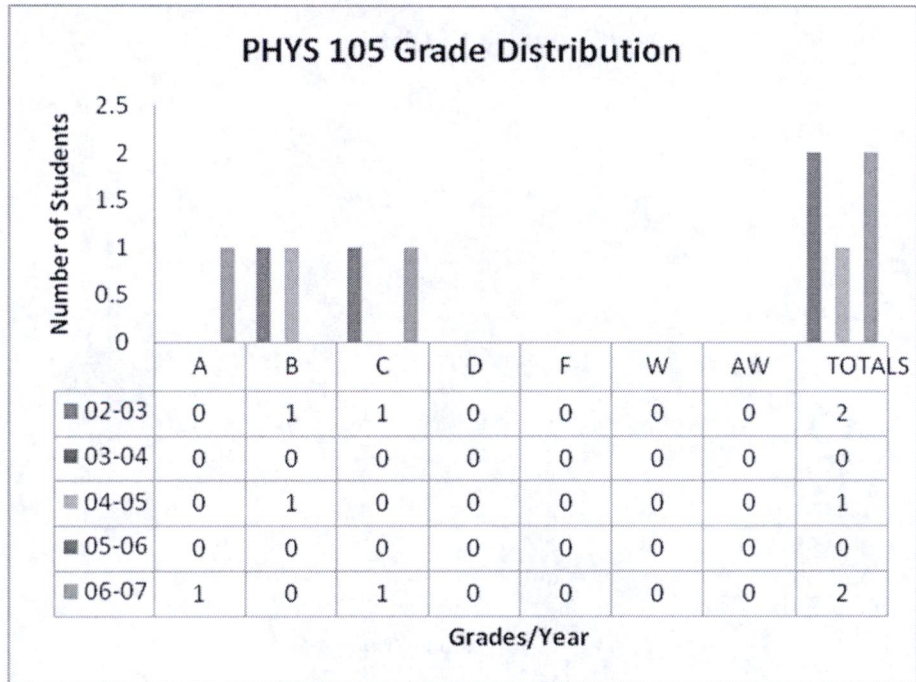


Graph 2: PHYS 140 Grade Distributions

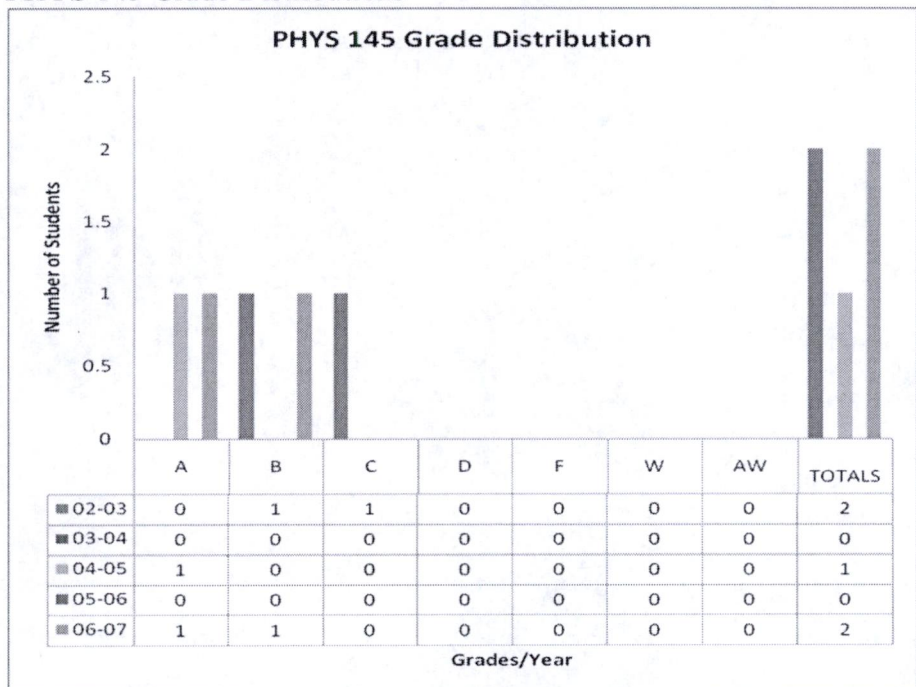




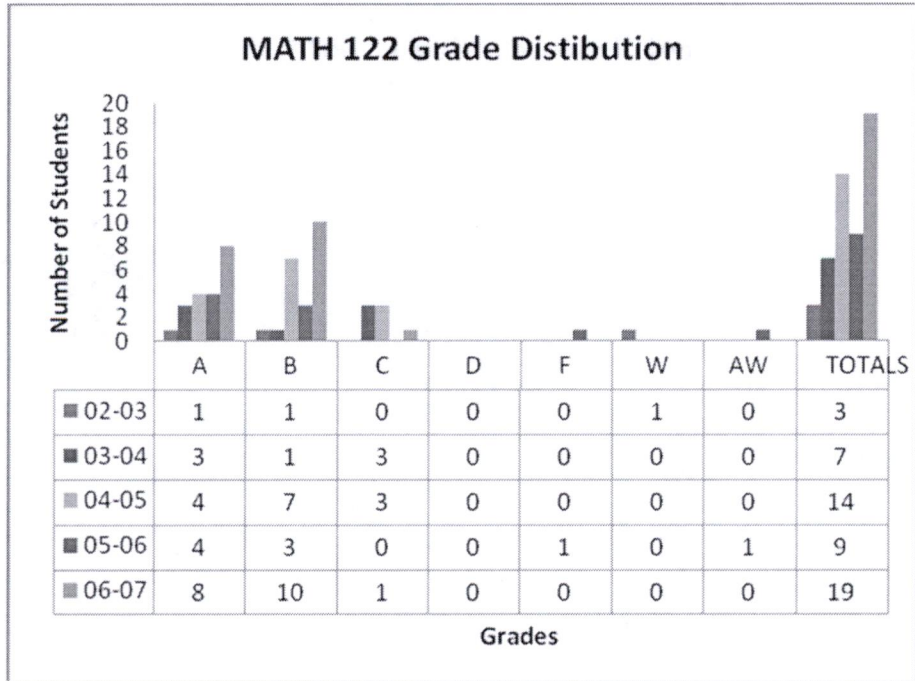
Graph 3: PHYS 105 Grade Distributions



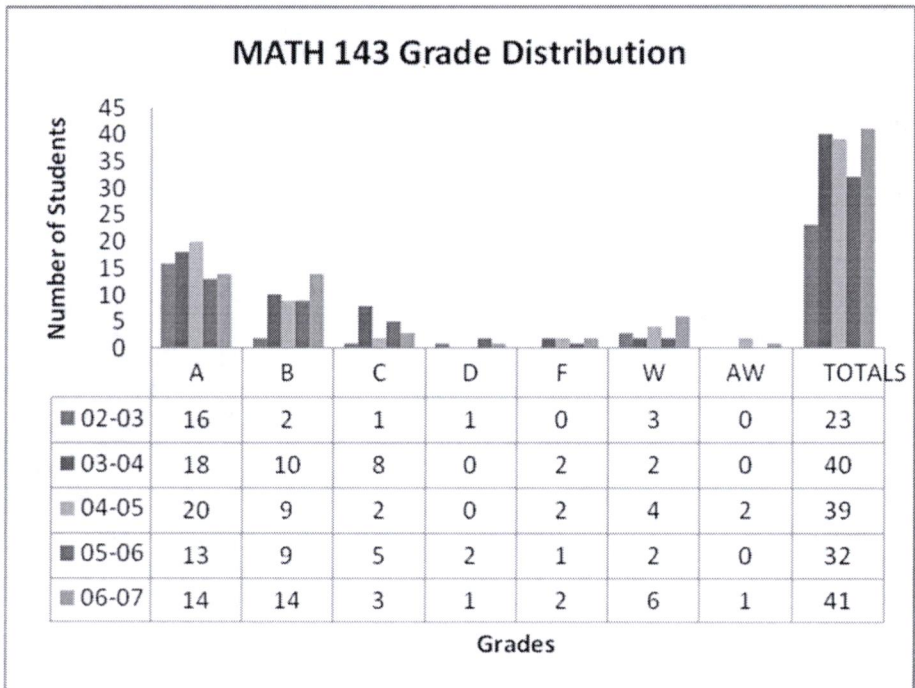
Graph 4: PHYS 145 Grade Distributions



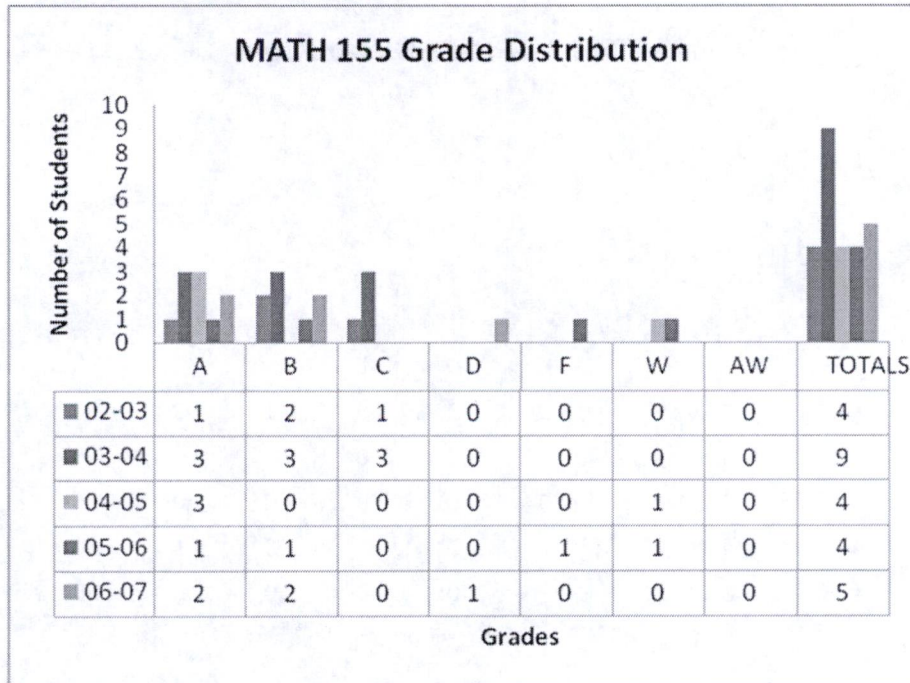
Graph 5: Math 122 Grade Distributions



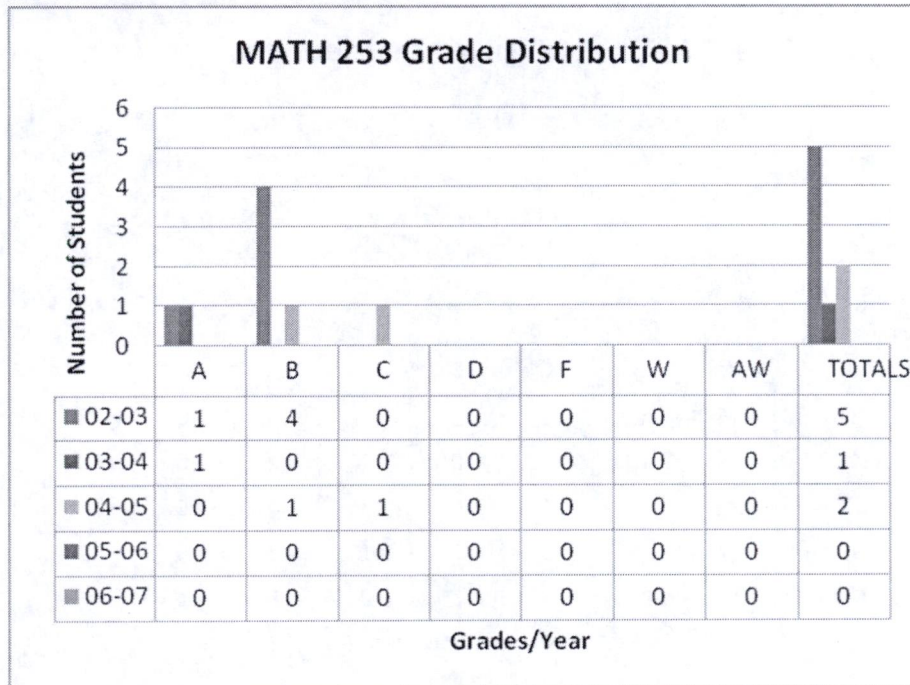
Graph 6: Math 143 Grade Distributions



Graph 7: MATH 155 Grade Distributions



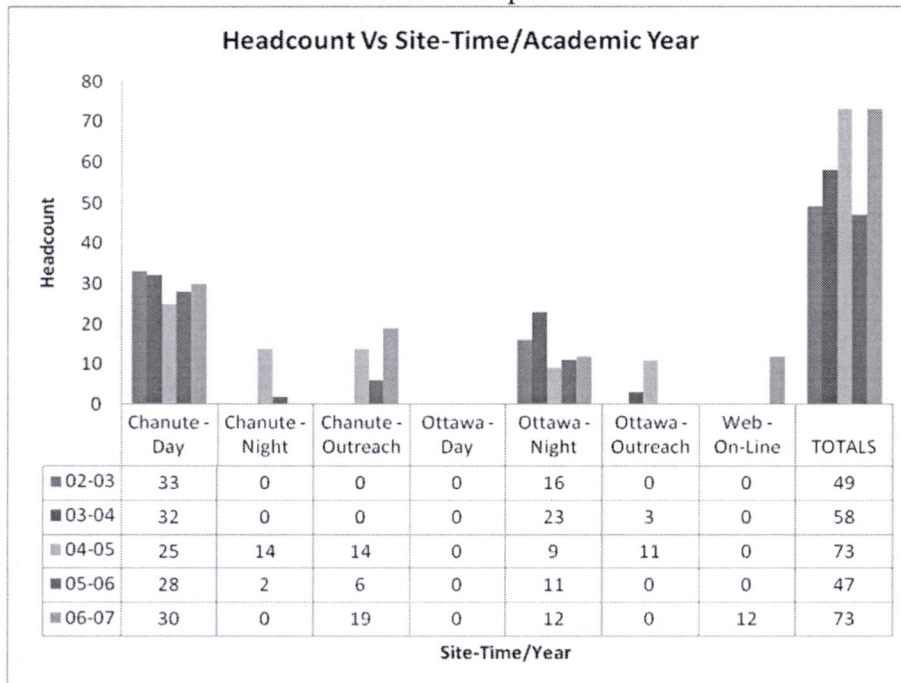
Graph 8: MATH 253 Grade Distributions



## Enrollment by site, day/night

The graphs shown below indicate the number of students enrolled in Physics and Math courses in the Chanute and Ottawa campus. Also presented in the graphs are the enrollments times (day or night). There are more students enrolled during the day in Chanute campus than during the night. In the Ottawa campus the enrollments are in the night with no day enrollments. There are a few students though enrolled in the Chanute and Ottawa outreach sites.

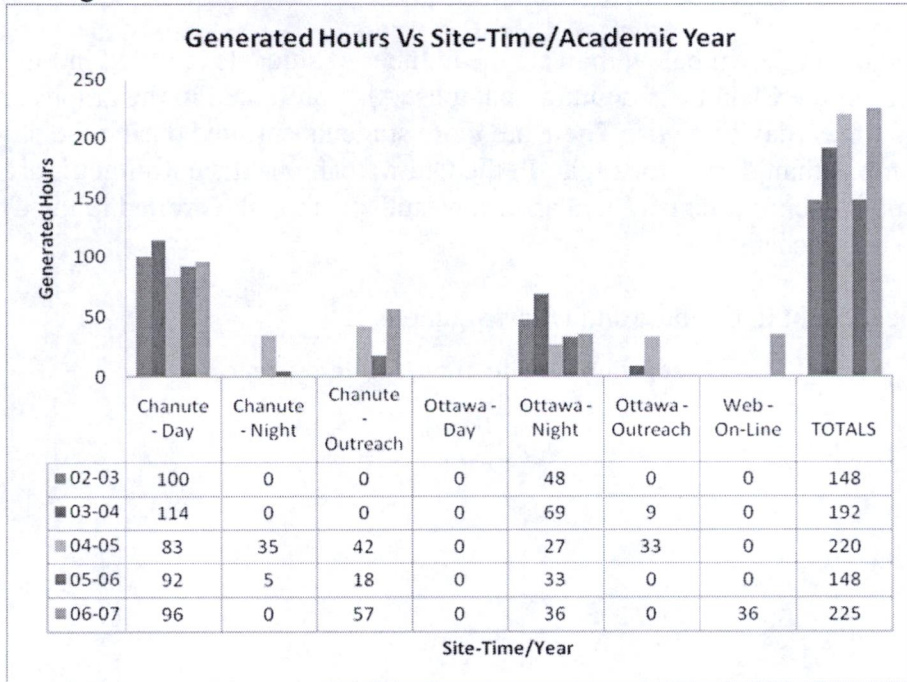
Graph 1: Headcount in Chanute and Ottawa campus



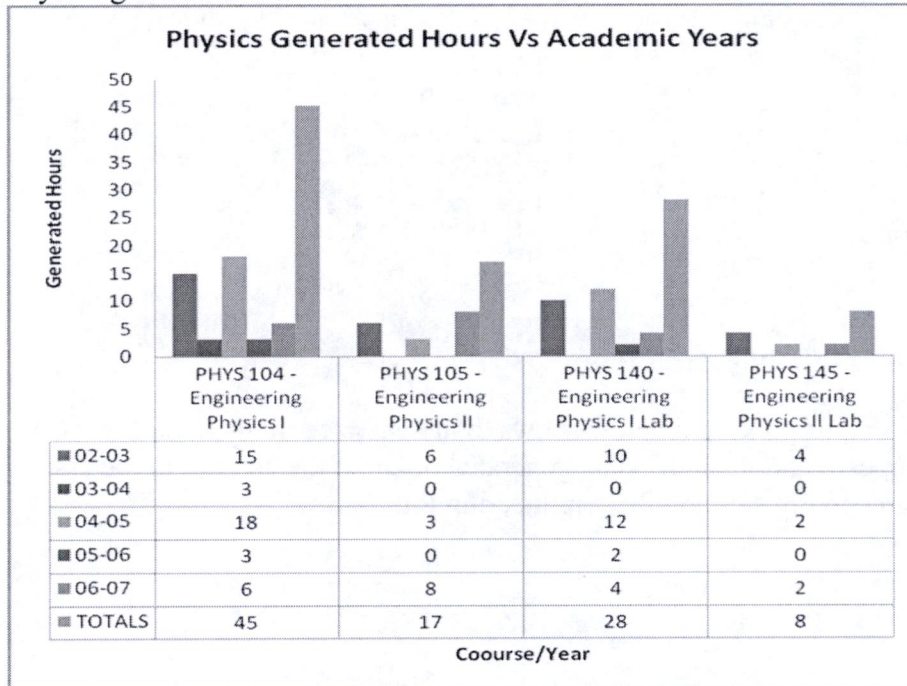
## Credit hours generated

The graphs presented below shows total generated hours in both the Chanute and Ottawa campuses and the individual generated hours of the courses in the associate of science degree in Physics and Pre-Engineering Program.

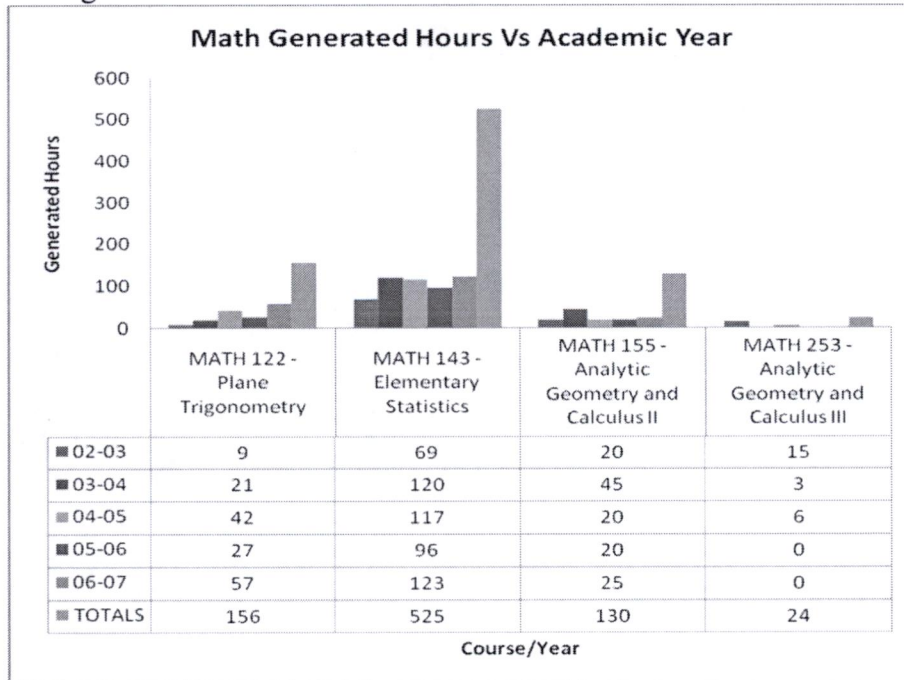
Graph 1: Total generated hours



Graph 2: Physics generated hours

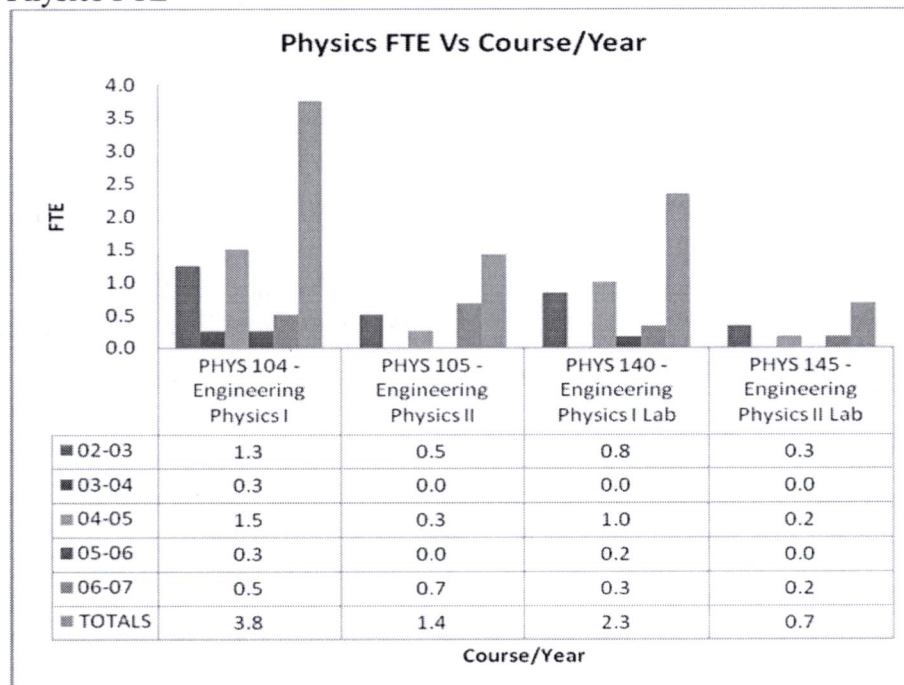


Graph 3: Math generated hours

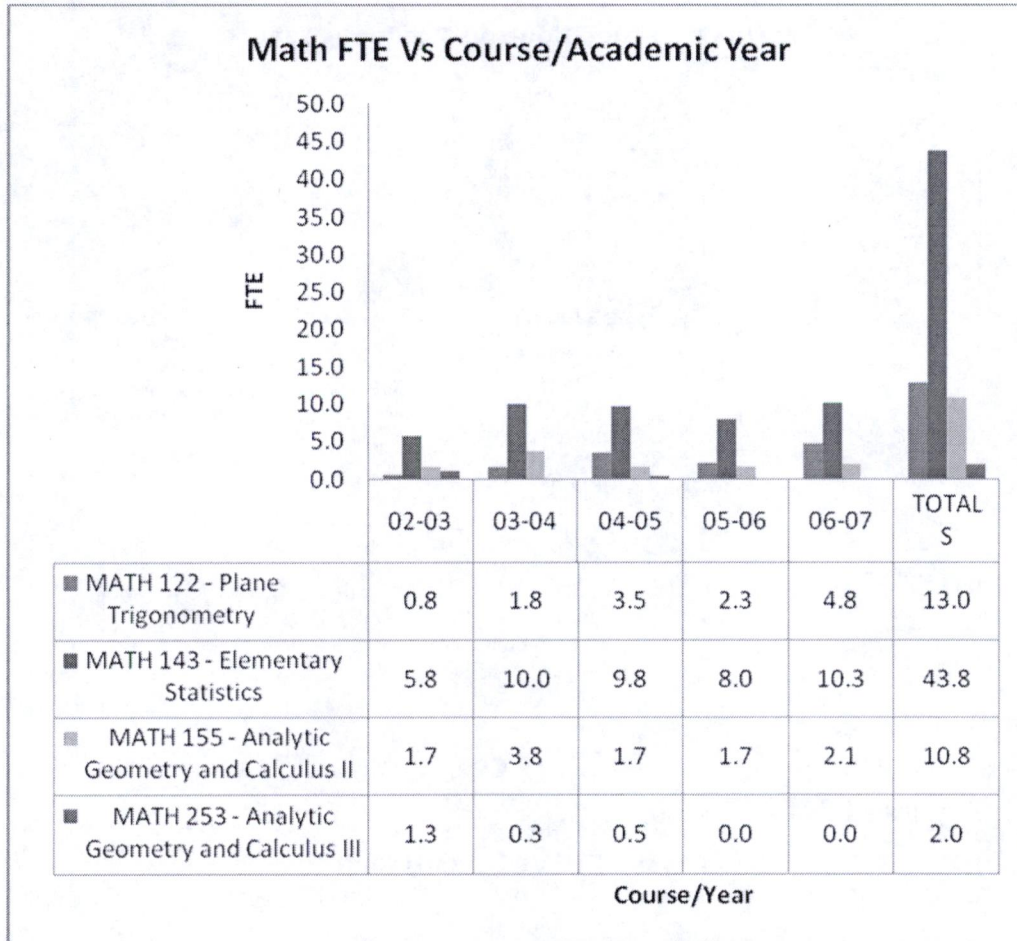


**FTE**

Graph 1: Physics FTE



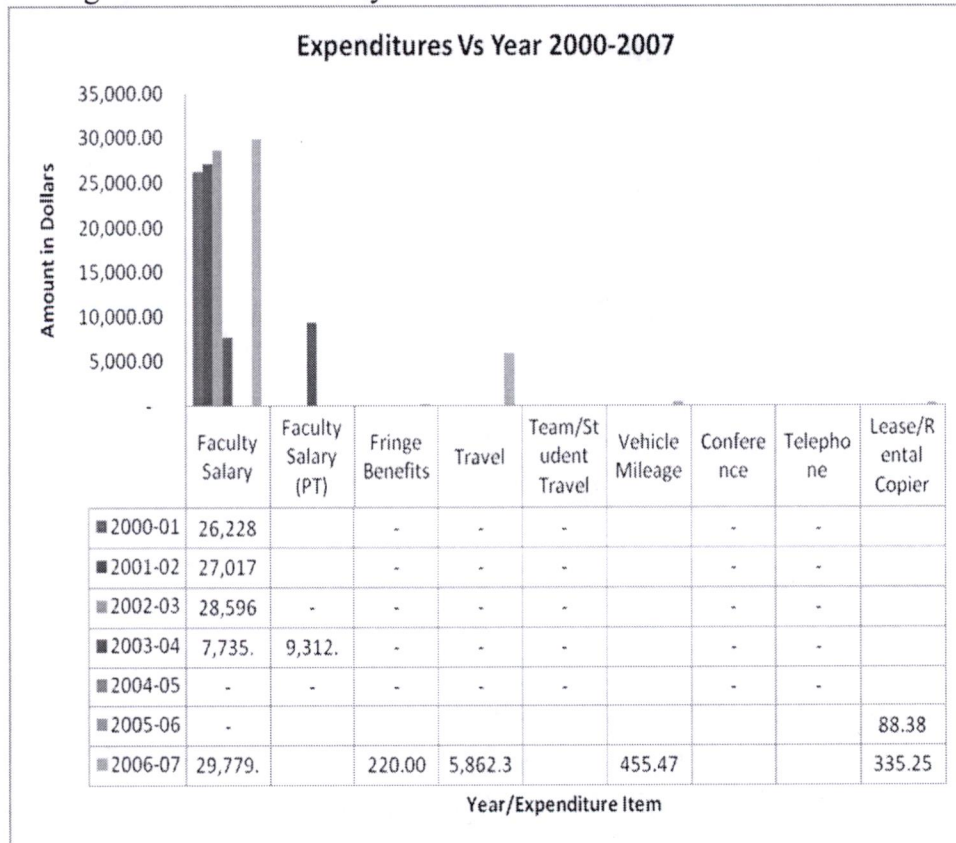
Graph 2: Math FTE



**Cost information for the last five years**

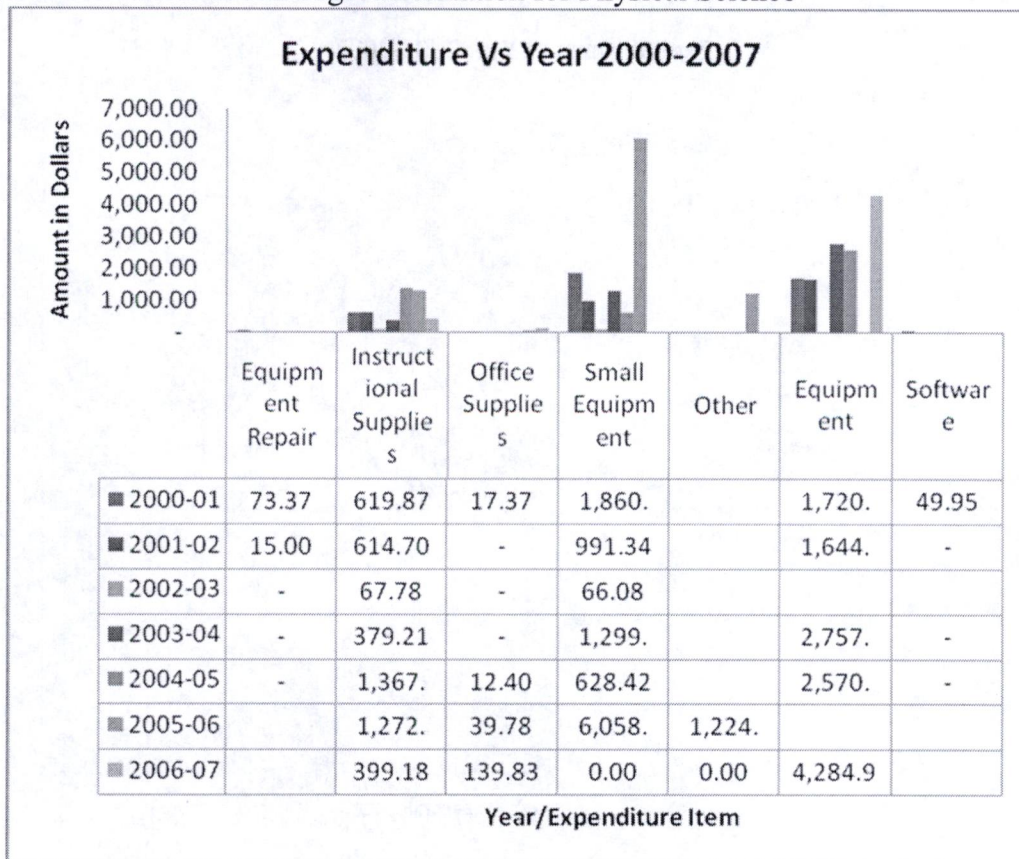
The following graphs indicate the budgetary information for the physical science courses Chanute campus for the last five years. The data is therefore not for the entire Physics and Pre-Engineering Program

Graph 1: Budget information for Physical Science





Graph 2: Continuation of Budget information for Physical Science



### Cost Breakdown

Total Budgeted Amount = \$ 212,109.28  
 Total Expended Amount = \$ 165,806.34  
 Total FTE (Chemistry and Physics combined) = 358.9  
 Cost per FTE = \$ 461.98

Note: The budgetary information shown here is for Physical Science courses only (Chemistry, Physics and physical science) Chanute campus. Mathematics budget was not included. Also not included in the budgetary information was Ottawa campus data.

### Section 4: Faculty

The associate of science in Physics and Pre-engineering Program had a total of 13 faculty members of which 7 were full time and 6 were part time instructors. Full time instructors taught 54 % of the courses and part time instructors taught a total of 46 % of the courses. The following is a table of fulltime and part time instructors.

Table 1: Full-time and Part-time instructors.

Full-time Instructors	Part-time Instructors
Charles Babb	Rex Babcock
Marie Gardner	Charles Bowers
Luka Kapkiai	Richard Brown
Carol O'Brien	James Carlson
Walid Shihabi	John Dowling
Carolyn Vaverka	Kim Rehagen
Mark Watkins	

## **Section 5: SWOT analysis of program based on above information**

### Strengths

- The courses being offered under this program are transferring smoothly to most of the regents universities especially Emporia State University and Kansas University without a problem.
- The computers available at A&P Lab acquired by Sarah McCoy through an HP grant are loaded with software that can be used in our Chemistry and Physics lab to collect and analyze data.
- We have the ability to offer math and science courses to non majors
- Regaining stability.

### Weaknesses

- The enrollments numbers for Physics and Calculus III are low.
- There are no science scholarship opportunities available to help increase our enrollments.
- Past turnover in instructors.

### Opportunities

- Apply for NSF grants to fully equip our lab and offer scholarships to students pursuing science programs
- Find out about internships opportunities in the local industries (such as Ash Grove, Chanute manufacturing, and etc) for our students
- Market our science programs in the local high schools
- Luka Kapkiai was selected to participate in a conference for new Physics faculty members at two year colleges March 2008. The conference agenda is to equip Physics instructors with valuable information on how to incorporate technology and develop new active learning techniques in Physics classes.

### Threats

- Outside universities that do not accept our courses.
- Number of students interested in these areas.

## **Section 6: Justification/Recommendations for Program**

Should the program be maintained, strengthened, diminished or removed and why  
Additional resources required needed to maintain or strengthen, recommendations for  
resources if diminished or removed.

All recommendations should be tied to outcomes assessment results.

**CHEMISTRY & PRE-CHEMICAL ENGINEERING  
and  
PHYSICS & PRE-ENGINEERING**

**Program Review Minutes  
March 28, 2008**

Presenter: Luka Kapkiai

Committee Members Present: Dale Ernst, Tosca Harris, Dr. Inbody, Linda Jones, Brenda Schoenecker, Mark Watkins

Physics & Pre-Engineering review, page 16, Section 4 – 54% and 36% don't total 100%. Luka was asked to correct this.

*SWOT to be added:*

Strengths

1. Regaining stability

Weaknesses

1. Past turnover in instructors

Opportunities

1. None

Threats

1. Outside universities that do not accept our courses
2. Number of students interested in these areas

*Acceptance of Report*

Tosca Harris moved that the report be accepted with the suggested changes and added SWAT. Brenda Schoenecker seconded the motion. Motion passed.

*Status of Program*

Linda Jones moved to strengthen the program, specifically in areas of facilities funding. Mark Watkins seconded the motion. Motion passed.