

Program Review - 2013

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

Program Instructors: Luka Kapkiai, Charles Babb, and Nathan Stanley

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.

A. Current mission statement of the program

The Associate of Science degree in Physics and Pre-Engineering Emphasis upholds all the missions and purpose of Neosho County Community College (NCCC). Specific missions for the Physics and Pre-Engineering Emphasis are as follows:

1. Provide 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.
2. Provide students with the opportunity to acquire knowledge and skills necessary for lifelong learning process as we live in a technological world as well as creating an enabling environment for our students to think critically, use logic and reasoning to solving everyday problems.
3. Create and develop interest among our students for science courses especially in Physics, Engineering and Mathematics among science majors and non-majors by engaging students in active learning process.
4. Offer an opportunity of courses in Physics, Engineering, and Mathematics for all our students at NCCC.
5. Involving our instructors in advising our students on their educational goals especially those in science of the many opportunities available in institution of higher learning and in the workforce.

B. How the program contributes to the purposes of 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 Emphasis 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 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 Emphasis 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, the soon to be started Stoltz renovations projects will address this.

NCCC Purpose 4

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

Physics and Pre-Engineering Emphasis 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 which have the potentials of helping 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 continues to explore ways of forging collaboration with other institutions that can offer internships or training opportunities for those

students who plan on joining the work force or transfer to four-year institutions as soon as they finish their associate degrees or want to gain some experience.

Section 2: Curriculum of Program and Outcomes Assessment

1) Program Sheet

Physics and Pre-Engineering

Associate of Science

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

Prerequisites
The student will need to demonstrate proficiencies in reading, English, and mathematics based on the COMPASS assessment test, ACT or SAT scores, or by taking the recommended/required classes. Some of the courses in this curriculum have specific prerequisites.

General Education (GE) Courses
In order to graduate with a college degree, all students are required to take certain general education courses. These include English composition, speech, wellness, science, art and humanities, mathematics, computer systems, and social and behavioral science.

Program Core Courses
MATH 150 Analytic Geometry and Calculus I, MATH 155 Analytic Geometry and Calculus II, MATH 253 Analytic Geometry and Calculus III, MATH 255 Differential Equations, PHYS 104/140 Engineering Physics I/lab, PHYS 105/145 Engineering Physics II/lab.

Program Elective Courses
Students interested in biochemistry should take BIOL 251/252 Biology I Lecture/Lab, BIOL 255/256 Biology II Lecture/Lab.

Program Outcomes
Students will develop an understanding of the following:


1. Show concept knowledge in measuring, mechanics of motion, the mechanical and thermal properties of matter, by application in problem solving.
2. Show concept knowledge 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. Incorporation of graphing calculators in math and physics lab analysis.
5. Calculation in three-dimensional coordinate systems.
6. Apply the scientific method in lab work settings.
7. Analyze experimental error in lab work, and relate it to lab measurement.

Course Sequence
The listing that follows is a recommended sequence of courses for full-time students. The student should consult with an advisor for information specific to their academic situation.

Recommended Sequence of Courses		Cr Hrs
(Fall) Semester I		
COMM 207	Fundamentals of Speech	3
PSYC 100	First Year Seminar	1
ENGL 101	English Composition I	3
MATH 150	Analytic Geometry and Calculus I*	5
CSIS 100/130	Computer Concepts and Applications or Intro to Computer Information Systems	3
Total		15
(Spring) Semester II		
ENGL 289	English Composition II	3
MATH 155	Analytic Geometry and Calculus II	5
PSYC 155	General Psychology	3
	Arts/Humanities Elective	3
	Social/Behavioral Science Elective	3
Total		17
(Fall) Semester III		
PHYS 104	Engineering Physics I	4
PHYS 140	Engineering Physics I Lab	1
MATH 253	Analytic Geometry and Calculus III	3
HPER 150	Lifetime Fitness	1
	Arts/Humanities Elective	3
	Biological Science and Lab	5
Total		17
(Spring) Semester IV		
PHYS 105	Engineering Physics II	4
PHYS 145	Engineering Physics II Lab	1
MATH 255	Differential Equations	3
	Social/Behavioral Science Elective	3
	Arts/Humanities Elective	3
	Program Elective (s)	3-5
Total		17-19
Total Program Credits		66-68

*Assuming the student has passed the equivalent of College Algebra and Trigonometry. If not, enroll first in MATH 125 College Algebra and Trigonometry (5 cr hrs).

For more information contact:
Program advisor
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2) Courses in Program

- a. MATH 122 – Plane Trigonometry
- b. MATH 143 – Elementary Statistics
- c. MATH 150 – Analytic Geometry and Calculus I
- d. MATH 155 – Analytic Geometry and Calculus II
- e. MATH 253 – Analytic Geometry and Calculus III
- f. PHYS 104 – Engineering Physics I
- g. PHYS 105 – Engineering Physics II
- h. PHYS 140 – Engineering Physics I lab
- i. PHYS 145 – Engineering Physics II Lab

3) The courses in the associate of science in Physics and Pre-Engineering Emphasis were assessed during the five year period of this review. 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.

4) Program Outcomes (PO) and matrix

Course Number	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
PHYS 104	Engineering Physics I	CO 1	CO 1	CO 2				
PHYS 140	Engineering Physics I Lab			CO 2	CO 3		CO 1	CO 2
PHYS 105	Engineering Physics II	CO 1	CO 1	CO 2				
PHYS 145	Engineering Physics II Lab			CO 2	CO 3		CO 1	CO 2
MATH 122	Plane Trigonometry			CO 1-9				
MATH 143	Elementary Statistics			CO 1-5				
MATH 150	Analytic Geometry & Calculus I			CO 1-5				
MATH 155	Analytic Geometry & Calculus II			CO 1-9		CO 9		
MATH 253	Analytic Geometry & Calculus III			CO 1-3		CO 1,2		

Program Outcomes Grand Totals

Academic Year	CRSE OTCM	# STDNTS ASSESSED	WGHTED AVERAGE %	GOALS MET	GOALS UNMET	GOALS MET %	GOALS UNMET%
07-08	48	509	79	67	11	86	14
08-09	48	762	76	57	31	65	33
09-10	48	559	83	32	16	67	33
10-11	48	645	81	24	12	50	50
11-12	48	669	79	33	15	69	31

Physics courses had a set goal of 70 % while Math courses had set goals of 80 %. The higher set goal of 80 % is due to the higher expectations from students taking these advanced math courses.

- 5) Assessments
 1) Results of assessments

Course Level Analysis

Course Outcome	PHYS 104						PHYS 140				
	07-08	08-08	09-10	10-11	11-12		07-08	08-09	09-10	10-11	11-12
1	85	65	68	60	86		83	86	80	78	80
2	79	73	71	80	77		80	72	68	83	78
3							83	80	80	100	84

Course Outcome	PHYS 105						PHYS 145				
	07-08	08-08	09-10	10-11	11-12		07-08	08-09	09-10	10-11	11-12
1	85	66	63		72		75	73	65		75
2	81	79	75		69		96	71	68		80
3							95	88	80		85

Course Outcome	MATH 122						MATH 143				
	07-08	08-08	09-10	10-11	11-12		07-08	08-09	09-10	10-11	11-12
1	87	78	91	87	83		85	81	82	83	88
2	88	77	96	88	99		73	68	74	85	79

3	83	73	95	83	86	67	67	68	78	70
4	100	77	68	65	88	82	90	66	82	81
5	31	39	91	77	90	75	78	76	69	73
6	91	86	78	82	96					
7	100	84	84	90	93					
8	25		100	90	88					
9	38		96	87	76					

Course Outcome	MATH 150						MATH 155				
	07-08	08-08	09-10	10-11	11-12		07-08	08-09	09-10	10-11	11-12
1	72	76	87	83	81	87	67	68	75	54	
2	86	84	89	80	79	98	72	93	76	73	
3	89	79	78	75	64	81	61	66		68	
4	85	71	82	81	71	88	73	61	74	40	
5	91	73	83	77	74	90	76	88	75	63	
6						83	75	82	74	60	
7						94	81	84		85	
8						86	75	86	79	52	
9						85	84	90		90	

Course Outcome	MATH 253				
	07-08	08-09	09-10	10-11	11-12
1	96	87	95	87	79
2	90	87	95	88	80
3		90	88	81	72

Note: Highlighted region indicate no assessment performed for that particular outcome.

2) General Education Assessment Analysis:

None of the courses taught in Physics and Pre-Engineering emphasis feed into any of the general education assessment outcomes.

3) Changes made to instruction, curriculum or outcomes as a result of assessment

The use of essay/structured type problems instead of multiple choices in physics courses tests/exams has been explored with better results. The recent statewide core outcomes meetings held in 2012 resulted to “new course outcomes” that were recently approved by the applied science division and the curriculum committee.

4) Any new data/narrative comment since the change

6) Transferability of Program and Program Courses or “straight to work” numbers including transfer GPA in major

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 313	PHYS 211	PS 281
PHYS 105	PHSX 212	PHYS 214	PH 393	PHYS 105	PHYS 314	PHYS 212	PS 282
PHYS 140	PHSX 211	PHYS 213	PH 191	PHYS 130	PHYS 315	PHYS 211L	LDE
PHYS 145	PHSX 212	PHYS 214	PH 394	PHYS 131	PHYS 316	PHYS 212L	LDE
MATH 122	MATH 103	MATH 150	MA110	MATH 122	MATH123	MATH 122	MATH117
MATH 143	MATH 365	MATH 325	MA 120	MATH 143	STAT 370	MATH 250	MATH140
MATH 150	MATH 121	MATH 220	MA 161	MATH 150	MATH 242	MATH 234	MATH151
MATH 155	MATH 122	MATH 221	MA 262	MATH 155	MATH 243	MATH 235	MATH152
MATH 253	N	MATH 222	MA 263	MATH 253	MATH344	MATH 236	???

Note:

- Highlighted regions indicate that changes have occurred from the last program review. In particular, course equivalencies information was missing from Wichita State University. This information is in addition to Math courses at Washburn University which is now available and has been added.
- In all most of ours courses are transferring smoothly to the regents universities in Kansas

7) 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. In addition, faculty stays current in the curriculum by participating in statewide core competency meetings.

Faculty specific efforts are:

Nathan Stanley – took professional development graduate courses in teaching methods and uses online math homework programs such as WebAssign and MYMathlab

Charles Babb – participated on professional development on collaborative learning and has implemented on college algebra. Currently reviewing math text books

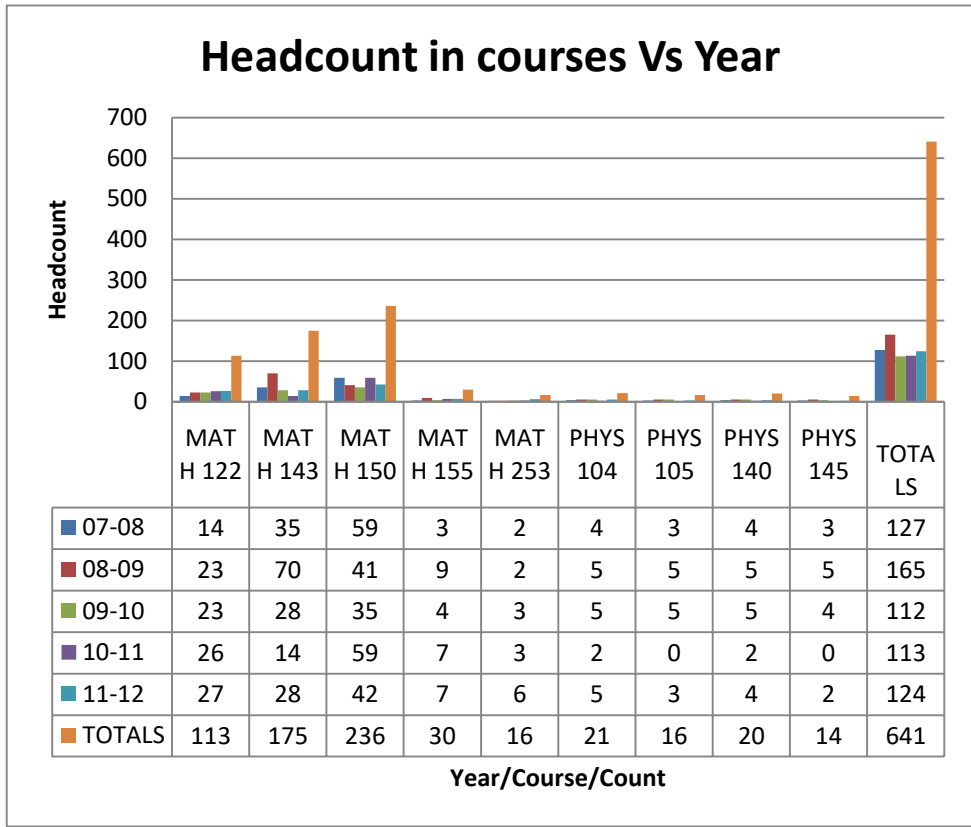
Luka Kapkiai – participated in New Faculty Training Conference in Physics, attended and presented at Association of American Physics Teachers on the use of micro-based laboratories (MBL) and is taking graduate courses towards a degree in Education.

Section 3: Data – Enrollment and Costs

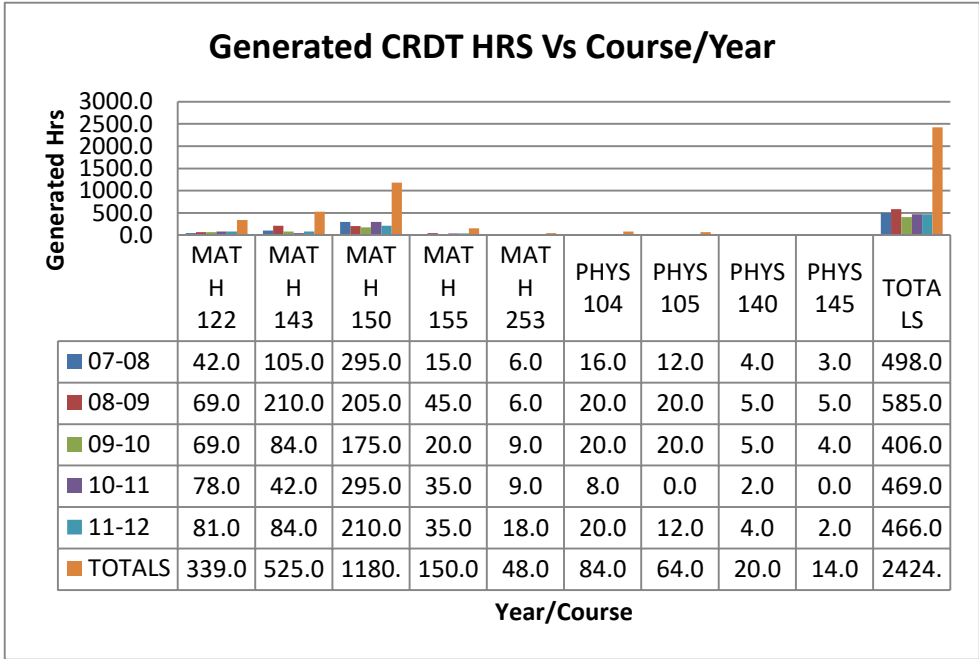
1) Each Course

Headcount

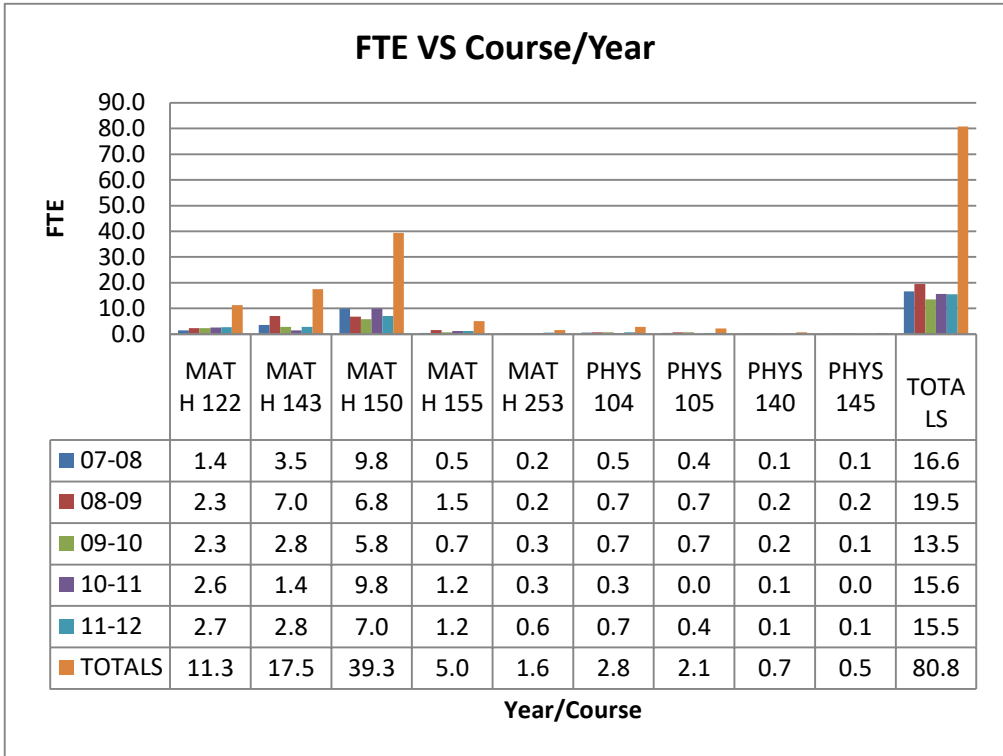
The graph shown below indicates the number of students enrolled in the specified courses within the Physics and Pre-Engineering emphasis at the Chanute and Ottawa campuses.



Credit hours generated: The graph presented below shows the total generated hours for the specified courses taught in both the Chanute and Ottawa campuses in the Chemistry and Pre-chemical Engineering emphasis.



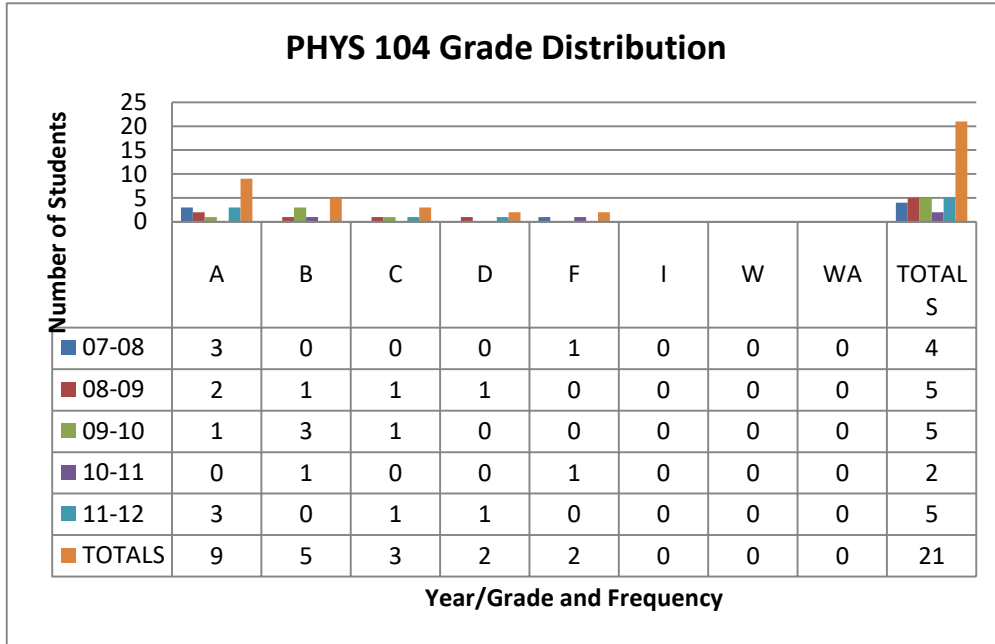
FTE



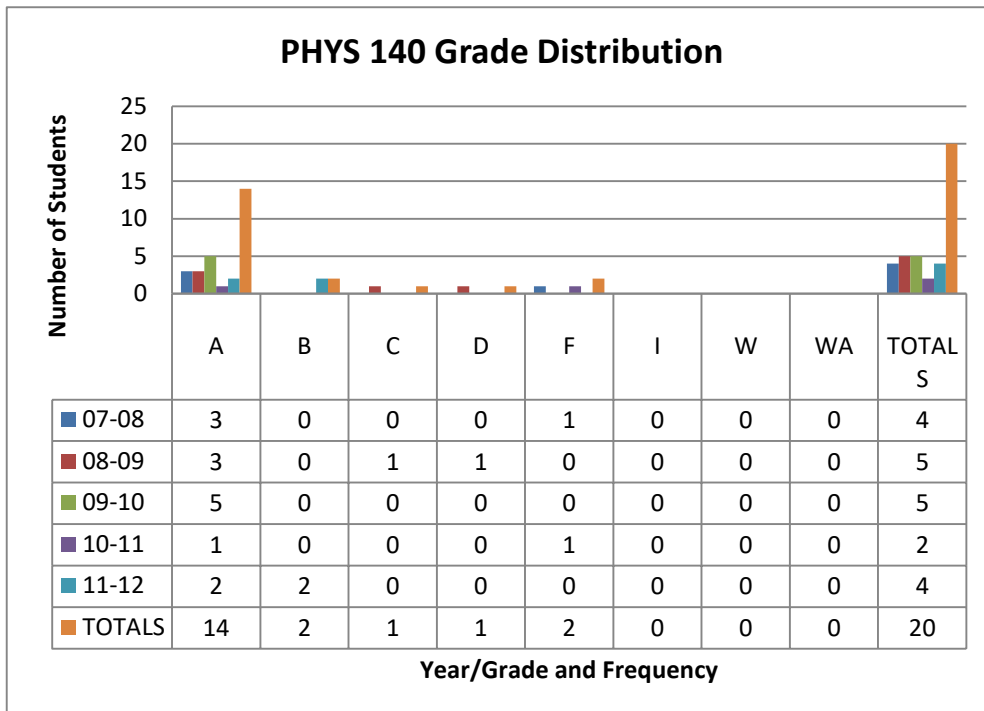
Grade Distributions

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 2006 – 2012). The data indicate that majority of the students are achieving grades better than a C.

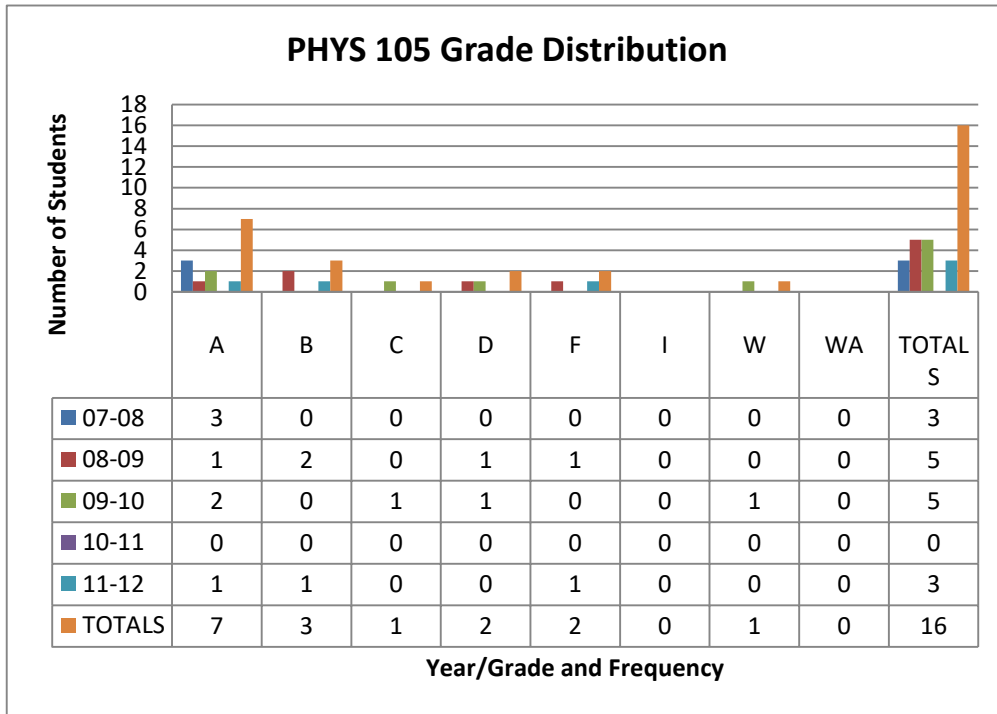
PHYS 104 Grade Distributions



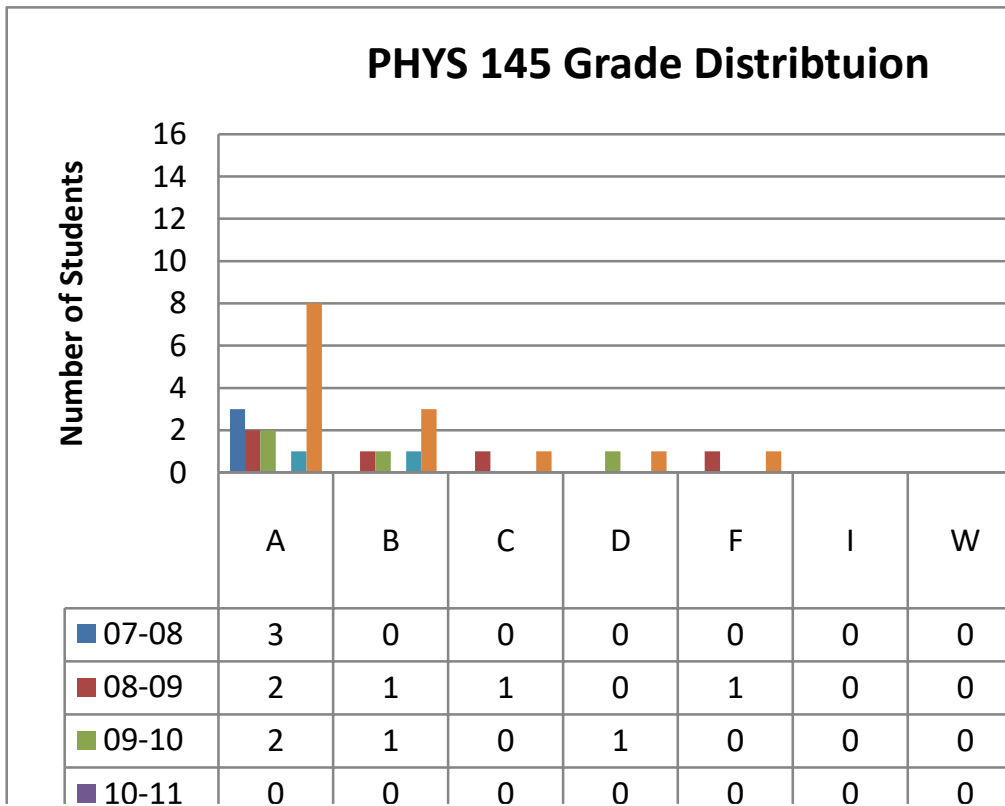
PHYS 140 Grade Distributions



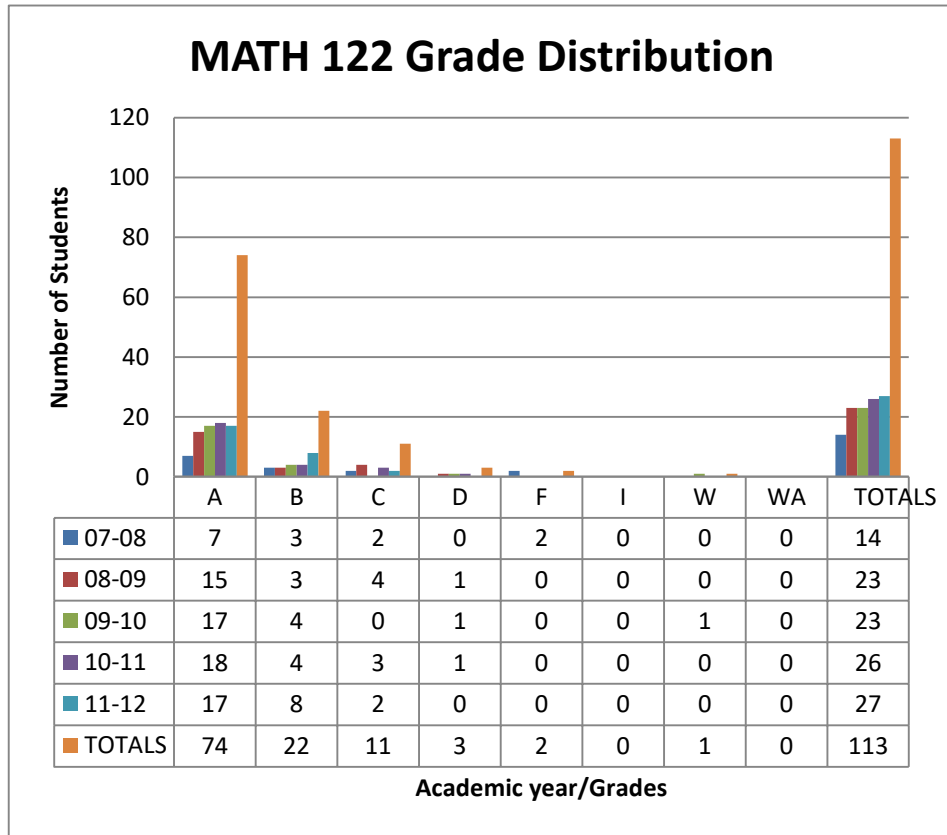
PHYS 105 Grade Distributions



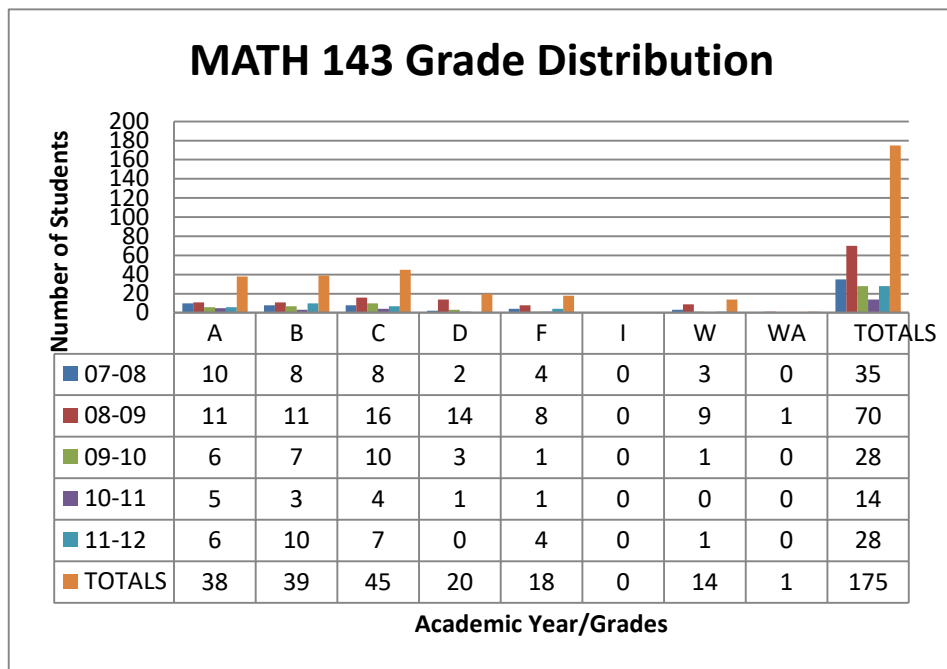
Graph 4: PHYS 145 Grade Distributions



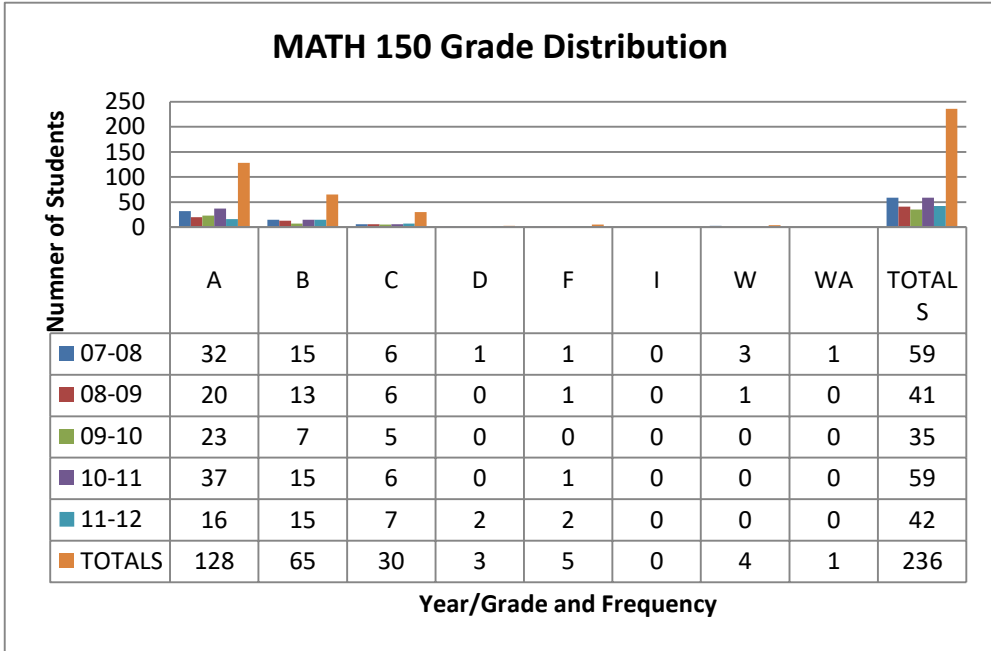
Math 122 Grade Distributions



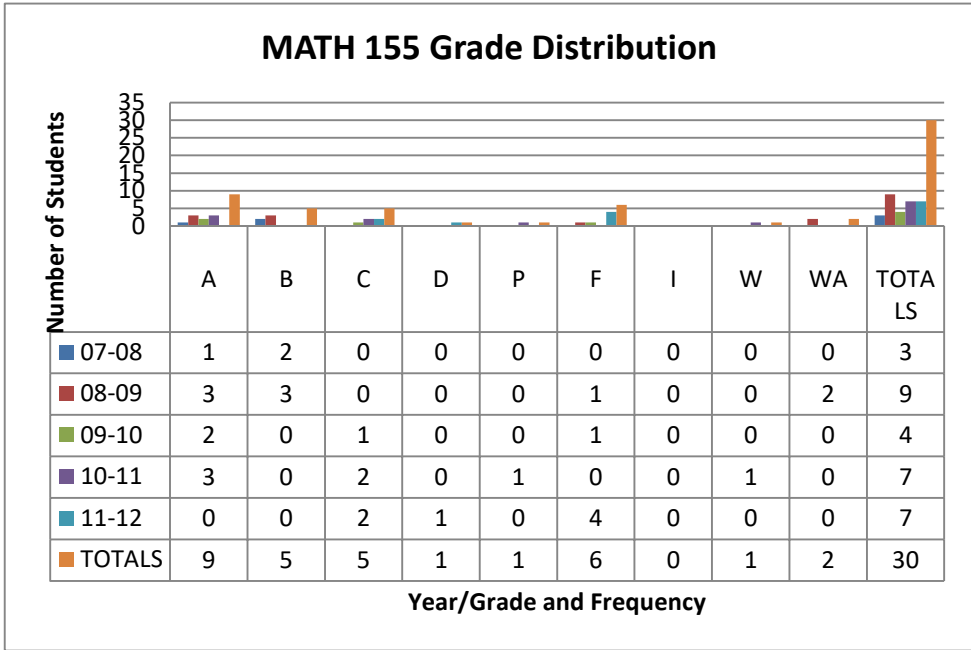
Math 143 Grade Distributions



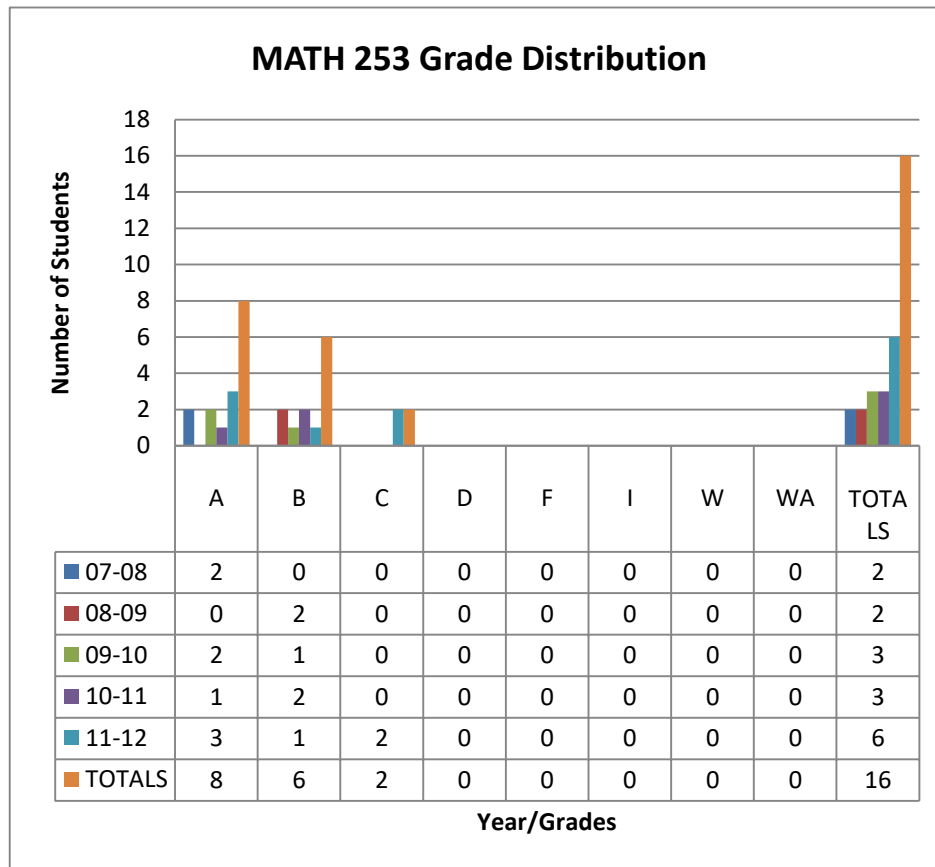
MATH 150 Grade Distributions



MATH 155 Grade Distributions



MATH 253 Grade Distributions



Withdrawal numbers and percentages from a course

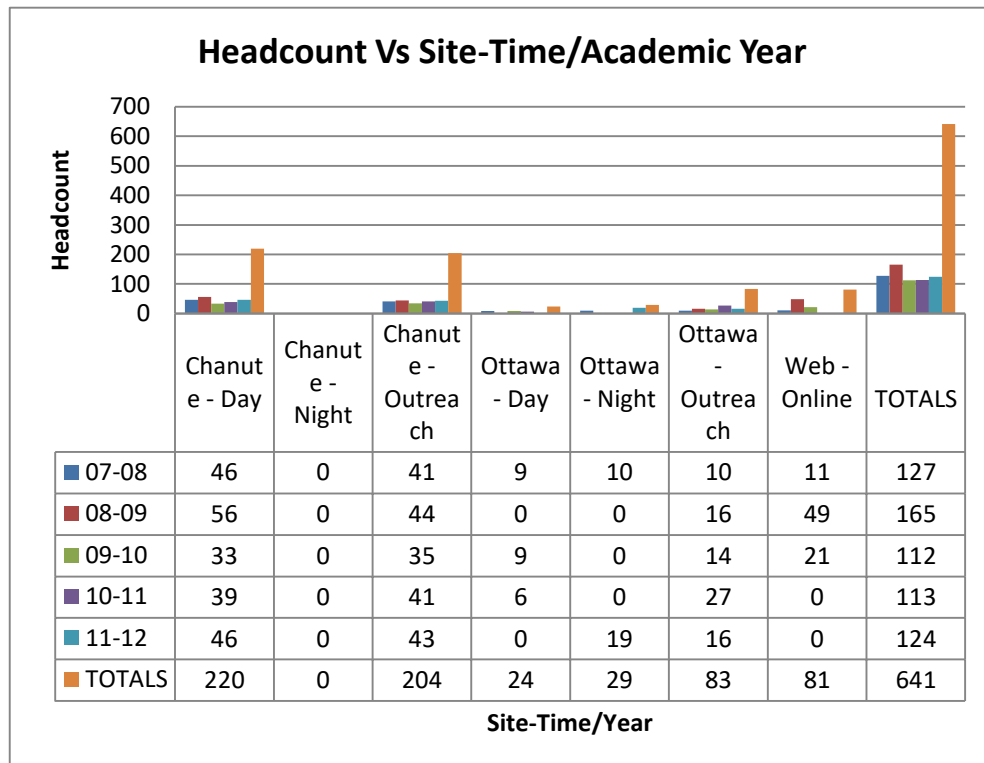
The data presented below indicate the percentage of students who withdrew or who were withdrawn from the specified courses in the Physics and Pre-Engineering Emphasis.

Course	Withdrawals	% Withdrawn
MATH 122	1	1
MATH 143	15	9
MATH 150	5	2
MATH 155	3	10
PHYS 104	0	0
PHYS 105	1	6
PHYS 140	0	0
PHYS 145	0	0

2) Enrollment by site, day/night

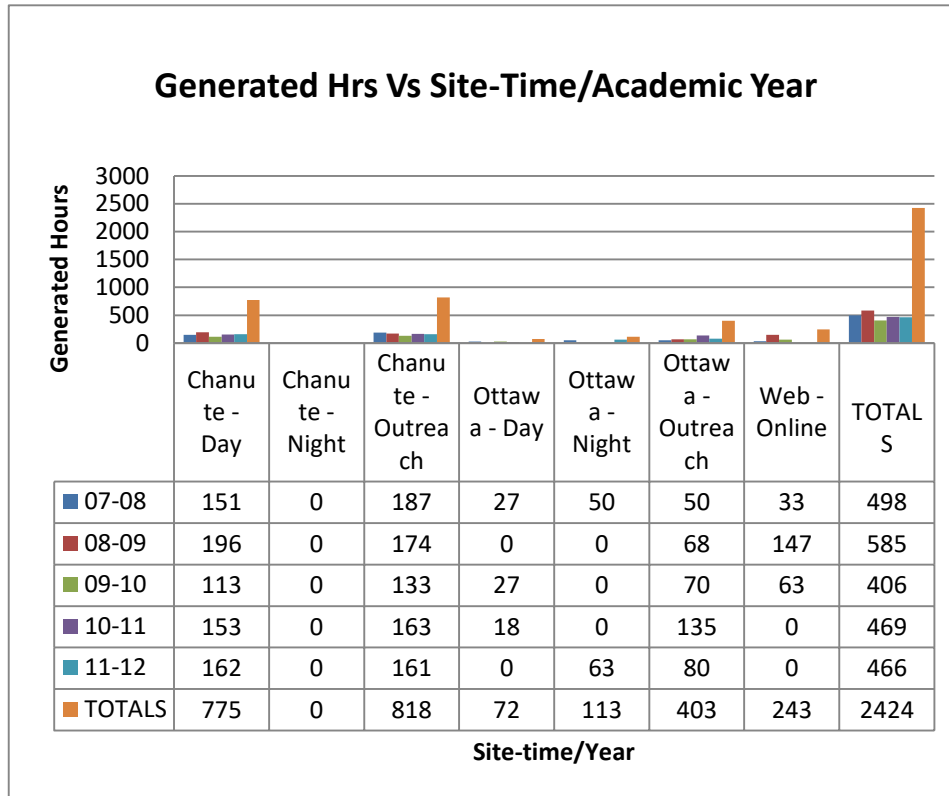
The graphs shown below indicate the number of students enrolled in Physics and Math courses at the Chanute and Ottawa campus. Also presented in the graphs are the enrollments times (day or night). There are more students enrolled during the day in Chanute campus than during the night. In the Ottawa campus the enrollments are spread with some at night and some during the day. There are a good number of students enrolled in the Chanute and Ottawa outreach sites.

Headcount in Chanute and Ottawa campus



Credit hours generated

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



3) Students in Physics and Pre-Engineering Emphasis

During the review period of 2006-2013, there were a total of four students who had indicated working towards an associate of science in Physics and pre-engineering emphasis at NCCC. All of the four students were in year 2011-2012 and they were:

David Knox

Yong Hyun Lee

Yerbolay Dauletovich Saizin

Christina Sherppard

4) Graduates/certificates or stated goal

No student was conferred a degree with an emphasis in Physics and Pre-engineering during the period of this review.

B. Cost information for the last five years

The budget information provided below is for Chanute campus (Physical Science only).
Math instructors have their own budgets.

1) Yearly budget

Academic Year	2008-2009	2009-2010	2010-2011	2011-2012
Physical Science	\$33,205.00	\$34,973.00	\$35,825.00	\$37,757.00
Travel	\$2,577.00	\$1,600.00	\$3,900.00	\$3,900.00
Vehicle Mileage	\$375.57	\$376.00	\$400.00	\$77.50
Postage	\$5.00	\$20.00	\$20.00	\$20.00
Advertising	\$50.00	\$0.00	\$20.00	\$10.00
Telephone	\$10.00	\$0.00	\$0.00	\$0.00
Copier				
Lease/Rental	\$350.00	\$395.65	\$400.00	\$284.18
Instructional				
Supplies	\$845.00	\$263.19	\$694.70	\$399.33
Equipment Repair	\$0.00	\$0.00	\$0.00	\$30.00
Office Supplies	\$75.00	\$11.20	\$26.36	\$20.00
Equipment	\$9,460.00	\$0.00	\$0.00	\$151.95
Total Budgeted	\$46,952.52	\$37,638.04	\$41,276.06	\$42,649.96

Budgeted Amount = \$ 168,516.58

Total Expenditure = \$ 162,600.11

2) Full-time instructors

As shown above, the information provided is for Chanute campus only (Physical Science). Math instructors have their own budget.

3) Adjunct instructors

$$1346 * 425 = \$ 572,050$$

Note: The cost of part-time instructors was calculated based on the number of credit hours (1346) taught by part-time instructors for the review period.

4) Cost per FTE (FTE for NCCC is calculated by total credit hours generated by a course/program for an entire academic year divided by 30), please do an analysis by course and then a total for the program.

The FTE graph provided in section 3 provides the necessary FTE data for the Physics and Pre-Engineering Emphasis

Course	MATH122	MATH143	MATH150	MATH155	MATH253	PHYS104	PHYS140	PHYS105	PHYS145	Totals
FTE	11.3	17.5	39.3	5.0	1.6	2.8	0.7	2.1	0.5	80.3

- 5) Cost per credit hour
- 6) Any fund 70 account balance
- 7) Any contributions from outside sources (grants, donations, etc.)

Section 4: Faculty

The associate of science in Physics and Pre-engineering Program had a total of 15 faculty members of which 5 were full-time and 8 were part-time instructors. Full time instructors taught 57 % of the courses and part-time instructors taught a total of 43 % of the courses an improvement from the prior program review period of 2007.

The information presented below shows a list of full-time and part-time instructors, credit hours generated, and percentages of course taught by full-time and part-time instructors.

Full-time Instructors

Charles Babb
Benjamin, Gort
Luka Kapkiai
Nathan Stanley
Mark Watkins

Part-time Instructors

Rex Babcock
Kelsi Botts
Richard Brown
Brian Carlson
James Carlson
Russell Carlson
Finley Charles
Kristopher Hassler
Kristi Miller
Brian Wika

Full-time Instructors	CRSE #	HRS	# ENRLD	GNRTD HRS
Charles Babb	11	49	74	326
Benjamin, Gort	3	11	25	89
Luka Kapkiai	19	49	71	182
Nathan Stanley	8	28	61	211
Mark Watkins	8	24	90	270
Total	49	161	321	1078

Part-time Instructors	CRSE #	HRS	# ENRLD	GNRTD HRS
Rex Babcock	14	52	182	708
Kelsi Botts	1	5	1	5
Richard Brown	1	5	10	50
Brian Carlson	5	25	21	105
James Carlson	1	3	5	15
Russell Carlson	1	3	7	21
Finley Charles	1	3	2	6
Kristopher Hassler	5	25	33	165
Kristi Miller	6	38	50	238

Brian Wika	2	8	9	33
Total	37	157	320	1346

Faculty course load

Faculty	Courses Taught	% Taught
Full-time	49	57
Part-time	37	43
Total	86	100

Section 5: SWOT analysis of program based on above information

Strengths

Weaknesses

Opportunities

Threats

Section 6: Justification/Recommendations for Program

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

All recommendations should be tied to outcomes assessment results.