Los Angeles Harbor College

Program Review
for

MATHEMATICS
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Academic Program Review

Name of discipline: Mathematics

Division chairperson: L. J. McKenzie Phone Number: 310-233-4501

☑ Degree Program: Associate of Science
☐ Certificate program: N/A
☐ Skills certificate: N/A

Self-Study Committee for Harbor

Division Chairperson: L. J. McKenzie

Program Review Chairperson: L. J. McKenzie

<table>
<thead>
<tr>
<th>Program Tenured Faculty</th>
<th>Program Adjunct Faculty</th>
<th>Program Adjunct Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>M. Gagrat</td>
<td>N. Andres-Sandor</td>
<td>J. Macias</td>
</tr>
<tr>
<td>M. Jimenez</td>
<td>R. Broas</td>
<td>A. Martinez</td>
</tr>
<tr>
<td>F. Ma</td>
<td>M. Can</td>
<td>J. Muncherian</td>
</tr>
<tr>
<td>J. Pavlina</td>
<td>J. Desulima</td>
<td>Z. Ni</td>
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<tr>
<td>Z. Romero</td>
<td>B. Dovner</td>
<td>N. Noguera</td>
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<tr>
<td>F. Saddigh</td>
<td>A. Elshihabi</td>
<td>T. Oepomo</td>
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<td></td>
<td>F. Faridpak</td>
<td>B. Ohm</td>
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<tr>
<td></td>
<td>A. Gill</td>
<td>H. Ortiz</td>
</tr>
<tr>
<td></td>
<td>K. Heneks</td>
<td>R. Salem</td>
</tr>
<tr>
<td></td>
<td>T. Hoang</td>
<td>M. Saso</td>
</tr>
<tr>
<td></td>
<td>S. Huang</td>
<td>R. Sibner</td>
</tr>
<tr>
<td></td>
<td>G. Judd</td>
<td>D. Strivewell</td>
</tr>
<tr>
<td></td>
<td>D. Le</td>
<td>B. Tong</td>
</tr>
<tr>
<td></td>
<td>L. Le</td>
<td>R. Wong</td>
</tr>
</tbody>
</table>

Program Staff: N. Muro – Mathematics Instructional Assistant
A. Vega – Division Secretary

Academic Dean: D. Humphreys

Academic Cluster Vice-President: L. Rosas

Outside professional or alumni: S. Fasteau

Students currently enrolled in the program under review:
Program Mission

The mission of the department is to provide students with a foundation of mathematical skills and competencies needed to satisfy a variety of degree and careers goals. Recognizing the diverse background of students, this foundation includes basic skills, transfer level and specialized courses that aim to contribute to workforce development and improvement. In all aspects of its mission, the department’s goal is to provide a supportive learning environment that imparts student success in analyzing, quantifying and developing critical thinking skills. The curriculum focuses on recognizing the interdependence between theory and application, enhancing it with the appropriate use of classroom technology.

Program Description and Overview

The Mathematics Department offers courses that meet AA degree, occupational and transfer programs requisites such as allied health, engineering, pre-med and physical sciences. Courses offered in this department vary from developmental/remedial to college sophomore level. The department supports special students’ populations by closely working with college support services such as Counseling, Financial Aid and Special Services programs.

Mathematics is an integral part of many college programs that include at least one requisite course in this subject. Mathematics competency is required for the AA/AS degrees awarded at the college. In addition, many college programs include at least one requisite course in math to meet certificate and/or degree requirements.

The Mathematics Department meets the academic goals and strategies of the College by offering a flexible schedule of courses that accommodates morning, evening and Saturday student populations. Scheduling of courses is based on student demand and course rotations that allow students to complete their transfer requirements in a timely manner.

The Mathematics Department is located in the newly built Northeast Academic Hall, occupying room NEA 222, 224, 225, 226, 227, 229, 231, as well a suite of faculty offices. In addition the Mathematics laboratory is located in the campus Learning Assistance Center room 105B.

Program Learning Outcomes and Assessment Results

Student will demonstrate increasing levels of mastery of the following outcomes throughout the mathematics curriculum. Upon successful completion of the requirements for the Associate of Arts Degree, students will

- Create, interpret and analyze graphs and charts that communicate quantitative or relational information
- Apply mathematical techniques to solve problems that arise in the real world
- Determine and carry out an appropriate mathematical algorithm to solve problems with or without the support of technology
- Communicate content information formally, using appropriate mathematical notation and terminology
- Engage in logical and critical thinking

A. Program Curriculum – Appendix A

B. Mathematics Course Flow Chart - page 12
C. Student Learning Outcomes

Upon successful completion of mathematics courses, students will have a foundation in mathematics skills and competencies needed to satisfy a variety of degree and careers goals.

Upon successful completion of Math 105/112 with a grade of “C” or better, students will be able to satisfy the minimum pre-requisite for Math 123A.

Upon successful completion of Math 123A and B with a grade of “C” or better, students will be able to meet the mathematics competency requirement for the AA degree, if the student matriculated prior to fall 2009.

Upon successful completion of Math 123C with a grade of “C” or better, students will be able to meet the mathematics competency level for the AA degree, if the student matriculated in or after fall 2009.

Upon successful completion of Math 123C with a grade of “C” or better, students will be able to satisfy the minimum pre-requisite for math and science transfer courses.

Upon successful completion (with a grade of “C” or better) of Math courses at least one level above Math 123C, students will be able to meet minimum mathematics transfer requirements.

D. Assessment Results

Math Department faculty have always been involved in the assessment of their students, however new ACCJC accreditation standards presently demands that student learning outcomes be assessed on an ongoing and systematic basis.

The department conducted its first formal assessment project in spring 2008 by defining and refining student learning outcomes and formulating a rubric to measure success. Course outlines of record for all courses went through extensive revision to ensure alignment of measurable learning outcomes.

The findings and recommendations derived from this project have produced important data for the department to analyze success as well as failure.


3. During 2010 – 11 Math Department developed program learning outcomes and will link and assess these to the college institutional learning outcomes.

Supporting Documentation – appendix B

E. Program Modifications
Course Realignment
Pursuing the philosophy that the study of mathematics is an integral part of the student’s preparation in all aspects of academic development, during the fall of 2000 the department collapsed the course offerings of Math 113, 114, 115, 125, 125A and 125B, with academic units varying from 2.5 to 5, into a cohesive three course Math 123A, B and C sequence with equal academic units. The purpose of this modification was two fold: firstly, to bring about order to a rather erratic course sequence with multiple paths and secondly, to increase the retention rate in the entry level algebra sequence. Fall 2000 to 2004 data shows a modest increase in the retention rate for students undertaking the elementary and intermediate algebra sequence.

Math Jam
A program was introduced in the summer of 2008 to provide incoming students with the necessary math and college skills to be successful in their freshman experience in elementary algebra and other college courses. The program was modeled after Pasadena City College’s namesake. The program was set up as a cohort/learning community involving Math 112 – Pre Algebra, PD 017 – College Survival Skills and CAOT 185 – Directed Study.

Online Delivery
Several mathematics classes polled during Sp 2007 led to the scheduling of the first hybrid mathematics course. A single section of Math 123C was scheduled to be offered during the spring 2010 term to assess student success with this type of instructional delivery. The department is planning to follow up with a hybrid section of Math 227 during the fall 2010 term.

Based on the assessment of student learning outcomes at the course and program levels, areas that require modifications to improve performance and areas that are working well and should be expanded.

1. Areas for improvement:
   Based on placement scores data, the Mathematics Department faculty realize that they cannot continue to increase the number of basic skills sections offered to meet demand without increasing the number of full-time faculty hired to teach these sections. Faculty in this department will also continue to review the way that basic skills courses are staffed. Faculty require continued training on how to conduct basic skills classes effectively since the number of students placing into this level increases yearly. A smaller student to teacher ratio in basic skills courses would be beneficial to student interaction; consequently the recommendation is to lower the class limit in basic skills sections to 35 students. Use computer instructional software provided by textbook publishers to increase student practice time and exposure.

   Train department faculty in the use of web-based support services such as developing websites.

Supporting Documentation – High School Placement Data - page 40

2. Areas for reinforcement:

   Following is a list of—short-term and long-term time goals:

   a. Continue discussion on basic skills program
      i. Coordinate workshops and reading groups for basic skills “best practices”
      ii. Use of faculty resources (e.g. Developmental Education Committee members, faculty with BSI training)
      iii. Reinstate supplemental instruction
b. Increase focus on professional development
   i. designate time at each department meeting
   ii. observe each other’s classrooms

c. Increase and improve participation from discipline members
   i. vary dates and times of department meetings; set calendar for semester
   ii. form course review committees

d. Continue focus on assessment and commitment to implement findings and recommendations
   i. build in time between projects for faculty to implement findings and recommendations
   ii. tie this to professional development with course review/project committee members
       presenting findings and describing some practical classroom strategies for improvement

e. Improve communication with part-time faculty
   i. more workshops, orientations
   ii. improve current department website
   iii. create a mentoring program

f. Improve communication with feeder high school and transfer institution mathematics faculty
   i. organize workshops, orientations
A. External SCAN--General

1. Demographics—Service Area will grow at a slower rate than State average.

2. Demographics—Aging Population in the College’s Service Area
   i. The number of High School Seniors in our Service Area will peak in 2010 and then decline
   ii. The number of 15-19 year olds will decline over the next 10 years

3. Demographics—Percentage of Latinos and Asians in service area will increase, while percentage of Whites and African-Americans will decrease over the next 10 years.

4. Economic Downturn--For LAHC, Rising Unemployment is associated with Rising Enrollment.

5. Technology—Incoming students will be much more comfortable in the “virtual world” than previous generations.

B. External SCAN—Occupations in Math, Physical Science and Technology Division.

Recognizing the diverse background of students, the division offers programs that support the workforce development mission of the college:

Demographics for engineering general and related fields indicate a steady 10% increase in job demand through the year 2017.
Source: EMSI Complete Employment - Spring 2008 Release v. 2

Executive Summary
Although the number of positions available in the areas of astronomy, chemistry, computer science, mathematics and physics is not overwhelming, demographics indicate a steady 16% to 19% increase in job demand through the year 2017. As part of the program review, Math Departments will address present and future trends in mathematics, science and technology education as described professional articles such as Strengthening the Science and Math Pipeline, an AASCU policy paper found at http://www.aascu.org/policy_matters/pdf/v2n11.pdf, and Science and Mathematics, found at http://www.ohiostem.org/_data/user_docs/SAMEPAC_REPORT_FINAL_1-22.pdf

C. Internal SCAN—Performance

1. The average class retention in mathematics courses through census week, from 2003 to 2007, was 74.4%, on a par with the California state average of 75%.

2. The average mathematics course completion rate from 2003 to 2007, was 48.4% lower than the California state average of 53%.

3. The average class size in mathematics courses from 2003 to 2007, was 41 exceeding both division and college average of 34.6 for the same time period.
4. Recent personnel changes in the department include retirements of S. Downey, K. Keller and C. Huff in 2002, 2007 and 2009 respectively. The accompanying table summarizes the numerical relationship between adjunct and tenured faculty as budget and FTES targets fluctuate.

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<th>Hourly</th>
<th>Full-time</th>
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<td>9.0</td>
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<td>2007</td>
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5. The accompanying tables summarizes enrollment and efficiency data for the discipline

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6. FTES (FALL ONLY)

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<th>2006</th>
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<td>20</td>
<td>19</td>
<td>22</td>
<td>20</td>
<td>26</td>
</tr>
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</table>
7. Degrees awarded: according to the Factbook one (1) degree was awarded in 2004-05.

Executive Summary
Factbook data supports the position that the Mathematics Department efficiency is below the college norm in the areas of class retention and course completion, but exceeds the college class size average by a considerable margin.
The Mathematics Department mirrors the college attrition trend with no retirement replacements due to a serious fiscal deficit.
The department meets student demand for math courses by scheduling day, afternoon, evening and weekend classes. The department enrollment is strong and parallels district, state and nationwide student enrollment patterns.

Areas of the program that need strengthening

Instructional Assistance: additional instructional staffing is required in the math lab to provide better service to students enrolled during evening hours and weekends.

Student Placement: to ensure greater success in the math sequence of courses offered, the department must undertake a cyclical review of the placement instrument and cut off scores used to enroll students in math courses. After extensive review and discussion, the math department faculty attempted to replace the present COMPASS placement instrument. Major local and state hurdles have to be addressed in order to achieve this goal.

D. Program Strengths

Curriculum: Courses have been designed to fully prepare students to meet math competency requirements for the AA degree, math requirements for courses offered at the college, and CSU/UC transfer requirements.

Instructional Assistance: the department operates an instructional math lab to supplement math instruction for students enrolled at the college. The math lab operates Monday through Saturday employing one instructional assistant and several peer tutors.

E. Program and unit plan modifications necessary for program improvement.

Department faculty visited the Campus Placement Center to get a first hand look at the math placement process. Recommendations to improve the placement of students into Math courses have been forwarded to the Matriculation Committee.

Department faculty continues to review textbooks and search for technology that will help students succeed in meeting their math requisites.

F. Sources of data outside the college data set used for the program review
AMATYC, MAA and NCTM articles discussing trends and challenges in the teaching of mathematics.
California Community College System Office enrollment data.

G. Trends are indicated by the data
1. The average class retention in mathematics courses through census week, from 2003 to 2007, was 74.4%, on a par with the California state average of 75%
2. The average mathematics course completion rate from 2003 to 2007, was 48.4% lower than the California state average of 53%.

3. The average class size in mathematics courses from 2003 to 2007, was 41 exceeding both division and college average of 34.6 for the same time period.

Describe any unique institutional goals the program satisfies:

The Mathematics Department aligns with the institutional missions and strategic LACCD goals by offering an array of classes and resources to meet the needs of all college students such as:

1. Developmental, remedial, transfer-level courses, emphasizing mathematical skills and critical-thinking.
2. Sophomore-level courses provide transfer requirements that parallel four year colleges and university curricula.
3. Pre-college, tutorial, and supplemental instruction for under-prepared students through course offerings, the Open Entry/Exit Mathematics Laboratory, and peer tutoring.
4. Classes are provided at a great range of times, on weekends, and through hybrid formats.
5. The department strives to improve student retention and success by providing an effective learning environment for students, focusing on teaching excellence.
6. The department is actively engaged in implementing and assessing, SLOs for each of its courses to ensure that its offerings are both effective and responsive to student needs, and ultimately ensuring improved student success and retention rates.
7. The department is actively engaged in mapping course SLO’s, PLO’s and ILO’s for the upcoming ACCJC accreditation report and visit.

- **Degree Information:**

Presently the number of declared mathematics major is unknown.

The program review did not focus on the gender breakdown of students. Math Department faculty do not consider this to be relevant issue at this time.

The program review did not focus on the ethnic breakdown of students. Math Department faculty do not consider this to be relevant issue at this time.
MATHEMATICS FOR COMPUTER SCIENCE - Major Code: 1701.01

Plan A

A.S. Degree Program Requirements

UNIT REQUIREMENTS: A minimum of 60 semester units of course credit in a selected curriculum which includes at least 30 semester units of general education coursework as specified in the College Catalog (GENERAL EDUCATION REQUIREMENTS- GRADUATION PLAN A) and at least 18 semester units of study taken in a single discipline or related disciplines as indicated below (MAJOR REQUIREMENT). See course description for prerequisites since these will be strictly enforced.

When planning their program of study, students should see a counselor.

MAJOR REQUIREMENTS

Completion of each of the following courses with a grade of "C" or better:

**Units**
- CHEM 102 General Chemistry II 5
- PHYS 38 Elect. Magnet. Optics 5
- MATH 165, 170, 175 Computer Programming 3
- MATH 270 Linear Algebra 3
- MATH 275 Diff. Equations 3
- ENGLISH 101 College Reading and Composition I 3

Below is a departmentally recommended sample program which groups required major courses into four semesters. Students must also complete 30 units of General Education requirements from Graduation Plan A.

*Degree and Certificate Programs* *69 2004-2006 General Catalog*

**Sample Program**

**FIRST SEMESTER** **Units**
- +CHEM 101 General Chemistry I 5
- +ENGL 101 Reading and Composition I 3
- +MATH 265 Calculus I 5
- MATH 155 Introduction to Visual Basic 3

**SECOND SEMESTER**
- CHEM 102 General Chemistry II 5
- MATH 266 Calculus II 5
- PHYS 37 Mechanics Solids, Sound 5

**THIRD SEMESTER**
- MATH 267 Calculus III 5
- MATH 270 Linear Algebra 3
- MATH 165, 170, 175 Computer Programming 3
- Mathematics 2008-09 13
PHYS 38 Elect. Magnet. Optics 5
FOURTH SEMESTER
MATH 275 Diff. Equations 3
MATH 165, 170, 175
Computer Programming 3
Additional G.E. Requirements 21
Total Units for this A.S. Degree 74
+ This course may count towards General Education Requirements
MATHEMATICS COURSE SEQUENCE FLOW CHART

INSERT PAGE 151 OF THE 2008-10 COLLEGE CATALOG
COURSES OFFERED

MATH 100 - MATHEMATICS WORKSHOP (1) RPT 3
NDA
Co-requisite: Concurrent enrollment in a mathematics or mathematics related course.
Laboratory 3 hours and 20 minutes per week.
This course supplements all mathematics level courses by providing tutorial and self-help assistance. Offered on a credit/no credit basis only.

MATH 105 - ARITHMETIC FOR COLLEGE STUDENTS (3)
NDA
This course explores arithmetic concepts from a modern point of view. It includes discussion of pre-algebra topics, applications of arithmetic in business and finance, and geometry.

MATH 112 - PRE-ALGEBRA (3) NDA
This course presents a review of arithmetic topics and an introduction to elementary algebraic topics including signed numbers, exponents, mathematical sentences, and linear equations.

MATH 121 - ESSENTIALS OF PLANE GEOMETRY (3)
Prerequisite: completion of Math 123A & B or equivalent with a grade of “C” or better
This course covers the definitions, axioms and theorems of geometry relating to angles, lines, circles, polygons and polyhedra. The meaning and techniques of logical proof are emphasized.

MATH 123A - ELEMENTARY AND INTERMEDIATE ALGEBRA I (4)
Prerequisite: completion of Math 112 with a grade of “C” or better, or placement by exam.
First of three modules for Math 123 covering elementary algebra topics such as properties and operations with real numbers, addition, subtraction, multiplication of algebraic expressions, solution of linear equations and inequalities. Solution of word problems involving linear equations and inequalities. Also includes graphing linear functions.

MATH 123B - ELEMENTARY AND INTERMEDIATE ALGEBRA II (4)
Prerequisite: completion of Math 123A with a grade of “C” or better
Second of three modules for Math 123 covering elementary algebra topics such as addition, subtraction, multiplication of polynomials, (done in 123A not 123B) solution of second degree equations and radical expressions, solution of word problems involving second degree equations, and radical expressions.

MATH 123C - ELEMENTARY AND INTERMEDIATE ALGEBRA III (4)
Prerequisite: completion of Math 123B with a grade of “C” or better
Third of three modules for Math 123 covering intermediate algebra topics such as functions and their operations, conic sections, series and sequences. Applications of these topics to business, science and engineering are included.

MATH 215 - PRINCIPLES OF MATHEMATICS I (3) UC: CSU
Prerequisite: completion of Math 123C with a grade of “C” or better
First of two courses in a sequence designed for elementary school teachers. Emphasis is on the study of sets and relations, numeration systems, basic problem solving, elementary number theory and their applications.

MATH 216 - PRINCIPLES OF MATHEMATICS II (3) UC: CSU
Prerequisite: completion of Math 215 with a grade of “C” or better
Second of two courses in a sequence designed for elementary school teachers. Emphasis is on the study of probability, statistics networks, basic geometry concepts and their applications.

MAT 227 - STATISTICS (4) UC: CSU
Prerequisite: completion of Math 123C with a grade of “C” or better
This course is an introduction to probability, descriptive and inferential statistics including measures of central tendency and dispersion, sampling and estimation. Hypothesis testing, analysis of variance, tests of independence, linear correlation and regression analysis are also covered.

MATH 230 - MATHEMATICS FOR LIBERAL ARTS STUDENTS (3) UC: CSU
Prerequisite: A grade of “C” or better in Mathematics 123C
This course surveys selected topics in modern algebra including voting methods, apportionment, mathematics of finance, number theory, probability, statistics and graph theory. (CAN MATH 2)

MATH 234 – COLLEGE LEVEL ALGEBRA (4) UC: CSU
Prerequisite: completion of Math 123C with a grade of “C” or better
This course is designed to prepare students to apply mathematical concepts and quantitative reasoning at a collegiate level. Topics include solution of higher order equations and inequalities, functional analysis, zeroes of polynomials, exponential and logarithmic functions, solution of systems of equations using matrices, and binomial expansions.

MATH 235 - FINITE MATHEMATICS (5) UC: CSU
Prerequisite: completion of Math 123C with a grade of “C” or better
The objective of this course is to expose students to various mathematical techniques required in solving business and social science related problems. The topics cover a brief survey of basic algebra, together with the theory of matrices, simplex method, and their applications in linear programming. In addition, the course also covers mathematics of finance, probability theory with applications to statistics, the binomial and normal distributions.

MATH 236 - CALCULUS FOR BUSINESS AND SOCIAL SCIENCE (5) UC: CSU
Prerequisite: completion of Math 124 with a grade of “C” or better.
This course consists of basic concepts of differential and integral calculus in single variables with applications for business, life and social sciences. Topics include limits, derivatives, maxima and applications, integration techniques with applications, and graphs. (CAN MATH 34)

MATH 240 - TRIGONOMETRY (3) CSU
Prerequisites: completion of Math 121 and 123C with a grade of “C”
This course provides a study of the circular functions and equations, as well as formulas related to angles and the solution of triangles and their applications to other sciences. (CAN MATH 8)

MATH 260 - PRE-CALCULUS (5) UC: CSU
Prerequisite: completion of Math 123C with a grade of “C” or better.
Topics in college algebra such as induction, the binomial theorem, theory of equations, arithmetic and geometric series, determinants and matrices. Function analysis and analytic geometry topics also covered. (CAN MATH 16)

MATH 265 - CALCULUS WITH ANALYTIC GEOMETRY I (5) UC: CSU
Mathematics 2008-09
Prerequisites: completion of Math 240 and 260 with a grade of “C” or better. Business majors are urged to take Mathematics 235 and 236 instead of Mathematics 260 and 265 unless they plan to take additional calculus courses. Some business majors may need to take engineering calculus—consult a counselor.

This is the first in a sequence of three courses in calculus and analytic geometry. Topics include functions, limits, continuity, derivatives, integrals of rational and trigonometric functions. Applications include topics in engineering and physics.

MATH 266 - CALCULUS WITH ANALYTIC GEOMETRY II (5) UC: CSU
Prerequisite: completion of Math 265 with a grade of “C” or better.
This course includes applications of integrals to work and pressure, exponential, logarithmic, inverse trigonometric and hyperbolic functions. Additional topics include integration techniques, improper integrals, L’Hospital’s Rule, infinite series and analytic geometry of conic sections.

MATH 267 - CALCULUS WITH ANALYTIC GEOMETRY III (5) UC: CSU
Prerequisite: completion of Math 266 with a grade of “C” or better.
This course includes polar spherical and cylindrical coordinates; parametric equations, vector algebra and calculus in two and three dimensions; partial derivatives; multiple integrals and applications.

MATH 270 - LINEAR ALGEBRA (3) UC: CSU
Prerequisite: completion of Math 266 with a grade of “C” or better. Recommended co-requisite: Concurrent enrollment in Math 267.
Matrix algebra, vector spaces, linear transformations and matrices are included in this course. There is emphasis on theory and applications.

MATH 275 - ORDINARY DIFFERENTIAL EQUATIONS (3) UC: CSU
Prerequisite: completion of Math 267 with a grade of “C” or better or concurrent enrollment in Mathematics 267.
This is a course in differential equations with emphasis on applications in physical science. Traditional methods of solution by closed forms are studied together with series solutions and numerical methods of solution. La Place transforms are also included.

MATH 185 - DIRECTED STUDY-MATH (1) UC*:CSU RPT 2
Prerequisite: Completion of Math 123C with a grade of “C” or better.
Conference 1 hour and 5 minutes per week per unit.
Allows student to pursue directed study in Math on a contract basis under the direction of a supervising instructor.
* UC credit may be granted by petition after transfer.

MATH 285 - DIRECTED STUDY-MATH (2) UC*:CSU
Prerequisite: Completion of Math 123C with a grade of “C” or better.
Conference 1 hour and 5 minutes per week per unit.
Allows student to pursue directed study in Math on a contract basis under the direction of a supervising instructor.
* UC credit may be granted by petition after transfer.

MATH 385 - DIRECTED STUDY-MATH (3) UC*:CSU
Prerequisite: Completion of Math 123C with a grade of “C” or better
Conference 1 hour and 5 minutes per week per unit.
Allows student to pursue directed study in Math on a contract basis under the direction of a supervising instructor.
* UC credit may be granted by petition after transfer.

Credit limit: A maximum of 3 units in Directed Study is allowed for any combination of Math 185, 285 and 385.

COOPERATIVE WORK EXPERIENCE EDUCATION
Mathematics is approved for Cooperative Work Experience Education credit. See Cooperative Education courses for prerequisites, course descriptions, and credit limits.

Mathematics 2008-09
Los Angeles Community College District

COURSE OUTLINE
(Replaces PNCR and Course Outline)

Section I: Basic Course Information

Outline Status:

1. College: Harbor
2. Subject (Discipline) Name: Mathematics
   (40 characters, no abbreviations)
3. Course Number: 275
4. Course Title: Ordinary Differential Equations
5. Units: 3
6. Catalog Course Description — Provide a description of the course, including an overview of the topics covered:
   This course introduces the theory and applications of ordinary differential equations with emphasis on applications in the physical sciences. Traditional methods of solution by closed forms are studied together with series solutions, numerical methods and Laplace transforms solutions.
7. Class Schedule Course Description — Provide a brief description of the course, including an overview of the topics covered:
   This course introduces the theory and applications of ordinary differential equations with emphasis on applications in the physical sciences. Traditional methods of solution by closed forms are studied together with series solutions, numerical methods and Laplace transforms solutions.
8. Initial College Approval Date:

---

1 Underlined course attributes are the same for the course throughout the LACCD; all other course attributes are college specific.

Mathematics 2008-09

19
9. UPDATES (check all applicable boxes):

- Content  Last Update: 09/04/09
- Objectives  Last Update: 09/04/09

10. CLASS HOURS:

<table>
<thead>
<tr>
<th></th>
<th>“Standard Hours” per Week (based on 18 weeks)</th>
<th>Total Hours per Term (hrs per week x 18)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture:</td>
<td>3.00</td>
<td>54.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Lab/activity (w/ homework):</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Lab/activity (w/o homework):</td>
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<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Total:</td>
<td>3.00</td>
<td>54.00</td>
<td>3.00</td>
</tr>
</tbody>
</table>

Note: The Carnegie Rule and Title 5, section 55002 sets forth the following minimum standards: 1 unit = 1 hour lecture per week, 2 hours homework per week; OR 2 hours per week of lab with homework; OR 3 hours of lab per week without homework. The hours per week are based on a standard 18-week calendar. Lecture also includes discussion and/or demonstration hours, laboratory includes activity and/or studio hours.

11. PREREQUISITES, COREQUISITES, ADVISORIES ON RECOMMENDED PREPARATION, and LIMITATION ON ENROLLMENT

Note: The LACCD’s Policy on Prerequisites, Corequisites and Advisories requires that the curriculum committee take a separate action verifying that a course’s prerequisite, corequisite or advisory is an “appropriate and rational measure of a student’s readiness to enter the course or program” and that the prerequisite, corequisite or advisory meets the level of scrutiny delineated in the policy.

- Prerequisites: Yes  (If Yes, complete information below)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Number</th>
<th>Course Title</th>
<th>Units</th>
<th>Validation Approval Date (official use only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>267</td>
<td>Calculus with analytic Geometry III</td>
<td>5.00</td>
<td></td>
</tr>
</tbody>
</table>
12. REPEITITIONS -- Number of times course may be repeated for credit (three maximum): 0 (see: Section V, #9)

13. OTHER LIMITATIONS ON ENROLLMENT (see Title 5, Section 58106 and Board Rule 6803 for policy on allowable limitations. Other appropriate statutory or regulatory requirements may also apply):

N/A

Section II: COURSE CONTENT AND OBJECTIVES

1. COURSE CONTENT AND SCOPE – Lecture: Hours

<table>
<thead>
<tr>
<th>COURSE CONTENT AND SCOPE – Lecture</th>
<th>Hours</th>
<th>COURSE OBJECTIVES – Lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of differential equations: separable variables, exact and linear equations, substitution methods, linear, homogeneous and non-homogeneous equations reduction in order of a differential equation with constant coefficients. Applications</td>
<td>12</td>
<td>State and apply solution methods and theorems related to ordinary differential equations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>State and apply solution methods and theorems related to ordinary differential equations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>State and apply solution methods and theorems related to ordinary differential equations</td>
</tr>
<tr>
<td>Systems of linear differential equations, nonlinear differential equations</td>
<td>9</td>
<td>Develop techniques for applying differential equations to the solution of problems arising in science and engineering</td>
</tr>
<tr>
<td>Modeling with differential equations: initial value problems, spring mass systems, boundary value problems</td>
<td>9</td>
<td>Develop techniques for applying differential equations to the solution of problems arising in science and engineering.</td>
</tr>
<tr>
<td>Solution of differential equations using power series</td>
<td>6</td>
<td>Attain further proficiency in methods of mathematical analysis.</td>
</tr>
<tr>
<td>Laplace Transforms. Numerical methods</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

| **Total Lecture hours*** | 54  |

| COURSE CONTENT AND SCOPE -- **Laboratory**: If applicable, outline the topics included in the laboratory portion of the course (*outline reflects course description, all topics covered in class*). | Hours per Topic | COURSE OBJECTIVES - **Laboratory** (If applicable): Upon successful completion of this course, the student will be able to… (*Use action verbs – see Bloom’s Taxonomy below for “action verbs requiring cognitive outcomes.”*)

| Total Lab hours*** | 0.00 |

*Total lecture and laboratory hours (which include the final examination) must equal totals on page 1.

2. **REQUIRED TEXTS:**

Provide a representative list of textbooks and other required reading; include author, title and date of publication:


3. **SUPPLEMENTARY READINGS:**

Reading assignments may include, but are not limited to the following:

None

4. **WRITING ASSIGNMENTS:**

² In general “activity” courses or portions of courses are classified “laboratory.”
Title 5, section 55002 requires grades to be “based on demonstrated proficiency in subject matter and the ability to demonstrate that proficiency, at least in part, by means of essays or, in courses where the curriculum committee deems them to be appropriate, by problem solving exercises or skills demonstrations by students.” Writing assignments in this course may include, but are not limited to the following:

Students will be required to maintain a journal of their experiences in the course including perceptions of significant topics, assignments and exam results.

5. REPRESENTATIVE OUTSIDE ASSIGNMENTS:

Out of class assignments may include, but are not limited to the following:

Navigate History Topics Index internet website to find historical information on the mathematician Leonhard Euler.

6. REPRESENTATIVE ASSIGNMENTS THAT DEMONSTRATE CRITICAL THINKING:

Title 5, section 55002(a) requires that a degree-applicable course have a level of rigor that includes “critical thinking and the understanding and application of concepts determined by the curriculum committee to be at college level”. Critical thinking may include, but is not limited to analysis, synthesis, and evaluation. Provide examples of assignments that demonstrate critical thinking.

Compare and contrast information found on the internet on the topic numerical approximations to Euler methods discussed in class.

7. METHODS OF EVALUATION:

Title 5, section 55002 requires grades to be “based on demonstrated proficiency in subject matter and the ability to demonstrate that proficiency, at least in part, by means of essays or, in courses where the curriculum committee deems them to be appropriate, by problem solving exercises or skills demonstrations by students.” Methods of evaluation may include, but are not limited to the following (please note that evaluation should measure the outcomes detailed “Course Objectives” at the beginning of Section II):

Exams, quizzes and homework assignments are used to determine the course grade

8. METHODS OF INSTRUCTION:

Methods of instruction may include, but are not limited to the following:

- Lecture
- Discussion
- Laboratory
- Activity
- Field Experience
9. SUPPLIES:

List the supplies the student must provide.

- Textbook, handheld scientific calculator and notebook.

10. COMPUTER COMPETENCY:

If applicable, explain how computer competency is included in the course.

N/A

11. INFORMATION COMPETENCY:

Information competency is the ability to find, evaluate use, and communicate information in all its various formats. It combines aspects of library literacy, research methods and technological literacy. Information competency includes consideration of the ethical and legal implications and requires the application of both critical thinking and communications skills. If applicable, explain how information competency is included in the course.

- Students will be required to compare and contrast information found on the Internet with information provided in class.

12. DIVERSITY:

If applicable, explain how diversity (e.g., cultural, gender, etc.) is included in the course.

N/A

13. SCANS COMPETENCIES (required for all courses with vocational TOP Codes; recommended for all courses):

RESOURCES

- Managing Time: Selecting relevant goal-related activities, ranking them in order of importance, allocating time to activities, and understanding, preparing and following schedules.
Managing Money: Using or preparing budgets, including making cost and revenue forecasts; keeping detailed records to track budget performance, and making appropriate adjustments.

Managing Material and Facility Resources: Acquiring, storing, allocating, and distributing materials, supplies, parts, equipment, space or final products in order to make the best use of them.

INTERPERSONAL

Participating as Member of a Team: Working cooperatively with others and contributing to group’s efforts with ideas, suggestions and effort.

Teaching Others New Skills: Helping others learn needed knowledge and skills.

Exercising Leadership: Communicating thoughts, feelings, and ideas to justify a position, encouraging, persuading, convincing or otherwise motivating an individual or group, including responsibly challenging existing procedures, policies or authority.

Negotiating: Working toward agreement that may involve exchanging specific resources or resolving divergent interests.

Working with Cultural Diversity: Working well with men and women and with people from a variety of ethnic, social, or educational backgrounds.

INFORMATION

Acquiring and Evaluating Information: Identifying a need for data, obtaining the data from existing sources or creating them, and evaluating their relevance and accuracy.

Organizing and Maintaining Information: Organizing, processing and maintaining written or computerized records and other forms of information in a systematic fashion.

Interpreting and Communicating Information: Selecting and analyzing information and communicating the results of others, using oral, written, graphic, pictorial, or multimedia methods.

Using Computers to Process Information: Employing computers to acquire, organize, analyze and communicate information.

SYSTEMS
- **Understanding Systems**: Knowing how social, organizational and technological systems work and operating effectively with them.

- **Monitoring and Correcting Performance**: Distinguishing trends, predicting impacts of actions on system operations, diagnosing deviations in the functioning of a system/organization, and taking necessary steps to correct performance.

- **Improving or Designs Systems**: Making suggestions to modify existing systems in order to improve the quality of products or services and developing new or alternative systems.

**TECHNOLOGY**

- **Selecting Technology**: Judging which sets of procedures, tools or machines, including computers and their programs, will produce the desired results.

- **Applying Technology to Tasks**: Understanding overall intent and proper procedures for setting up and operating machines, including computers and their reprogramming systems.

- **Maintaining and Troubleshooting Equipment**: Preventing, identifying, or solving problems with equipment, including computers and other technologies.
Section III: RELATIONSHIP TO COLLEGE PROGRAMS

1. THIS COURSE WILL BE AN APPROVED REQUIREMENT FOR AN APPROVED ASSOCIATE DEGREE OR CERTIFICATE PROGRAM: **Yes**

   a. If yes, the course will be a **Not applicable** portion of the “approved program” listed on the State Chancellor’s Inventory of Approved Programs (approved programs can be found on the State Chancellor’s Office website at http://misweb.cccco.edu/esed/webproginv/prod/invmenu.htm

   Associate in Science in Mathematics

   NOTE: In order for a course to be approved as a requirement for an associate degree or certificate program, the program must be listed on the State Chancellor’s Office Inventory of Approved Programs AND the course must be listed in the college catalog as either a requirement or an elective for the program. If course is not part of an approved program at the college adopting the course, it will be considered to be a “stand-alone” course, and is subject to the State Chancellor’s approval criteria. The college must complete and submit the Chancellor’s Office “APPLICATION FOR APPROVAL OF CREDIT” form. Certain courses are granted “blanket approval” by the State Chancellor’s Office and do not require separate approval. See the Chancellor’s Office Program and Course Approval Handbook for details. LACCD Skills Certificates are not State approved programs and are not listed on the Chancellor’s Office Inventory of Approved Programs.

2. GENERAL EDUCATION REQUIREMENTS FOR THE ASSOCIATE DEGREE STATUS:

   a. Area requested: **None** Approval date:

   If applicable, provide an explanation of how the course meets the General Education parameters for one of the five general education areas – Natural Sciences, Social and Behavioral Sciences, Humanities, Language and Rationality, Health and Physical Education -- contained in Board Rule 6201.14 -General Education Requirements.

   http://marlin.laccd.edu/district/BoardRules_AdmRegs/boardrules.htm

   a. 2nd Area requested: **None** Approval date:
If applicable, provide an explanation of how the course meets General Education parameters for an additional general education area – *Natural Sciences, Social and Behavioral Sciences, Humanities, Language and Rationality, Health and Physical Education* -- contained in Board Rule 6201.14 - General Education Requirements. [http://marlin.laccd.edu/district/BoardRules_AdmRegs/boardrules.htm](http://marlin.laccd.edu/district/BoardRules_AdmRegs/boardrules.htm)
Section IV: ARTICULATION INFORMATION

(Complete in consultation with College Articulation Officer)

1. TRANSFER STATUS:

   a. Transferable to the University of California: Yes
   b. UC approval date:
   c. Transferable to the California State University: No
   d. College approval date:

2. GENERAL EDUCATION FOR TRANSFER:

   IGETC Certification:
   a. Area requested: None
   b. Date requested:
   c. IGETC approval date:

   CSU Certification:
   a. Area requested: None
   b. Date requested:
   c. CSU approval date:

   If applicable, provide an explanation of how the course meets the appropriate General Education parameters, as defined in IGETC Certification Guidelines.

   a. 2nd Area requested: None
   b. Date requested:
   c. IGETC approval date:

   If applicable, provide an explanation of how the course meets the appropriate General Education parameters, as defined in IGETC Certification Guidelines.

   a. 2nd Area requested: None
   b. Date requested:
   c. CSU approval date:

   If applicable, provide an explanation of how the course meets the appropriate General Education parameters, as defined in CSU Certification Guidelines.
3. **MAJOR REQUIREMENT FOR TRANSFER** – Will this course be articulated to meet lower division major requirements?  **NO**

List college/university and the majors:

<table>
<thead>
<tr>
<th>College/University</th>
<th>Major(s)</th>
</tr>
</thead>
</table>

**CAN NUMBER:** CAN SEQUENCE NUMBER:
Section V: SUPPLEMENTAL COURSE INFORMATION

1. DEPARTMENT/DIVISION NAME: Mathematics/Math-Phy-Sci and Tech

2. DEPARTMENT/DIVISION CODE: 45

3. SUBJECT CODE -- 3 characters, assigned by District Office: 589 (existing subject codes are available on the LACCD web site at http://www.laccd.edu/curriculum/directory-programs-courses/index.htm

4. SUBJECT ABBREVIATION -- 7 characters, assigned by District Office: Math

5. SPC CODE -- 3 characters, assigned by District Office: 742

6. ABBREVIATION FOR TRANSCRIPTS -- 20 characters, assigned by District Office: Math

7. DEGREE CREDIT: Indicate whether the course meet the "standards for approval" for degree credit course set forth in Title 5, section 55002(a)(2), which requires the course to have a degree of intensity, difficulty, and vocabulary that the curriculum committee has determined to be at the college level:

   This courses is Degree Applicable

8. CREDIT/NO CREDIT GRADING: No

9. REPETITIONS -- Number of times course may be repeated for credit (three maximum): 0

   How does the repetition of this course meet Title 5, section 58161 requirements? A course may be repeatable when, "course content differs each time it is offered, and that the student who repeats it is gaining an expanded educational experience for one of the following reasons: (A) Skills or proficiencies are enhanced by supervised repetition and practice within class periods; or (B) Active participatory experience in individual study or group assignments is the basic means by which learning objectives are obtained."

10. PRIOR TO TRANSFERABLE LEVEL – This course attribute applies to English, writing, ESL, reading and mathematics courses ONLY. If applicable, indicate how many levels below the transferable level this course should be placed: Not applicable

11. CREDIT BASIC SKILLS -- Title 5, section 55502(d) defines basic skills as “courses in reading, writing, computation, and English as a Second Language, which are designated as non-degree credit courses pursuant to Title 5, section 55002(b).” No If Yes, course must be non-degree applicable.
12. **CROSS REFERENCE** -- Is this course listed as equivalent in content to existing College/District courses in another discipline?

   **No**

   If Yes, list courses (documentation of cross-discipline agreement must be provided):


13. **COURSE SPECIFICALLY DESIGNED FOR STUDENTS WITH DISABILITIES** -- Title 5, section 56029 allows a course to be repeatable when continuing success of the students with disabilities is dependent on additional repetitions of a specific class. Is this course designated as an “approved special class” for students with disabilities? **No**

   If yes, provide an explanation of how this course meets the requirements of Title 5, section 56029:


14. **COOPERATIVE EDUCATION STATUS** -- Title 5, section 55252 allows for two types of Cooperative Education: 1) General Work Experience Education -- i.e., supervised employment, which is intended to assist students in acquiring desirable work habits, attitudes and career awareness, which need not be related to the students’ educational goals; or 2) Occupational Work Experience Education -- i.e., supervised employment, extending classroom based occupational learning at an on-the-job learning station, which is related to the students’ educational or occupational goal. Is this course part of the college’s approved cooperative work experience education program? **No**

15. **COURSE CLASSIFICATION**: **Liberal Arts Sciences**

   Note: A course’s Classification, TOP Code and SAM code must be aligned – e.g., Courses with an “Occupational” Course Classification must have an “Occupational” TOP Code and a SAM Code of A, B, C, or D; courses that do not have an “Occupational” Course Classification cannot have an Occupational TOP Code and must have an “E” SAM Code. Courses coded as “basic skills” in #11 should be coded “Adult and Secondary Basic Skills.”

16. **TOP CODE** – (6 digits XXXX.XX) **1701. 00**

   Course content should match discipline description in Taxonomy of Programs found at www.cccco.edu/cccco/eresd/curric/curriculum.htm.

17. **SAM CODE** (Student Accountability Model): **E - Non-Occupational**

   SAM Codes (see CCC Chancellor’s Office Student Accountability Model Operations Manual, 1984) should be assigned as follows:

   **Priority "A" – Apprenticeship**: Courses designed for an indentured apprentice must have the approval of the State of California, Department of Industrial Relations Department, Division of Apprenticeship Standards.
**Priority "B" -- Advanced Occupational:** Courses taken by students in the advanced stages of their occupational programs. Courses should be offered in one specific occupational area only. Priority letter "B" should be assigned sparingly; in most cases, no more than two courses in any one program should be labeled "B." "B"-level courses must have Priority "C" prerequisites in the same program area.

**Priority "C" -- Clearly Occupational:** Courses generally taken by students in the middle stages of their programs should have a difficulty level sufficient to detract "drop-ins." Courses may be offered in several occupational programs within a broad area. The "C" priority, however, should also be used for courses within a specific program area when the criteria for "B" classification are not met. A "C"-level course should provide the student with entry-level job skills.

**Priority "D" -- Possibly Occupational:** "D" courses are those taken by students in the beginning stages of their occupational programs. The "D" priority can also be used for service (or survey) courses for other occupational programs.

**Priority "E" -- Non-occupational.**
SECTION VI: APPROVAL STATUS

1. APPROVAL STATUS:
   a. ☐ New Course . Board Approval Date: . Effective Semester:
   b. ☐ Addition of Existing District Course . College Approval Date: . Effective Semester:
   c. ☐ Course Change* . College Approval Date: . Effective Semester:
   d. ☑ Outline Update . College Approval Date: 09/04/09

   * Changes to a course require the completion of a “Course Change Request” form and approval by the college's Curriculum Committee. In some cases districtwide approval is also required; see, Administrative Regulation E-65, section 3(c) for details.

SECTION VII: APPROVAL INFORMATION FOR NEW OR ADDED COURSES
(complete in consultation with Department Chair and the appropriate Academic Administrator)

1. ORIGINATOR: L McKenzie
2. DEPARTMENT: Mathematics
3. IF THIS IS A NEW COURSE, INDICATE HOW THE COLLEGE PLANS TO MEET THE EXPENSE OF THIS COURSE:
   ☐ By additional funds. Describe:

   ☐ By deleting courses from the college catalog and course database. List specific courses to be deleted:

   ☐ By deleting sections of existing courses. List courses and number of sections to be deleted:

   First year: Second year: Third year:
By rotating sections of existing courses. List courses and number of sections to be rotated, as well as the semesters in which they will be offered:

4. IMPACT -- Will this course directly impact other course offerings and/or associate degree or certificate programs on campus?
   No (If yes, briefly explain how)

5. METHOD OF SUPPORT -- Indicate how the college plans to support the proposed course:

   Additional staff -- List additional staff needed:
   None

   Classroom -- List classroom type needed:
   Regular lecture

   Equipment -- List new equipment needed and indicate funding source for any new equipment:
   N/A

   Supplies- List supplies and indicate dollar value:
   N/A

   Library/Learning Resources- The course initiator shall consult with the College Librarian and review the college library, book, periodical, and electronic resource collections relevant to this course. List additional titles and resources to be considered for purchase as funding permits:
   Adequate
CERTIFICATION AND RECOMMENDATION

☐ This course meets Title 5 requirements for Associate Degree applicable college credit towards an Associate of Arts Degree.

☐ This course meets Title 5 requirements but does not satisfy the requirements for an Associate Degree applicable course.

We certify that the information and answers above properly represent this course.

__________________________________________________________  ____________________________
Originator                                                                 Date

__________________________________________________________  ____________________________
Department/Cluster Chairperson                                         Date

__________________________________________________________  ____________________________
Articulation Officer                                                  Date

__________________________________________________________  ____________________________
Librarian                                                             Date

__________________________________________________________  ____________________________
Dean (if applicable)                                                  Date

__________________________________________________________  ____________________________
Curriculum Committee Chairperson                                      Date
DATA INPUT PAGES
(Fills Automatically from Other Pages)

COLLEGE: Harbor

APPROVAL STATUS:
- New Course
- Addition of Existing District Course

Board Approval Date: 
College Approval Date: 
Effective Semester: 

DEPARTMENT/DIVISION NAME: Mathematics/Math-Phy-Sci and Tech

DEPARTMENT/DIVISON CODE: 45

SUBJECT (DISCIPLINE) NAME: Mathematics

SUBJECT CODE -- 3 characters, assigned by District Office: 589

SUBJECT ABBREVIATION -- 7 characters, assigned by District Office: Math

COURSE TITLE: Ordinary Differential Equations

COURSE NUMBER: 275

UNITS: 3

CLASS HOURS:

<table>
<thead>
<tr>
<th>Hours per week (based on 18 weeks)</th>
<th>Total Hours per term (hrs per week x 18)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture: 3.00</td>
<td>54.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Lab/activity (w/ homework): 0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Lab/activity (w/o homework): 0.00</td>
<td>0.00</td>
<td>0.00</td>
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<td>-----</td>
</tr>
<tr>
<td><strong>Total</strong>:</td>
<td>3.00</td>
<td>54.00</td>
</tr>
</tbody>
</table>

**DEGREE CREDIT**: Indicate whether the course meets the “standards for approval” for degree credit courses set forth in Title 5, section 55002(a)(2), which requires the course to have a degree of intensity, difficulty, and vocabulary that the curriculum committee has determined to be at the college level: This course is Degree Applicable.

**THIS COURSE WILL BE AN APPROVED REQUIREMENT FOR AN APPROVED ASSOCIATE DEGREE OR CERTIFICATE PROGRAM**:

If yes, the course will be a Not applicable portion of the “approved program” listed on the State Chancellor’s Inventory of Approved Programs (approved programs can be found on the State Chancellor’s Office website at).

**GENERAL EDUCATION FOR TRANSFER**:

<table>
<thead>
<tr>
<th>Area requested</th>
<th>Approval date</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

**GENERAL EDUCATION REQUIREMENTS FOR THE ASSOCIATE DEGREE STATUS**:

<table>
<thead>
<tr>
<th>Area requested</th>
<th>Approval date</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2nd Area requested</th>
<th>Approval date</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

**TRANSFER STATUS**:

- Transferable to the University of California: **Yes**
- UC approval date: 

- Transferable to the California State University: **No**
- College approval date: 

**GENERAL EDUCATION FOR TRANSFER**: **Yes**

**IGETC**

<table>
<thead>
<tr>
<th>Area requested</th>
<th>Date requested</th>
<th>IGETC approval date</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CSU CERTIFICATION**: **None**

<table>
<thead>
<tr>
<th>Date requested</th>
<th>CSU approval date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ABBREVIATION FOR TRANSCRIPTS**: -- 20 characters, assigned by District Office: **Math**
COURSE CLASSIFICATION: Liberal Arts Sciences

TOP CODE – (6 digits XXXX.xx) 1701.00

SAM CODE (Student Accountability Model): E - Non-Occupational

PREREQUISITES, COREQUISITES, ADVISORIES ON RECOMMENDED PREPARATION, and LIMITATION ON ENROLLMENT
Prerequisites: Yes (If Yes, complete information below)
Corequisite: None (If Yes, complete information below)

CREDIT/NO CREDIT GRADING: No

REPETITIONS -- Number of times course may be repeated for credit (three maximum): 0

CROSS REFERENCE -- Is this course listed as equivalent in content to existing College/District courses in another discipline? No

CREDIT BASIC SKILLS -- Title 5, section 55502(d) defines basic skills as "courses in reading, writing, computation, and English as a Second Language, which are designated as non-degree credit courses pursuant to Title 5, section 55002(b)." No If Yes, course must be non-degree applicable

COURSE SPECIFICALLY DESIGNED FOR STUDENTS WITH DISABILITIES -- Title 5, section 56029 allows a course to be repeatable when continuing success of the students with disabilities is dependent on additional repetitions of a specific class. Is this course designated as an "approved special class" for students with disabilities? No

APPROVAL STATUS:

New Course

Board Approval Date:
Effective Semester:

Addition of Existing District Course

College Approval Date:

COOPERATIVE EDUCATION STATUS -- Title 5, section 55252 allows for two types of Cooperative Education: 1) General
Work Experience Education -- i.e., supervised employment, which is intended to assist students in acquiring desirable work habits, attitudes and career awareness, which need not be related to the students' educational goals; or 2) Occupational Work Experience Education -- i.e., supervised employment, extending classroom based occupational learning at an on-the-job learning station, which is related to the students' educational or occupational goal. Is this course part of the college's approved cooperative work experience education program? No

CATALOG COURSE DESCRIPTION -- Provide a description of the course, including an overview of the topics covered:

This course introduces the theory and applications of ordinary differential equations with emphasis on applications in the physical sciences. Traditional methods of solution by closed forms are studied together with series solutions, numerical methods and Laplace transforms solutions.

CLASS SCHEDULE COURSE DESCRIPTION -- Provide a brief description of the course, including an overview of the topics covered:

This course introduces the theory and applications of ordinary differential equations with emphasis on applications in the physical sciences. Traditional methods of solution by closed forms are studied together with series solutions, numerical methods and Laplace transforms solutions.

SPC CODE -- 3 characters, assigned by District Office: 742
### PREREQUISITE, COREQUISITE OR ADVISORY CONTENT REVIEW

**Prerequisite**

**All courses: Content Review Validation**

Provide evidence that skills and knowledge acquired in the proposed prerequisite course are necessary for student success in the course by completing the Content Validation Table below.

1. List the skills or knowledge contained in the prerequisite course. (These items should be incorporated into the learning objectives of this course).
2. List skills or knowledge necessary for students to succeed in the requisite course for which the Prerequisite is proposed.

Certified by:

<table>
<thead>
<tr>
<th>Requisite Course Subject, Number, Title:</th>
<th>Target Course Subject, Number, and Title:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics 267 – Calculus III</td>
<td>Mathematics 275 – Ordinary Differential Equations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COLUMN 1: COURSE OBJECTIVES - EXIT SKILLS (List all exit skills, repeat if needed)</th>
<th>COLUMN 2: TARGET COURSE - ENTRY SKILLS (List all entry skills, repeat if needed)</th>
<th>Check box where match occurs or list the number(s) of the matching exit skills on the left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graph of functions in rectangular and polar coordinates.</td>
<td>Graph of functions in rectangular and polar coordinates.</td>
<td></td>
</tr>
<tr>
<td>Areas using polar coordinates</td>
<td>Areas using polar coordinates</td>
<td></td>
</tr>
<tr>
<td>Graphs of functions in parametric form.</td>
<td>Graphs of functions in parametric form.</td>
<td></td>
</tr>
<tr>
<td>Equations of tangent and normal lines to a curve</td>
<td>Equations of tangent and normal lines to a curve</td>
<td></td>
</tr>
<tr>
<td>Arc length of a curve</td>
<td>Arc length of a curve</td>
<td></td>
</tr>
<tr>
<td>Interpret rectangular coordinates in 3 space; vectors in R-3 and R-2; compute tangent and normal vectors, curvature; graph lines in 3-Space</td>
<td>Interpret rectangular coordinates in 3 space;</td>
<td></td>
</tr>
<tr>
<td>Compute scalar product; vector product; scalar triple product.</td>
<td>Vectors in R-3 and R-2; compute tangent and normal vectors, curvature; graph lines in 3-Space</td>
<td></td>
</tr>
<tr>
<td>Multiply and differentiate using vectors</td>
<td>Compute scalar product; vector product; scalar triple product.</td>
<td></td>
</tr>
<tr>
<td>Draw curves in 3-space</td>
<td>Multiply and differentiate using vectors</td>
<td></td>
</tr>
<tr>
<td>Draw quadric surfaces using spherical and cylindrical coordinates</td>
<td>Draw curves in 3-space</td>
<td></td>
</tr>
<tr>
<td>Partial derivatives, chain rule; directional Derivative, gradient, tangent planes; functions in n-variables; maxima and minima of function of 2-variables; Method of Lagrange multipliers</td>
<td>Partial derivatives, chain rule; directional Derivative, gradient, tangent planes; functions in n-variables; maxima and minima of function of 2-variables; Method of Lagrange multipliers</td>
<td></td>
</tr>
</tbody>
</table>
Double and triple integrals using rectangular, polar, cylindrical and spherical coordinates.
Surface area, centroids, center of mass and gravity.

Line integrals, Green's Theorem.
Surface integrals. Divergence theorem.

Select the most appropriate basis for validation and provide the necessary documentation: (Mouse over • for details.)

- Advisories/recommended prerequisites.
- Course within the same discipline.
- Course outside of discipline closely related but not English or Math.
- Required by a four year transfer institution.
- Computation or Communication Skill courses outside of a discipline.
- Health and Safety.
- Imposed by law or contract.
- Program prerequisites.
- Recency, GPA, and Other Measures of Readiness Prerequisites.
- Placement based on skills assessment.

DISCIPLINE FACULTY HAVE REVIEWED THE PREREQUISITE/COREQUISITE AND TARGET COURSE SKILLS LISTED ABOVE AND HAVE DETERMINED THAT TAKING THE PREREQUISITE/COREQUISITE COURSE WILL PROVIDE CONCEPTS/SKILLS NECESSARY FOR SUCCESS IN THE TARGET COURSE. FOR ADVISORY COURSES, THE DISCIPLINE FACULTY HAVE DETERMINED THAT TAKING THE ADVISORY COURSE WILL BROADEN AND/OR DEEPEN STUDENT LEARNING, BUT IS NOT REQUIRED FOR SUCCESS, IN THE TARGET COURSE.

Discipline Faculty:

_______________________________     ______________________
Signature         Date

_______________________________     ______________________
Signature         Date

_______________________________     ______________________
Signature         Date

Division Chairperson

Mathematics 2008-09
43
Curriculum Committee Chairperson

Date
<table>
<thead>
<tr>
<th>Institutional Mission and Goals</th>
<th>Course Intended Outcomes</th>
<th>Means of Assessment and Criteria for Success</th>
<th>Summary of Data Collected</th>
<th>Use of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1. Identify the type, order and solution method for various differential equations</td>
<td><strong>Means:</strong> Embed problems in the final exam. Collect the work from all students with names and scores. <strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td></td>
<td>Analyze the outcomes to determine issues such as: do the exercises assess the SLO clearly</td>
</tr>
<tr>
<td>2</td>
<td>2. Reduce the order of a differential equation</td>
<td><strong>Means:</strong> Embed problem in the final exam. Collect the work from all students with names and scores. <strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3. Solve differential equations with constant and variable coefficients</td>
<td><strong>Means:</strong> Embed problem in the final exam. Collect the work from all students with names and scores. <strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>4. Solve linear and non-linear differential equations</td>
<td><strong>Means:</strong> Embed problem in the final exam. Collect the work from all students with names and scores. <strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5. Solve systems of differential equations</td>
<td><strong>Means:</strong> Embed problems in the final exam. Collect the work from all students with names and scores. <strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6. Apply the method of La Place Transforms</td>
<td><strong>Means:</strong> Embed problem in the final exam. Collect the work from all students with names and scores. <strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7. Solve differential equations using numerical approximations</td>
<td><strong>Means:</strong> Embed problem in the final exam. Collect the work from all students with names and scores. <strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8. Solve word problems involving differential equations</td>
<td><strong>Means:</strong> Embed problem in the final exam. Collect the work from all students with names and scores. <strong>Criteria:</strong> 50% of the class will</td>
<td></td>
<td></td>
</tr>
<tr>
<td>demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mathematics 2008-09

MATH 275 – INTRO. TO DIFFERENTIAL EQUATIONS – Course Syllabus

COURSE OBJECTIVES
To introduce the student to topics in differential equations and their applications to science and engineering. To encourage critical thinking.

UNITS: Three (3) CSU: UC-transferable

PREREQUISITES: Completion of Math 267 with a grade of "C" or better, or concurrent enrollment.

MATERIALS REQUIRED:
A First Course in Differential Equations – Zill- 6th ed, Houghton/Mifflin

CLASS FORMAT: One and a half(1 1/2) hours, twice a week, of lecture, discussion and practice on theory and applications. Class participation is part of the curriculum.

STUDY HABITS: At least two(2) hours per day, seven(7) days a week of study to keep current with the course.

ASSIGNMENTS: Do all assigned work, it is an integral part of learning mathematics. Forty percent of your grade will be determined by homework assignments.

EVALUATION: Grading for all exams, assignments and course grade will be based on the following percentage distribution:

100 - 90% A
89 - 78% B
77 - 60% C
59 - 40% D
39 - 0% F

Grade distribution for the course will be approximately as follows:

Midterm Exam 30% - 100 pts
Assignments/quizzes 40% - 133 pts
Final exam 30% - 100 pts
Total 100% - 333 pts

ATTENDANCE: Be here. Class participation and attendance will be part of your grade.

OFFICE HOURS: 9:30 - 11:00 A.M. MW in NEAC 232
or by appointment Phone: 310-233-4500 e-mail: Laplacep@lahc.edu

OUTSIDE HELP: MATH LAB: 8:00 AM - 8:00 PM M Tu W Th 8:00 AM - 2:00 PM F
3/03/07 Last day to drop without a "W"
3/03/07 Last day to option for "CR/NCR" grade
3/21 - 3/26 Spring Recess
4/05/07 Midterm exam
5/05/07 Last day to drop with a "W"
6/02/07 Final exam – 10:30 – 12:30 Noon
<table>
<thead>
<tr>
<th>Topic or Activity</th>
<th>Time Allocated</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of differential equations: separable variables, exact and linear equations, substitution methods, linear, homogeneous and non-homogeneous equations reduction in order of a differential equation with constant coefficients. Applications</td>
<td>12 hours</td>
<td>State and apply solution methods and theorems related to ordinary differential equations</td>
</tr>
<tr>
<td>Solution of differential equations with constant coefficients: undetermined coefficients, annihilator variation of parameters and Cauchy-Euler methods. Applications</td>
<td>9 hours</td>
<td>State and apply solution methods and theorems related to ordinary differential equations</td>
</tr>
<tr>
<td>Systems of linear differential equations, nonlinear differential equations</td>
<td>9 hours</td>
<td>State and apply solution methods and theorems related to ordinary differential equations</td>
</tr>
<tr>
<td>Modeling with differential equations: initial value problems, spring mass systems, boundary value problems</td>
<td>9 hours</td>
<td>Formulate sophisticated methods of problem solving and critical thinking using differential equations</td>
</tr>
<tr>
<td>Solution of differential equations using power series</td>
<td>6 hours</td>
<td>Develop techniques for applying differential equations to the solution of problems arising in science and engineering</td>
</tr>
</tbody>
</table>
H. External SCAN—Occupations in Math, Physical Science and Technology Division.

Executive Summary

<table>
<thead>
<tr>
<th>Selected Occupations</th>
<th>Education Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer and information scientists, research (SOC 15-1011)</td>
<td>Doctoral degree</td>
</tr>
<tr>
<td>Computer programmers (SOC 15-1021)</td>
<td>Bachelor's degree</td>
</tr>
<tr>
<td>Computer software engineers, applications (SOC 15-1031)</td>
<td>Bachelor's degree</td>
</tr>
<tr>
<td>Computer software engineers, systems software (SOC 15-1032)</td>
<td>Bachelor's degree</td>
</tr>
<tr>
<td>Computer support specialists (SOC 15-1041)</td>
<td>Associate's degree</td>
</tr>
<tr>
<td>Computer systems analysts (SOC 15-1051)</td>
<td>Bachelor's degree</td>
</tr>
<tr>
<td>Database administrators (SOC 15-1061)</td>
<td>Bachelor's degree</td>
</tr>
<tr>
<td>Network and computer systems administrators (SOC 15-1071)</td>
<td>Bachelor's degree</td>
</tr>
<tr>
<td>Computer specialists, all other (SOC 15-1099)</td>
<td>Associate's degree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Basic Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 Occupational Jobs</td>
</tr>
<tr>
<td>2017 Occupational Jobs</td>
</tr>
<tr>
<td>Total Change</td>
</tr>
<tr>
<td>Total % Change</td>
</tr>
<tr>
<td>2007 Median Hourly Earnings</td>
</tr>
</tbody>
</table>

Occupational Change Summary
Region Information

Harbor - MSA

Description: LB, Sta Ana Metropolitan Area

Counties: Los Angeles, CA (6037), Orange, CA (6059)
Executive Summary

<table>
<thead>
<tr>
<th>Selected Occupations</th>
<th>Education Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace engineering and operations technicians (SOC 17-3021)</td>
<td>Associate's degree</td>
</tr>
<tr>
<td>Civil engineering technicians (SOC 17-3022)</td>
<td>Associate's degree</td>
</tr>
<tr>
<td>Electro-mechanical technicians (SOC 17-3024)</td>
<td>Associate's degree</td>
</tr>
<tr>
<td>Mechanical engineering technicians (SOC 17-3027)</td>
<td>Associate's degree</td>
</tr>
<tr>
<td>Engineering technicians, except drafters, all other (SOC 17-3029)</td>
<td>Associate's degree</td>
</tr>
</tbody>
</table>

Basic Information

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 Occupational Jobs</td>
<td>10,631</td>
</tr>
<tr>
<td>2017 Occupational Jobs</td>
<td>11,719</td>
</tr>
<tr>
<td>Total Change</td>
<td>1,088</td>
</tr>
<tr>
<td>Total % Change</td>
<td>10.22%</td>
</tr>
<tr>
<td>2007 Median Hourly Earnings</td>
<td>$23.97</td>
</tr>
</tbody>
</table>

Occupational Change Summary

Regional Total

<table>
<thead>
<tr>
<th>Region</th>
<th>2007 Jobs</th>
<th>2017 Jobs</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional Total</td>
<td>10,631</td>
<td>11,719</td>
<td>1,088</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>% Change</th>
<th>2007 Median Hourly Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10%</td>
<td>$23.97</td>
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<tr>
<td></td>
<td>State Total</td>
<td>National Total</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Employment</td>
<td>30,695</td>
<td>245,864</td>
</tr>
<tr>
<td>Population</td>
<td>34,004</td>
<td>269,151</td>
</tr>
<tr>
<td>Jobs</td>
<td>3,309</td>
<td>23,287</td>
</tr>
<tr>
<td>Employment to Pop</td>
<td>11%</td>
<td>9%</td>
</tr>
<tr>
<td>Wages ($/hr)</td>
<td>$25.99</td>
<td>$23.26</td>
</tr>
</tbody>
</table>

Source: EMSI Complete Employment - Spring 2008 Release v. 2
A total of 38 students from the two high schools were assessed in ENL, ESL and MATH in 2009.

Performance (Source: 2008 LAHC Factbook)
(Source: 2008 LAHC Fact book) Appendix B

a. Within class retention

<table>
<thead>
<tr>
<th>Fall</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math</td>
<td>76.3%</td>
<td>77.2%</td>
<td>72.8%</td>
<td>73.3%</td>
<td>72.3%</td>
</tr>
<tr>
<td>Physics</td>
<td>80.6%</td>
<td>57.1%</td>
<td>60.4%</td>
<td>71.9%</td>
<td>69.5%</td>
</tr>
<tr>
<td>Process Plant Tech</td>
<td>63.9%</td>
<td>79.8%</td>
<td>86.7%</td>
<td>89.3%</td>
<td>89.5%</td>
</tr>
<tr>
<td>Statistics</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>83.0%</td>
<td>97.2%</td>
</tr>
<tr>
<td>Division Rates</td>
<td>94.3%</td>
<td>98.1%</td>
<td>90.0%</td>
<td>95.8%</td>
<td>97.4%</td>
</tr>
<tr>
<td>College Rates</td>
<td>83.7%</td>
<td>84.5%</td>
<td>83.4%</td>
<td>84.6%</td>
<td>84.5%</td>
</tr>
<tr>
<td>State Rate(math)</td>
<td>75%</td>
<td>76%</td>
<td>75%</td>
<td>76%</td>
<td>75%</td>
</tr>
</tbody>
</table>
### b. Within class successful completion rates

<table>
<thead>
<tr>
<th>Fall</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astronomy</td>
<td>74.1%</td>
<td>73.2%</td>
<td>69.7%</td>
<td>61.7%</td>
<td>79.1%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>63.3%</td>
<td>66.2%</td>
<td>74.0%</td>
<td>77.3%</td>
<td>72.6%</td>
</tr>
<tr>
<td>Co Science</td>
<td>53.8%</td>
<td>58.3%</td>
<td>47.6%</td>
<td>59.8%</td>
<td>55.6%</td>
</tr>
<tr>
<td>Co Tech</td>
<td>74.6%</td>
<td>69.4%</td>
<td>61.3%</td>
<td>67.1%</td>
<td>59.6%</td>
</tr>
<tr>
<td>Drafting</td>
<td>67.5%</td>
<td>69.1%</td>
<td>67.5%</td>
<td>66.3%</td>
<td>72.2%</td>
</tr>
<tr>
<td>Electronics</td>
<td>78.6%</td>
<td>100.0%</td>
<td>0.0%</td>
<td>55.6%</td>
<td>80.0%</td>
</tr>
<tr>
<td>Engineering Gen</td>
<td>40.0%</td>
<td>58.3%</td>
<td>81.8%</td>
<td>88.2%</td>
<td>24.4%</td>
</tr>
<tr>
<td>Engineering Tech</td>
<td>61.1%</td>
<td>54.2%</td>
<td>47.8%</td>
<td>65.0%</td>
<td>32.5%</td>
</tr>
<tr>
<td><strong>Math</strong></td>
<td><strong>50.7%</strong></td>
<td><strong>50.4%</strong></td>
<td><strong>47.9%</strong></td>
<td><strong>48.8%</strong></td>
<td><strong>44.1%</strong></td>
</tr>
<tr>
<td>Physical Science</td>
<td>46.8%</td>
<td>32.7%</td>
<td>29.2%</td>
<td>53.1%</td>
<td>25.4%</td>
</tr>
<tr>
<td>Physics</td>
<td>57.4%</td>
<td>62.0%</td>
<td>70.0%</td>
<td>77.3%</td>
<td>75.4%</td>
</tr>
<tr>
<td>Process Plant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tech</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>83.0%</td>
<td>83.3%</td>
</tr>
<tr>
<td>Statistics</td>
<td>80.0%</td>
<td>92.3%</td>
<td>80.0%</td>
<td>88.3%</td>
<td>76.3%</td>
</tr>
<tr>
<td><strong>Division Rates</strong></td>
<td><strong>55.2%</strong></td>
<td><strong>55.3%</strong></td>
<td><strong>52.3%</strong></td>
<td><strong>55.2%</strong></td>
<td><strong>50.2%</strong></td>
</tr>
<tr>
<td><strong>College Rates</strong></td>
<td><strong>65.6%</strong></td>
<td><strong>67.0%</strong></td>
<td><strong>64.5%</strong></td>
<td><strong>66.1%</strong></td>
<td><strong>63.5%</strong></td>
</tr>
<tr>
<td><strong>State Rate(math)</strong></td>
<td><strong>55%</strong></td>
<td><strong>54%</strong></td>
<td><strong>53%</strong></td>
<td><strong>53%</strong></td>
<td><strong>52%</strong></td>
</tr>
</tbody>
</table>

### c. Internal SCAN—Efficiency


<table>
<thead>
<tr>
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<td>7.3, 7.4</td>
<td>To facilitate student learning via qualified faculty and staff</td>
<td>Monitor/enforce contractual and participatory governance agreements involving administration, faculty and staff. Make periodic request through FHPC, Senate, Academic Affairs and President's Offices</td>
<td>Program 100</td>
<td>$1.23 M per year</td>
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<tr>
<td>2</td>
<td>2.4, 2.5</td>
<td>To provide students with up to date classroom/laboratory equipment and supplies</td>
<td>Purchase necessary contemporary classroom/laboratory equipment and supplies</td>
<td>Program 100, Bloc Grant</td>
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<td>3, A</td>
<td>1.1, 1.3, 5.2</td>
<td>To provide a stable and viable student tutorial service</td>
<td>Hire peer tutors for Math Lab, student worker to assist in Chemistry stockroom and technology labs</td>
<td>Program 100</td>
<td>$8K per year</td>
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<td>4, A</td>
<td>1.1, 1.3, 5.2</td>
<td>To provide quality instruction to students and aim for 54% class retention in all courses</td>
<td>Assign trained readers to classes to increase graded homework output. Perform periodic evaluation of course placement cut scores.</td>
<td>A pool of qualified readers. Viable research data. Cooperative staff</td>
<td>$4K per year</td>
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<td>To expose students to current technology in and out of the classroom</td>
<td>Update classrooms and laboratories on a regular basis</td>
<td>Bloc Grant and VATEA funds Training for faculty</td>
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<td>To increase student's science awareness in the community</td>
<td>Foster partnerships with LAUSD and PVUSD. Offer college courses in local HS for qualified students. Schedule college courses in such a way that qualified HS students can enroll. Schedule Chemistry</td>
<td>STARS for Kids Program, Drafting classes at Peninsula HS, PLTW program, Comp Sci courses at Narbonne HS, Comp Tech courses at Banning HS</td>
<td>$20K</td>
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<td>7</td>
<td>1.1, 1.3, 5.2</td>
<td>To Support student success initiatives for basic skills and entry level courses</td>
<td>Lower class size limits for entry-level courses. Add skills/discussion lab TBA. Provide supplemental instruction. Assign peer tutors to work with faculty in the classroom. Enforce course pre-requisites. Explore new teaching techniques. Develop new courses such as Math Anxiety, Study Skills and Ethics. Reintroduce a self paced elementary algebra section. Offer short term courses during regular semesters. Offer on-going modules for entry-level courses. Introduce hybrid courses.</td>
<td>Program 100. Admissions and records</td>
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<td>To address the college mission on workforce development by preparing students for immediate employment in local oil refineries</td>
<td>Restart Process Plant Tech Program Foster partnerships with local industry and trade unions. Submit PNPR for Process Pant AS degree and Instrumentation AS degree. Seek funding for an instrumentation laboratory.</td>
<td>State/Conoco Phillips/Valero/Mobil Oil/SBCC/AWU Grant to fund classes</td>
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<td>To address the college mission on workforce development by training students in craft skills that could lead to immediate</td>
<td>Add basic craft skills courses such as electrical. Continue to schedule drafting courses</td>
<td>Grants to fund classes and equipment. Program 100</td>
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<td>employment or apprenticeship.</td>
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<td>To provide students with additional basic skills preparation</td>
<td>Add more sections of existing basic skills courses. Introduce new courses related to math test taking skills, employment, GED, etc. (Math 140).</td>
<td>Program100</td>
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<td>To provide students with easy to read and erase slate boards in classrooms and laboratories</td>
<td>Request through CPC. Monitor construction phase of new buildings</td>
<td>Prop A/AA funds.</td>
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<td>13</td>
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<td>To provide students with up to date planetarium</td>
<td>Request through CPC. Monitor renovation phase. Work with College Foundation to find sponsors for a new planetarium projector</td>
<td>Prop A/AA funds. SFP grants and donations</td>
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<td>14</td>
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<td>To ensure that students have continual access to modern and leading edge laboratory equipment</td>
<td>Install security systems in locations housing laboratory equipment to protect costly investments.</td>
<td>Prop A/AA or State Deferred Maintenance funds</td>
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<td>15</td>
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<td>To provide learning experiences for students using current technology.</td>
<td>Install Smart Board, computer projector in classroom and laboratories</td>
<td>Prop A/AA funds</td>
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<td>16</td>
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<td>To Introduce new student oriented programs such as hazardous disposal certification and allied health assistant programs (pharmacology, dental, biotechnology, etc)</td>
<td>Package existing college courses into a viable certificates and programs. Coordinate with Life Sciences Dept.</td>
<td>Faculty</td>
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# LOS ANGELES HARBOR COLLEGE

## FY 07-08 Operating Budget

### MATH-PHY-SCI AND TECH DIVISION

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Mathematics 2008-09
Executive Summary

The Mathematics Department faculty thanks the external validation team for its thorough review of the documents submitted and addresses its recommendations as follows:

I. The department will continue to rely and build on the strengths noted by the validation team such as
   a. maintain the quality and rigor of mathematics courses with current course outline content and SLO's assessment. In priority #7 of the 2009-10 Unit Plan, faculty in the Math-Phy-Sci and Tech Division outline goals to improve teaching learning-skills strategies that would benefit all students
   b. encouraging more transfers students to pursue engineering, mathematics and science degrees particularly with pending new State of California blended apportionment funding. See 2009-10 Unit Plan priority #4
   c. scheduling classes that addresses the needs of our student population during days, evenings, Saturdays, early morning (6:55 a.m.) and distance learning
   d. seeking funding to expand early diagnostic and intervention programs like the Math Jam

II. The department acknowledges the concerns noted by the validation team
   a. department has a completion rate of 48.8% compared to the state average of 53%
   b. ratio of full-time to part-time faculty has decreased rapidly from 52% FT:48% PT in 2005 to 35% FT:65% PT in 2009
   c. high level of students placing in developmental sections and limited sections of basic arithmetic and pre-algebra courses offered
   d. limited number of full-time faculty specifically trained to teach developmental courses
   e. lack of financial support for Math Jam/summer bridge program
   f. the matriculation assessment process for math placement is perceived as needing changes by the math department
   g. the committee is concerned that the Math department does not consider the gender or ethnic breakdown of students in the department to be relevant issues.

III. The department addresses the recommendations noted by the validation team as follows
   a. The department will be submitting a HSI STEM grant proposal in July 2010 focusing on mathematics learning skills and transitioning students into transfer math, science, and technology programs. Again In priority #7 of the 2009 -10 Unit Plan, faculty in the division outlines goals to improve teaching learning-skills strategies that would benefit all students.
b. The number one priority in the 2010-11, as well as future years, Division Unit Plan, the Mathematics Department intends to that the college hire two(2) mathematics learning skills specialists to address a most critical component of our student population.

c. Invite department faculty to participate in the numerous, such as www.facultyfocus.com, district and statewide training seminars/webinars/workshops dealing with mathematics learning skills and technology in/out of the classroom such as VOD casts, POD casts, and clickers.

d. Replace the current mathematics placement process with a mathematics diagnostic/prescriptive instrument

e. Lower the current student-teacher ratio in developmental math courses, and supplement instruction in these courses with in/out of class mentor/coaches

g. Expand the use of comprehensive WEB enhanced software specifically developed as diagnostic/prescriptive.

h. Invite department faculty to mentor/partner with adjunct instructors to increase instructional cohesion.

i. Invite department faculty to meet a portion of their contractual office hours in the Math Lab.

j. In priorities #1, 7, 6, 9 and 10 of the 2009-10 Unit Plan, the division recognizes the need to include the college community when planning for student success. The Mathematics Department will plan at least one yearly workshop involving feeder high schools, middle schools and elementary schools focusing topics that can better prepare students for college mathematics and sciences.
The Role of the Validation Team

The validation team has been selected to include professionals who can assist the program by reviewing the self-study and plan of action, then making comments and suggestions that will lead to program improvement. In addition to reviewing the materials included in the written packet, team members are asked to visit the facility which houses the program, talk with instructors and students in the program, and request any further informational materials which would be helpful in preparing the executive summary.

<table>
<thead>
<tr>
<th>Program Name: Process Plant Technology</th>
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</thead>
<tbody>
<tr>
<td>NAME</td>
</tr>
<tr>
<td>David Humphreys</td>
</tr>
<tr>
<td>Joaquin Arias</td>
</tr>
<tr>
<td>Judy Conn</td>
</tr>
<tr>
<td>Sally Fasteau</td>
</tr>
<tr>
<td>Eunice Krinsky</td>
</tr>
<tr>
<td>Sandra Ramos</td>
</tr>
<tr>
<td>Becky Yamada</td>
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</tbody>
</table>

Validation Team Report

Discipline: Mathematics
June 2010

**Major Findings: Strengths:**

- excellent list of short-term and long-term goals for program
- comprehensive program which meets degree, occupational, and transfer program requisites
- flexible schedule affording opportunities for students to attend, days, evenings, Saturdays, early morning (6:55 a.m.) classes, and hybrid classes
- new facilities, including state-of-the-art technology in the classrooms
- Math Lab support for students taking math classes
- updated course outlines with on-going efforts to assess and evaluate student learning outcomes.
- department’s effort to realign the elementary and intermediate algebra sequence of courses.
- introduction of a summer bridge through the Math Jam
- department’s recognition that developmental math skills need to be addressed differently in order to ensure student success in the math curriculum.
- the department is efficient in class size (41)

**Major Findings: Concerns:**

- department has a completion rate of 48.8% compared to the state average of 53%
- ratio of full-time to part-time faculty has decreased rapidly from 52% FT:48%PT in 2005 to 35% FT:65%PT in 2009
- high level of students placing in developmental sections and limited sections of basic arithmetic and pre-algebra courses offered
- limited number of full-time faculty specifically trained to teach developmental courses
- lack of support for Math Jam/summer bridge program
• the matriculation assessment process for math placement is perceived as needing changes by the math department
• The committee is concerned that the Math department does not consider the gender or ethnic breakdown of students in the department to be relevant issues.

Recommendations:

The Mathematics department has noted the following area as needing reinforcement.

• The department needs to hire more full-time faculty to assist with the development of a plan to improve the basic skills offerings.
• The mathematics faculty will need training to better address the needs of the basic skills math students.
• A smaller student to teacher ratio is needed to address the needs of the basic skills student population.
• Increase student exposure to the course content.
• Train math department faculty to use web-based support services such as developing websites.

The Validation team makes the following recommendations:

• The college needs to work with the math department to write a plan, perhaps funded through a grant, to focus on strengthening the developmental mathematics program and transitioning students into transfer math, science, and technology programs.
• Hire two Mathematics Specialists to address need for more faculty.
• Provide faculty training in techniques for teaching developmental math.
• Refine the assessment process for developmental mathematics to better define student placement.
• Lower the student-teacher ratio and add student mentor/coaches in developmental math courses.
• Provide training opportunities for faculty to use websites and other digital applications such as VOD casts, POD casts, and clickers in their classes.
• Provide CAI from textbooks and explore other comprehensive software programs specifically developed as diagnostic/prescriptive instruction for students needing developmental math instruction.
• Create a mentor program for part-time instructors, pair full-time to part-time instructors.
• Math faculty are encouraged to spend office hours in the Math Lab.
• Create liaisons with math teachers from feeder high schools, middle schools and elementary schools. Do joint training and projects to help better prepare students for college mathematics and sciences.
<table>
<thead>
<tr>
<th>Institutional Mission and Goals</th>
<th>Course Intended Outcomes</th>
<th>Means of Assessment and Criteria for Success</th>
<th>Summary of Data Collected</th>
<th>Use of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1. Distinguish between undefined terms, postulates, axioms, definitions, and theorems.</td>
<td>Means: A true/false question regarding postulates, was embedded in the final exam, and given to students enrolled in Math 121 during the spring 2009 session. <strong>Criteria:</strong> at least 60% of the students tested will answer correctly.</td>
<td>67% of the students answered the question correctly</td>
<td>Data collected from the chapter test point to students not memorizing formulas correctly. Further analysis will take place after data for all SLO’s is collected.</td>
</tr>
<tr>
<td>2</td>
<td>2. Distinguish various geometric terms with their corresponding notation (e.g., lines, line segments, rays, parallel lines, perpendicular lines, angles, angle measurement, etc.).</td>
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<td>2</td>
<td>3. Render a geometric construction using only a compass and straightedge subject to a set of given conditions.</td>
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<tr>
<td>2</td>
<td>4. Apply definitions, postulates and</td>
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<tr>
<td>2</td>
<td>5. Apply definitions, postulates, and theorems when determining the measurement of line segments.</td>
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<tr>
<td>2</td>
<td>6. Discriminate between various types of angles—acute, right, obtuse, and straight.</td>
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<tr>
<td>Means:</td>
<td>A true/false question regarding acute angles, was embedded in the final exam, and given to students enrolled in Math 121 during the spring 2009 session.</td>
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<tr>
<td>Criteria:</td>
<td>at least 60% of the students tested will answer correctly.</td>
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<tr>
<td>2</td>
<td>7. Distinguish between various pairs of angles (adjacent, congruent, complementary, supplementary, and vertical) and/or apply their properties.</td>
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<tr>
<td>Means:</td>
<td>A true/false question regarding the supplementary angles, was embedded in the final exam, and given to students enrolled in Math 121 during the spring 2009 session.</td>
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<tr>
<td>Criteria:</td>
<td>at least 60% of the students tested will answer correctly.</td>
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<td>2</td>
<td>8. Write a geometric proof using deductive reasoning in a formal two-column format with five parts: Given, Prove, Drawing, Statements, and Reasons.</td>
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<tr>
<td>Means:</td>
<td>Demonstration of a geometric proof was embedded in the final exam, and given to students enrolled in Math 121 during the spring 2009 session.</td>
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<tr>
<td>92% of the students answered the question correctly.</td>
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<td></td>
<td>Criteria: at least 50% of the students tested will score 3 or higher on a math department rubric.</td>
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<tr>
<td>2</td>
<td>9. Write a geometric proof using the indirect method.</td>
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<tr>
<td>2</td>
<td>10. Apply geometric relationships to produce an algebraic equation, system of equations, or inequality to solve a geometric problem.</td>
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<tr>
<td>2</td>
<td>11. Apply various triangle theorems (e.g., the sum of the measures of the angles of a triangle is 180°). Means: A true/false question regarding the measure of angles and the type of triangle, was embedded in the final exam, and given to students enrolled in Math 121 during the spring 2009 session. Criteria: at least 60% of the students tested will answer correctly.</td>
<td>100% of the students answered the question correctly</td>
<td></td>
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<tr>
<td>2</td>
<td>12. Distinguish between various line segments, rays, or lines related to a triangle (e.g., angle bisector, median, altitude, perpendicular bisector) and their properties. Means: A true/false question regarding the bisector of an angle, was embedded in the final exam, and given to students enrolled in Math 121 during the spring 2009 session. Criteria: at least 60% of the students tested will answer correctly.</td>
<td>100% of the students answered the question correctly</td>
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<tr>
<td>2</td>
<td>13. Apply the Pythagorean theorem to solve for parts of a right triangle. Means: Students were asked to compute the measure of an secant line segment Criteria: at least 50% of</td>
<td>100% of the students answered the question correctly</td>
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<td>2</td>
<td>14. Apply 30°-60°-90° and 45°-45°-90° theorems to angle and side measurements of a right triangle.</td>
<td><strong>Means:</strong> A true/false question regarding postulates, was embedded in the final exam, and given to students enrolled in Math 121 during the spring 2009 session. <strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td>85% of the students answered the question correctly</td>
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<tr>
<td>2</td>
<td>15. Prove congruence or similarity of triangles.</td>
<td><strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td>62% of the students answered the question correctly</td>
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<tr>
<td>2</td>
<td>16. Identify proportional relationships of similar polygons and apply appropriate algebra techniques to solving proportions.</td>
<td><strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td>69% of the students answered the question correctly</td>
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<tr>
<td>2</td>
<td>17. Apply definitions and theorems of quadrilaterals and other polygons.</td>
<td><strong>Means:</strong> A true/false question regarding geometric shapes was embedded in the final exam and given to students enrolled in</td>
<td>50% of the students answered the question correctly</td>
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<tr>
<td>2</td>
<td>18. Apply circle relationships of arcs, chords, tangents, secants, central angles, inscribed angles, etc.</td>
<td>Math 121 during the spring 2009 session. <strong>Criteria:</strong> at least 60% of the students tested will answer correctly.</td>
<td>93% of the students answered the question correctly</td>
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<td>2</td>
<td>19. Compute the area and perimeter of polygons, circumference and area of a circle applying appropriate formulas.</td>
<td><strong>Means:</strong> Students were asked to compute the area of a geometric figure of revolution in a chapter test. <strong>Criteria:</strong> at least 50% of the students tested will score 3 or higher on a math department rubric.</td>
<td>83% of the students answered the question correctly</td>
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<td>2</td>
<td>20. Compute the lateral area, total area, and volume of prism, pyramid, cone, and cylinder using appropriate formulas.</td>
<td><strong>Means:</strong> Students were asked to compute the volume of a right triangular prism in a chapter test. <strong>Criteria:</strong> at least 50% of the students tested will score 3 or higher on a math department rubric.</td>
<td>92% of the students answered the question correctly</td>
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<tr>
<td>2</td>
<td>21. Compute the surface area and volume of a sphere using appropriate formulas.</td>
<td>When given a geometry problem at least 50% of the students tested will score 3 or higher on a math department rubric.</td>
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<tr>
<td>2</td>
<td>22. Find the volume of the solid of revolution formed when a geometric region is revolved about its side.</td>
<td><strong>Means:</strong> Students were asked to compute the volume of a solid of revolution in a</td>
<td>83% of the students answered the question correctly</td>
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<td>2</td>
<td>23. Apply Euler’s equation ((V + F = E + 2)) to find (V), (F), or (E) when given conditions regarding a polyhedron.</td>
<td><strong>Means:</strong> A true/false question regarding Euler’s equation was embedded in the final exam and given to students enrolled in Math 121 during the spring 2009 session. <strong>Criteria:</strong> at least 60% of the students tested will answer correctly.</td>
<td>92% of the students answered the question correctly</td>
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<tr>
<td>Institutional Outcomes</td>
<td>Course Intended Outcomes</td>
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<tr>
<td>2</td>
<td>1. Add, subtract, multiply and divide integers, rational and irrational numbers following the rules of order and operation.</td>
<td><strong>Means:</strong> A problem involving whole numbers, was embedded in an exam and given to all Math 123 sections scheduled during the spring 2009 session. Students were instructed to simplify the problem using the order of operations. <strong>Criteria:</strong> 60% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td>53% of the students answered the question correctly</td>
<td>Assessment results of the first SLO’s did not meet expected criteria. We will determine actions after more SLOs have been measured.</td>
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<tr>
<td>2</td>
<td>2. Evaluate algebraic expressions</td>
<td><strong>Means:</strong> Embed problems in a chapter test or quiz. <strong>Criteria:</strong> 50% of the class score of 3 or higher on these problems based on the math department scoring rubric.</td>
<td>77% of the students answered the question correctly</td>
<td>Assessment results of SLO’s #2 – #4 meet expected criteria.</td>
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<tr>
<td>2</td>
<td>3. Translate English mathematical sentences into algebraic expressions.</td>
<td><strong>Means:</strong> Embed problems in a chapter test or quiz. <strong>Criteria:</strong> 50% of the class score of 3 or higher on these problems based on the math department scoring rubric.</td>
<td>81% of the students answered the question correctly</td>
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</tbody>
</table>
| 4. Solve a variety of first degree equations and inequalities. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class score of 3 or higher on these problems based on the math department scoring rubric. | 81% of the students answered the question correctly |   |
| 5. Solve a variety of word problems involving first degree equations and inequalities. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class score of 3 or higher on these problems based on the math department scoring rubric. |   |   |
| 6. Draw graphs of straight lines and inequalities. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class score of 3 or higher on these problems based on the math department scoring rubric. |   |   |
| 7. Solve systems of equations in two variables by various methods. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class score of 3 or higher on these problems based on the math department scoring rubric. |   |   |
| 8. Simplify exponential expressions. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class score of 3 or higher on these problems based on the math department scoring rubric. |   |   |
| 9. Demonstrate the use of scientific notation when multiplying and dividing real numbers | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class score of 3 or higher on these problems based on the math department scoring rubric. |   |   |
| 10. Determine the degree of a polynomial. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class score of 3 or higher on these problems based on the math department scoring rubric. |   |   |
| 11. Add, subtract, multiply and divide polynomials | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class score of 3 or higher on these problems based on the math department scoring rubric. |   |   |
<table>
<thead>
<tr>
<th></th>
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<th>higher on these problems based on the math department scoring rubric.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Find the Greatest common factor (GCF) of several algebraic expressions.</td>
<td><strong>Means:</strong> Embed problems in a chapter test or quiz. <strong>Criteria:</strong> 50% of the class score of 3 or higher on these problems based on the math department scoring rubric.</td>
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<tr>
<td>13. Factor a variety of polynomials by use of the GCF, difference of perfect squares and trinomials techniques.</td>
<td><strong>Means:</strong> Embed problems in a chapter test or quiz. <strong>Criteria:</strong> 50% of the class score of 3 or higher on these problems based on the math department scoring rubric.</td>
<td></td>
</tr>
</tbody>
</table>
### Institutional Mission and Goals

<table>
<thead>
<tr>
<th>Number</th>
<th>Course Intended Outcomes</th>
<th>Means of Assessment and Criteria for Success</th>
<th>Summary of Data Collected</th>
<th>Use of Results</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>1. Add, subtract, multiply and divide rational expressions and simplify answers.</td>
<td><strong>Means:</strong> A problem involving addition of rational expressions was embedded in an exam and given to all Math 123B sections scheduled during the spring 2009 session. Students were instructed to add the expression and simplify. <strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td>54% of the students answered the question correctly</td>
<td>Assessment results of the first four SLO's are mixed, with the first and third SLO barely meeting, the second exceeding and the fourth not meeting expected criteria. Actions are still being determined.</td>
</tr>
<tr>
<td>2</td>
<td>2. Solve equations involving rational expressions.</td>
<td><strong>Means:</strong> An equation involving rational expressions was embedded in an exam and given to all Math 123B sections scheduled during the spring 2009 session. Students were instructed to solve the expression. <strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems</td>
<td>56% of the students answered the question correctly</td>
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<tr>
<td>2</td>
<td>3. Solve word problems involving rational expressions.</td>
<td><strong>Means:</strong> A word problem involving rational expressions was embedded in an exam and given to all Math 123B sections scheduled during the spring 2009 session. Students were instructed to solve the word problem. <strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td>52% of the students answered the question correctly</td>
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<tr>
<td>2</td>
<td>4. Simplify complex fractions</td>
<td><strong>Means:</strong> A problem involving complex fractions was embedded in an exam and given to all Math 123B sections scheduled during the spring 2009 session. Students were instructed to simplify the expression. <strong>Criteria:</strong> 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
<td>44% of the students answered the question correctly</td>
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<tr>
<td>2</td>
<td>5. Compute the slope of a straight line given two points.</td>
<td><strong>Means:</strong> Embed problems in a chapter test or quiz. <strong>Criteria:</strong> 60% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
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<tr>
<td>2</td>
<td>6. Find the equation of a line given two points or given the slope and one point.</td>
<td><strong>Means:</strong> Embed problems in a chapter test or quiz. <strong>Criteria:</strong> 60% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
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</table>
| 2 | 7. Graph straight lines and inequalities. Translations | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 60% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric. |
| 2 | 8. Evaluate a function. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 60% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric. |
| 2 | 9. Graph a function (quadratic or linear). Determine its domain and range. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric. |
| 2 | 10. Solve equations and inequalities involving absolute value. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric. |
| 2 | 11. Solve a variation problem—direct, inverse, or joint. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric. |
| 2 | 12. Simplify radicals. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class will |
|   | 13. Simply algebraic expressions containing fractional exponents. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric. |
|---|---|---|
**Criteria:** 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric. |
| 2 | 15. Solve quadratic equations using a variety of methods: factoring, square root, completing the square, and quadratic formula | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric. |
| 2 | 16. Solve word problems involving quadratic equations. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 40% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric. |
| 2 | 17. Add, subtract, multiply and divide complex numbers. | **Means:** Embed problems in a chapter test or quiz.  
**Criteria:** 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric. |
### Institutional Mission and Goals

#### Course Intended Outcomes

<table>
<thead>
<tr>
<th>#</th>
<th>Activity</th>
<th>Means of Assessment and Criteria for Success</th>
<th>Summary of Data Collected</th>
<th>Use of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Add, subtract, multiply and divide rational expressions</td>
<td><strong>Means:</strong> Students were instructed to add a rational expression and simplify it.</td>
<td>54% of the students answered the question correctly</td>
<td>Assessment results of the first four SLO’s are mixed, with the first and third SLO barely meeting, the second exceeding and the fourth not meeting expected criteria.</td>
</tr>
<tr>
<td>2</td>
<td>Solve equations involving rational expressions</td>
<td>Students were instructed to solve an equation involving rational expressions.</td>
<td>56% of the students answered the question correctly</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Students were instructed to solve a word problem.</td>
<td>52% of the students answered the question correctly</td>
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<tr>
<td>Correctly answered</td>
<td>44% of the students correctly answered the question</td>
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<tr>
<td>Students instructed to simplify a complex fraction.</td>
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<tr>
<td>Institutional Mission and Goals</td>
<td>Course Intended Outcomes</td>
<td>Means of Assessment and Criteria for Success</td>
<td>Summary of Data Collected</td>
<td>Use of Results</td>
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<td></td>
<td>1. Apply basic problem solving techniques in mathematics</td>
<td><strong>Means</strong>: Embed problems in a chapter test, quiz, or final exam. Collect the work from all students with scores attached. <strong>Criteria</strong>: 50% of the students will demonstrate satisfactory performance of 3 or higher based upon a math department rubric.</td>
<td>90% of the students scored 3 or higher based upon the math department rubric.</td>
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<tr>
<td></td>
<td>2. Implement basic concepts of sets, relations</td>
<td>Use base blocks to demonstrate a</td>
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<td></td>
<td></td>
<td>and functions to teaching techniques</td>
<td>subtraction problem.</td>
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<tr>
<td>2</td>
<td></td>
<td>3. Apply pedagogy of numeration systems</td>
<td>Use base blocks to demonstrate a multiplication problem:</td>
<td>100% of the students scored 3 or higher based upon the math department rubric.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>4. Apply pedagogy of basic number theory and its applications</td>
<td>Use &quot;cards&quot; to find the a. GCF b. LCM</td>
<td>a) 60% of the students scored 3 or higher based upon the math department rubric. b) 80% of the students scored 3 or higher based upon the math department rubric.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>5. Apply basic logic and set theory concepts to problem solving</td>
<td>Problem solving using Venn diagrams</td>
<td></td>
</tr>
</tbody>
</table>
### LA HARE COLLEGE
Student Learning Outcomes (SLOs) Assessment Report
Course Assessment

**Division:** Math Physical Science  
**Discipline/Program:** Mathematics

**Course Number and Name:** MATH 227 Statistics

**Program Contact Person:** F. Saddigh and Z. Romero  
**Phone:**

Reviewed by: Academic Dean  
**Date:** Spring 2009

Attach additional pages as necessary.

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<tr>
<th>Institutional Mission and Goals</th>
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<th>Summary of Data Collected</th>
<th>Use of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1) Apply probability formulas such as addition and multiplication of compound events</td>
<td><strong>Criteria:</strong> 50% of the students will demonstrate satisfactory performance of 3 or higher based upon a math department rubric.</td>
<td>98% of the students answered the question correctly</td>
<td>Assessment results of the first five SLO's exceed expected criteria.</td>
</tr>
<tr>
<td>2</td>
<td>(2) Describe and calculate the measures of central tendency for discrete and continuous distributions.</td>
<td><strong>Means:</strong> Compute the mean, median variance and standard deviation</td>
<td>The combined results for SLO #5 and #6 is 62% of the students answered the question correctly</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>(3) Describe and calculate the measures of variability.</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>(4) Diagram the normal distribution.</td>
<td><strong>Means:</strong> Draw a bell-shaped curve with all relevant information.</td>
<td>71% of the students answered the question correctly</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>(5) Apply the normal curve to probability theory.</td>
<td><strong>Means:</strong> Find the 95% confidence interval of the mean.</td>
<td>90% of the students answered the question correctly</td>
<td></td>
</tr>
</tbody>
</table>
| (6) Describe and calculate the measure of correlation | **Means:**  
Test the significance of r. State the hypotheses. Find the critical values, make the decision and analyze the results. |   |   |
**Institutional Mission and Goals**

<table>
<thead>
<tr>
<th>Institutional Mission and Goals</th>
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<th>Use of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1. Solve equations and inequalities including linear, quadratic, and those with absolute values, roots or fractional exponents. <strong>(New)</strong></td>
<td>Means: A problems will be embedded in a quiz or exam <strong>(New)</strong> Criteria: 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric. <strong>(New)</strong></td>
<td>80% of the students answered the question correctly <strong>(New)</strong></td>
<td>Assessment results of the first four SLO’s exceed expected criteria. <strong>(New)</strong></td>
</tr>
<tr>
<td>2</td>
<td>2. Draw the graph of a function using shifts, reflections, expansions and contractions. <strong>(New)</strong> Draw graphs of polynomial <strong>(New)</strong></td>
<td>2. Given the graph of y = f(x), describe in detail three transformations done to <strong>(New)</strong></td>
<td>75% of the students answered the question correctly <strong>(New)</strong></td>
<td><strong>(New)</strong></td>
</tr>
</tbody>
</table>

*Attach additional pages as necessary.*
| 2 | 3. Draw the graph of a piece-wise defined function | \[ y = \begin{cases} f(x) & \text{if } x > a \\ g(x) & \text{if } x < a \end{cases} \] | 65% of the students answered the question correctly |
| 2 | 4. Demonstrate the method of synthetic division in the use of the factor and remainder theorems. Apply Descartes’ Rule of Signs to isolate roots of equations | 4. Use the factor method to find all zeroes of the function given by a polynomial equation | 65% of the students answered the question correctly |
| 2 | Additional SLO’s TBA | | |
**Division:** Math Physical Science  
**Discipline/Program:** Mathematics

**Course Number and Name:** MATH 235 Finite Mathematics

**Program Contact Person:** M. Jimenez  
**Phone:** 4500

**Reviewed by:** ___________________________, Academic Dean  
**Date:** Fall 2009

---

**Means of Assessment and Criteria for Success**

- **Means:** problems were embedded in one of two sections of Math 235 scheduled during the fall 2009 session.
- **Criteria for all SLO's:** 50% or more of the class will demonstrate a satisfactory performance of 3 or higher on this problem based upon a math department scoring rubric

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<table>
<thead>
<tr>
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<th>Course Intended Outcomes</th>
<th>Summary of Data Collected</th>
<th>Use of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Relations functions and graphs: definition, notation, operations, especial functions (exponential and logarithmic)</td>
<td>Means: problems were embedded in one of two sections of Math 235 scheduled during the fall 2009 session. Criteria for all SLO's: 50% or more of the class will demonstrate a satisfactory performance of 3 or higher on this problem based upon a math department scoring rubric</td>
<td>[ ]</td>
</tr>
<tr>
<td>2</td>
<td>Matrices and Systems of Linear Equations: definition, notation operations, inverse of a square matrix, solution of systems of linear equations using matrices</td>
<td></td>
<td>[ ]</td>
</tr>
<tr>
<td>2</td>
<td>Linear Programming: graphical interpretation and solution methods, Simplex method, dual</td>
<td></td>
<td>[ ]</td>
</tr>
<tr>
<td>2</td>
<td>Mathematics of Finance: simple and compound interest, annuities (present and future values, sinking funds and amortization)</td>
<td></td>
<td></td>
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<tr>
<td>---</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Venn diagrams and set notation. Permutations, combinations and counting techniques. Probability theory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Markov chains</td>
<td></td>
<td></td>
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</tbody>
</table>
LA HARBOUR COLLEGE  
Student Learning Outcomes (SLOs) Assessment Report  
Course Assessment

Division: Math Physical Science  
Discipline/Program: Mathematics

Course Number and Name: MATH 236 Calculus for Business and Social Science Majors

Program Contact Person: L. McKenzie  
Phone: 4501

Reviewed by: _________________________________, Academic Dean  
Date: Spring 2009

Attach additional pages as necessary.

<table>
<thead>
<tr>
<th>Institutional Mission and Goals</th>
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<th>Summary of Data Collected</th>
<th>Use of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Means:</strong> problems were embedded in one of two section Math 236 scheduled during the spring 2009 session. <strong>Criteria for all SLO’s:</strong> 50% or more of the class will demonstrate a satisfactory performance of 3 or higher on this problem based upon a math department scoring rubric</td>
<td>85% of the students who took the exam scored a 3 or higher on this SLO</td>
<td>Assessment result meets or exceeds the expected criteria</td>
</tr>
<tr>
<td>2</td>
<td>1 Compute limits of algebraic functions</td>
<td><strong>Means:</strong> 1. Students were instructed to compute four different limits</td>
<td>85% of the students who took the exam scored a 3 or higher on this SLO</td>
<td>Assessment result meets or exceeds the expected criteria</td>
</tr>
<tr>
<td>2</td>
<td>2. Use differentiation techniques and formulas to find derivatives of functions</td>
<td><strong>Means:</strong> 2. Students were instructed to compute derivatives of two functions using chain, product, quotient, exponential and logarithmic formulas</td>
<td>77% of the students who took the exam scored a 3 or higher on this SLO</td>
<td>Assessment result meets or exceeds the expected criteria</td>
</tr>
<tr>
<td>2</td>
<td>3. Use derivatives to solve</td>
<td><strong>Means:</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
<th>Means</th>
<th>Result</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4. Utilize calculus techniques to analyze graphs of algebraic functions</td>
<td><strong>Means:</strong> 4. Students were instructed to analyze the graph of a rational function</td>
<td>92% of the students who took the exam scored a 3 or higher on this SLO</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>5. Compute derivatives using the implicit differentiation</td>
<td><strong>Means:</strong> 5. Students were instructed to compute the derivative of three different implicit functions</td>
<td>77% of the students who took the exam scored a 3 or higher on this SLO</td>
<td></td>
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<tr>
<td>2</td>
<td>6. Utilize calculus to solve optimization problems</td>
<td><strong>Means:</strong> 6. Students were instructed to find the maximum cost of a demand function and the absolute maximum of an algebraic function</td>
<td>46% of the students who took the exam scored a 3 or higher on this SLO</td>
<td>Assessment result does not meet the expected criteria. The SLO will be retested in fall 2009</td>
</tr>
<tr>
<td>2</td>
<td>7. Evaluate definite and indefinite integrals of continuous functions using various formulas and techniques</td>
<td><strong>Means:</strong> 7. Students were instructed to compute one definite integral and two indefinite integral problems</td>
<td>31% of the students who took the exam scored a 3 or higher on this SLO</td>
<td>Assessment result meets or exceeds the expected criteria</td>
</tr>
<tr>
<td>2</td>
<td>8. Use definite integrals to compute areas</td>
<td><strong>Means:</strong> 8. Students were instructed to compute the area of the region bounded by the graphs of two polynomial functions</td>
<td>54% of the students who took the exam scored a 3 or higher on this SLO</td>
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<tr>
<td>2</td>
<td>9. Solve business and economics related problems using calculus techniques and formulas</td>
<td><strong>Means:</strong> 9. Students were instructed to compute the equilibrium price and producers surplus given the supply and demand equations</td>
<td>77% of the students who took the exam scored a 3 or higher on this SLO</td>
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</tr>
</tbody>
</table>
### LA HARBOUR COLLEGE

**Student Learning Outcomes (SLOs) Assessment Report**

**Course Assessment**

**Division/Program:** Mathematics

**Course Number and Name:** MATH 240, Trigonometry

**Program Contact Person:**

**Phone:** ________________

**Reviewed by:** ____________________, Academic Dean

**Date:** ________________

**Attach additional pages as necessary.**

<table>
<thead>
<tr>
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</tr>
</thead>
</table>
| 2                              | 1. Differentiate between degree and radian measures and perform conversions from one form to the other. | **Means:** Problems will be embedded in a quiz or exam  
**Criteria:** 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.  | 94% of the students answered the question correctly |               |
<p>| 2                              | 2. Define Trigonometric and Circular functions and find their exact or approximate values. |                      | 93% of the students answered the question correctly |               |
| 2                              | 3. Apply trigonometric properties and formulae to solve various geometric and physical problems (such as finding arc lengths and sector areas, evaluating areas of triangles, determining linear and angular velocities of bodies in circular motion, finding angles of elevation or depression, estimating heights and distances of stationary objects) |                      | 91% of the students answered the question correctly |               |
| 2                              | 4. Analyze graphs of Circular functions | | 88% of the students answered the question correctly |               |</p>
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<tbody>
<tr>
<td>2</td>
<td>5. Demonstrate an understanding of Inverse Circular functions.</td>
<td>76% of the students answered the question correctly</td>
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<tr>
<td>2</td>
<td>6. Apply Trigonometric functions and Law of Sines or Law of Cosines to solve a triangle.</td>
<td>77% of the students answered the question correctly</td>
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<tr>
<td>2</td>
<td>7. Recall Fundamental Trigonometric Identities, and apply them to simplify trigonometric expressions or verify trigonometric identities</td>
<td>78% of the students answered the question correctly</td>
</tr>
<tr>
<td>2</td>
<td>8. Solve Trigonometric equations.</td>
<td>62% of the students answered the question correctly</td>
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</tbody>
</table>
**Institutional Mission & Goals**

**Course Intended Outcomes**

**Means of Assessment and Criteria for Success**

**Summary of Data Collected**

**Use of Results**

<table>
<thead>
<tr>
<th></th>
<th>1. Determine the domain and range of functions.</th>
<th>Means: Embed problems in a chapter test, quiz, or final exam. Collect the work from all students with scores attached. Criteria: 50% of the students will demonstrate satisfactory performance of 3 or higher based upon a Math department rubric.</th>
<th>76% of students in the class scored a 3 or higher based on the rubric</th>
<th>Results meet or exceed expectations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2. Find the zeros of polynomial equations of degree higher than two applying Descartes’ Rule of Signs and determining upper and lower bounds for real zeros when appropriate.</td>
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<td>2</td>
<td>3. Sketch a graph of a polynomial function and determine intervals where the function is increasing and/or decreasing.</td>
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<td>4. Graph a rational function including intercepts and asymptotes.</td>
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<td>5. Solve systems of linear or nonlinear equations in</td>
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<tr>
<td><strong>2</strong></td>
<td>6. Sketch the graph of a system of linear and nonlinear inequalities.</td>
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<tr>
<td><strong>2</strong></td>
<td>7. Given a linear programming problem, graph the feasible solutions subject to a given set of constraints and find the minimum or maximum value of an objective function.</td>
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<td><strong>2</strong></td>
<td>8. Perform operations on matrices (add, subtract, scalar and matrix multiplication).</td>
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<td><strong>2</strong></td>
<td>9. Find the inverse of a matrix.</td>
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<td><strong>2</strong></td>
<td>10. Find the determinant of a matrix.</td>
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<td><strong>2</strong></td>
<td>11. Find a partial fraction decomposition of ( \frac{f(x)}{g(x)} ).</td>
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<td><strong>2</strong></td>
<td>12. Distinguish between arithmetic and geometric sequences and series and apply appropriate formulas.</td>
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<td><strong>2</strong></td>
<td>13. Find a designated term for a recursively-defined sequence.</td>
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<tr>
<td><strong>2</strong></td>
<td>or higher based on the rubric</td>
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<tr>
<td></td>
<td>100% of students in the class scored a 3 or higher based on the rubric</td>
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<tr>
<td></td>
<td>35% of students in the class scored a 3 or higher based on the rubric</td>
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<tr>
<td></td>
<td>Results are lower than expected</td>
</tr>
<tr>
<td></td>
<td>94% of students in the class scored a 3 or higher based on the rubric</td>
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<td></td>
<td>Results meet or exceed expectations.</td>
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<td></td>
<td>82% of students in the class scored a 3 or higher based on the rubric</td>
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<td></td>
<td>Results meet or exceed expectations.</td>
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<td></td>
<td>100% of students in the class scored a 3 or higher based on the rubric</td>
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<tr>
<td></td>
<td>75% of students in the class scored a 3 or higher based on</td>
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</tr>
<tr>
<td>2</td>
<td>14. Compose proofs using mathematical induction.</td>
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<tr>
<td>2</td>
<td>15. Apply counting techniques including permutations or combinations to compute probabilities.</td>
</tr>
<tr>
<td>2</td>
<td>16. Identify and graph conic sections. a. <em>Circle</em>: Identify center and radius. b. <em>Parabola</em>: Identify vertex, axis of symmetry, directrix, and focus. c. <em>Ellipse</em>: Identify center, vertices, and foci. d. <em>Hyperbola</em>: Identify center, vertices, foci, and asymptotes.</td>
</tr>
<tr>
<td>2</td>
<td>17. Find the equation of a conic section subject to given conditions.</td>
</tr>
<tr>
<td>2</td>
<td>18. Sketch the graph of a parametrized curve and indicate its orientation.</td>
</tr>
<tr>
<td>2</td>
<td>19. Graph polar coordinates.</td>
</tr>
<tr>
<td>2</td>
<td>20. Solve application problems.</td>
</tr>
</tbody>
</table>
### Student Learning Outcomes (SLOs) Assessment Report

**Course Assessment**

**Division:** Math Physical Science  
**Discipline/Program:** Mathematics

**Course Number and Name:** MATH 265 Calculus with Analytic Geometry I

**Program Contact Person:** Mani Gagrat  
**Phone:** ____________

**Reviewed by:** ____________________________, Academic Dean  
**Date:** Spring 2009

**Attach additional pages as necessary.**

<table>
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<tbody>
<tr>
<td>2</td>
<td>1. Compute limits of algebraic and trigonometric functions</td>
<td><strong>Means:</strong> A two-part problem based on this topic was embedded in the final exam, and given to the only Math 265 section scheduled during the fall 2008 session.</td>
<td>93.02% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric</td>
<td>Assessment result meets or exceeds the expected criteria</td>
</tr>
<tr>
<td>2</td>
<td>2. Determine continuity of functions</td>
<td><strong>Means:</strong> A problem to find all points of discontinuity of a function was embedded in the final exam, and given to the only Math 265 section scheduled during the fall 2008 session.</td>
<td>93.02% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3. Use differentiation techniques and formulae to find derivatives of functions</td>
<td><strong>Means:</strong> Multiple questions involving various formulae, chain rule,</td>
<td>86.04% of the students who took the exam scored a 3 or higher on these</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Use derivatives to compute equations of tangent lines to the graphs of algebraic and trigonometric functions</td>
<td><strong>Means:</strong> A problem based on this topic was embedded in the final exam, and given to the only Math 265 section scheduled during the fall 2008 session.</td>
<td>60.5% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric</td>
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</tr>
<tr>
<td>2</td>
<td>5. Apply numerical techniques such as Newton’s method and Simpson’s rule to approximate solutions to various problems</td>
<td>Two problems based on this topic were embedded in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6. Use derivatives to solve related rates and other applied problems</td>
<td><strong>Means:</strong> A related rates problem was embedded in the final exam, and given to the only Math 265 section scheduled during the fall 2008 session.</td>
<td>34.8% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7. Utilize differentiation techniques to analyze graphs of algebraic and trigonometric functions</td>
<td><strong>Means:</strong> Two problems based on this topic were embedded in the final exam, and given to the only Math 265 section scheduled during the fall 2008 session.</td>
<td>76.7% of the students who took the exam scored a 3 or higher on these problems using the math department scoring rubric</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>8. Apply derivatives to compute velocity and acceleration when dealing with rectilinear motion problems</td>
<td>A problem based on this topic was embedded in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>9. Utilize calculus to solve optimization problems</td>
<td><strong>Means:</strong> A problem on optimizing a function over a closed domain was embedded in the final exam, and</td>
<td>79.04% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric</td>
<td></td>
</tr>
<tr>
<td>10. Evaluate definite and indefinite integrals of continuous functions using various formulae and techniques</td>
<td><strong>Means:</strong> One definite integral and two indefinite integral problems were was embedded in the final exam, and given to the only Math 265 section scheduled during the fall 2008 session.</td>
<td>81.39% of the students who took the exam scored a 3 or higher on this SLO using the math department scoring rubric</td>
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<tr>
<td>11. Use definite integrals to compute areas</td>
<td><strong>Means:</strong> A problem based on this topic was embedded in the final exam, and given to the only Math 265 section scheduled during the fall 2008 session</td>
<td>74.41% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric</td>
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<tr>
<td>12. Solve initial value problems</td>
<td><strong>Means:</strong> A first order initial value problem was embedded in the final exam, and given to the only Math 265 section scheduled during the fall 2008 session.</td>
<td>76.7% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric</td>
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</tbody>
</table>
**Division: Math Physical Science**

**Discipline/Program: Mathematics**

**Course Number and Name: MATH 266 Calculus with Analytic Geometry II**

**Program Contact Person:**

**Phone:**

**Reviewed by:**

**Academic Dean**

**Date:**

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### Attach additional pages as necessary.

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</thead>
</table>
|                               | 1. Apply integration techniques to solve application problems such as evaluating areas between plane curves, volumes of solids of revolution, arc lengths, surface areas, work done by a variable force and fluid force exerted on a vertically submerged plate | **Criteria for all SLO's:**
50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric. | 83% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric. | Assessment results of the first seven SLO's meets or exceed expected criteria. |
|                               | 2 | **Means:**
The region bounded by a curve, the x-axis and two vertical lines was, embedded in the final exam, and given to the only Math 266 section scheduled during the spring 2009 session. Students were instructed to compute the area of the region described. | | |
|                               | 2 | **Means:**
A transcendental function was embedded in the | 100% of the students who took the exam scored a 3 or higher on | |
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<tbody>
<tr>
<td><strong>2</strong></td>
<td>3. Apply L’Hôpital’s Rule to compute limits that lead to indeterminate forms</td>
<td><strong>Means:</strong> A rational expression was embedded in the final exam, and given to the only Math 266 section scheduled during the spring 2009 session. 100% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric.</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>4. Solve Integration problems by applying techniques such as algebraic or trigonometric substitutions, integration by parts, integration by partial fractions and integration using tables</td>
<td><strong>Means:</strong> Five problems involving integration techniques were given during the fall 2009 session. 82% of the students who took the exam scored a 3 or higher on these problems using the math department scoring rubric.</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>5. Evaluate Improper Integrals</td>
<td><strong>Means:</strong> An improper integral was given to students during the fall 2009 session. 67% of the students who took the exam scored a 3 or higher on these problems using the math department scoring rubric.</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>6. Apply appropriate convergence tests to establish the convergence or divergence of infinite sequences and series</td>
<td><strong>Means:</strong> Problems about convergence and divergence of sequences and series were given to students during the fall 2009 session. 87% of the students who took the exam scored a 3 or higher on these problems using the math department scoring rubric.</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>7. Evaluate the radius of convergence and the interval of convergence of Power Series and utilize Taylor and Maclaurin Series to approximate values of functions and non-elementary definite integrals</td>
<td><strong>Means:</strong> A power series problem was given to students during the fall 2009 session. 75% of the students who took the exam scored a 3 or higher on these problems using the math department scoring rubric.</td>
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<tr>
<td></td>
<td>8. Convert equations of smooth curves in two or three dimension space to parametric form and use it to solve application problems</td>
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</tbody>
</table>
LA HARBOR COLLEGE
Student Learning Outcomes (SLOs) Assessment Report
Course Assessment

Division: Math Physical Science

Discipline/Program: Mathematics

Course Number and Name: MATH 267 Calculus with Analytic Geometry III

Program Contact Person: F. Saddigh

Phone: 310-233-4515

Reviewed by: __________________________ , Academic Dean

Date: Spring 2009

Attach additional pages as necessary.

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<td></td>
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<tr>
<td></td>
<td>1. Draw graphs of equations in polar form.</td>
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<td></td>
<td>2. Integrate functions in polar form and solve word problems involving polar equations</td>
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<td></td>
<td>3. Demonstrate the use of vectors.</td>
<td>Means: The equations of two planes in three space was embedded in the final exam, and given to the only Math 267 section scheduled during the spring 2009 session. Students were instructed to compute the acute</td>
<td>80% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric.</td>
<td>Assessment results of this SLO meets or exceed expected criteria.</td>
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<tr>
<td></td>
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<td>angle between the two planes to the nearest hundredth of a radian.</td>
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<td>2</td>
<td>4. Compare and contrast solid analytic geometry concepts such as rectangular coordinates, tangent and normal vectors, curvature, lines, scalar and vector product, scalar triple product, differentiation of vectors in 3 and 2 space.</td>
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<td>2</td>
<td>5. Analyze curves in 3-space, quadric surfaces, spherical and cylindrical coordinates.</td>
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<td>2</td>
<td>6. Solve word problems involving projectile motion.</td>
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<td>2</td>
<td>7. Compute the limit, continuity and differentiability of multivariate functions.</td>
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<td>8. Apply the chain rule to multivariate functions.</td>
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<tr>
<td>2</td>
<td>9. Compute directional derivative, gradient, tangent planes for of multivariate functions.</td>
<td><strong>Means:</strong> The parametric equation of a three dimensional curve was embedded in the final exam, and given to the only Math 267 section scheduled during the spring 2009 session. Students were instructed to compute the tangent, normal and their cross product at a given point</td>
<td>70% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric.</td>
<td>Assessment results of this SLO meets or exceed expected criteria.</td>
</tr>
<tr>
<td>2</td>
<td>10. Compute maxima and minima of function in 2-variables.</td>
<td><strong>Means:</strong> A two variable function was embedded in the final exam, and given to the only Math 267</td>
<td>80% of the students who took the exam scored a 3 or higher on this problem using the math department scoring</td>
<td>Assessment results of this SLO meets or exceed expected criteria.</td>
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<tr>
<td>No.</td>
<td>Task</td>
<td>Rubric</td>
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<tr>
<td>2</td>
<td>11. Apply the method of Lagrange Multipliers to solve word problems involving word problems involving of multivariate functions</td>
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<tr>
<td>2</td>
<td>12. Compute double integrals over rectangular, non-rectangular and polar coordinates.</td>
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<tr>
<td>2</td>
<td>13. Compute surface areas, centroids, center of mass and gravity using double and triple integrals. Apply the Theorems of Pappus</td>
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<tr>
<td>2</td>
<td>14. Compute line integrals using vector calculus.</td>
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<td>2</td>
<td>15. Demonstrate Green's Theorem as it relates to surface integrals.</td>
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**LA HARBOR COLLEGE**
Student Learning Outcomes (SLOs) Assessment Report
Course Assessment

**Division:** Math Physical Science  
**Discipline/Program:** Mathematics  
**Course Number and Name:** Math 275 Ordinary Differential Equations  
**Program Contact Person:** L. McKenzie  
**Phone:** 310-233-4501

**Reviewed by:** ________________________, Academic Dean  
**Date:** August 02, 2009

Attach additional pages as necessary.

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<td>Criteria for all SLO's: 50% of the class will demonstrate satisfactory performance of 3 or higher on these problems based upon a math department scoring rubric.</td>
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</tr>
<tr>
<td>2</td>
<td>1. Identify the type, order and solution method for various differential equations</td>
<td>Means: A second order, linear, non-homogeneous DE with constant coefficients, was embedded in the midterm exam, and given to the only Math 275 section scheduled during the spring 2009 session. Students were instructed to identify the type, order and solution method to use.</td>
<td>100% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric.</td>
<td>Assessment results of the first seven SLO’s meets or exceed expected criteria.</td>
</tr>
<tr>
<td>2</td>
<td>2. Reduce the order of a differential equation</td>
<td>Means: A second order, linear, homogeneous DE with variable coefficients, was embedded in the midterm exam, and given to the only Math 275 section scheduled during the spring 2009 session. Given a solution to the equation, students were instructed to find a second solution using reduction of order</td>
<td>62.5% of the students who took scored a 3 or higher on this problem using the math department scoring rubric.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3. Solve differential equations with constant and variable coefficients</td>
<td>Means: A second order linear non-homogeneous DE with constant coefficients and initial value conditions, was embedded in the midterm</td>
<td>87.5% of the students who took the exam scored a 3 or higher on this problem using the math</td>
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<tr>
<td></td>
<td>2</td>
<td>4. Solve linear and non-linear differential equations</td>
<td><strong>Means:</strong> A second order, non-linear, non-homogeneous DE with variable coefficients, was embedded in the midterm exam, and given to the only Math 275 section scheduled during the spring 2009 session. Students were instructed to solve the equation using undetermined coefficients.</td>
<td>50% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric.</td>
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<td></td>
<td>2</td>
<td>5. Solve systems of differential equations</td>
<td><strong>Means:</strong> A homogeneous system of DE with constant coefficients, was embedded in a chapter test and given to the only Math 275 section scheduled during the spring 2009 session. Students were instructed to solve the equation using a substitution method.</td>
<td>57% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric.</td>
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<td></td>
<td>2</td>
<td>6. Apply the method of Laplace Transforms</td>
<td><strong>Means:</strong> A non-homogeneous DE with constant coefficients, was embedded in the final exam and given to the only Math 275 section scheduled during the spring 2009 session. Students were instructed to solve the equation using Laplace Transforms.</td>
<td>86% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric.</td>
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<tr>
<td></td>
<td>2</td>
<td>7. Solve differential equations using numerical approximations</td>
<td><strong>Means:</strong> Embed problem in the final exam. Students were instructed to solve the equation using a numerical approximation.</td>
<td>57% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric.</td>
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<tr>
<td></td>
<td>2</td>
<td>8. Solve word problems involving differential equations</td>
<td><strong>Means:</strong> Embed problem in the final exam. Students were instructed to solve word problem involving related rates of mixing solutions</td>
<td>71% of the students who took the exam scored a 3 or higher on this problem using the math department scoring rubric.</td>
</tr>
</tbody>
</table>
### Institutional Mission and Goals

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<tr>
<td>1. Relate the nature of electric current to electric charge, and the resulting magnetic and electric fields</td>
<td>Means: questions will be posed on the final exam describing each SLO</td>
<td></td>
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<tr>
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<td>Criteria: At least 50% of the A, B and C-grade students will obtain a score of 3 or higher according to the Physics Department scoring rubric, on all problems listed below</td>
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</tr>
<tr>
<td>2. Apply each of Maxwell’s four equations of electromagnetism and the Lorentz force law to predict the behavior of electric and...</td>
<td>1. Given the location of two or more charged particles, the student will be instructed to draw the appropriate diagram, and calculate either the electric field or the Coulomb force at the required location. The resulting electric field, force or acceleration will be calculated and presented with the appropriate direction and units included.</td>
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<td></td>
<td>2. A proton ( q = +1.60 \times 10^{-19} \text{ C}, m = 1.673 \times 10^{-27} \text{ kg} ) moves with a velocity of ( v = (3^* - 2^* + 5^<em>) \text{ m/s} ) through an electric field ( E = (5^</em> - 7^* + 3^*) \text{ N/C} ) and a</td>
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<tr>
<td></td>
<td>magnetic fields, and the resulting motion of electric charges</td>
<td>magnetic field ( B = (* + 4*) ) Teslas. Determine the force on the proton, and the proton’s acceleration.</td>
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<td>(3) Analyze a circuit containing seats of emf, resistors, capacitors and inductors, when either DC or AC voltage is supplied</td>
<td>3. Given one or more capacitors in an electric circuit, or enough information, the student is instructed to write the appropriate equation and solve for either the voltage or the charge on the capacitor, and present the answer with the appropriate unit.</td>
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<tr>
<td>2</td>
<td>4. Identify a circuit diagram containing one or more resistors, capacitors and sources of electromotive force, and apply Kirchhoff’s Rules correctly to solve for the currents through the wires.</td>
<td>4. Given a circuit diagram complex enough that Kirchhoff’s Rules will be necessary to solve it, the student is instructed to apply Kirchhoff’s Rules at the appropriate loops and junctions, and solve the resulting algebraic equations for the unknowns.</td>
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<td>4. Describe the source of the electromagnetic spectrum and the frequency associated with its waves, the spectrum’s divisions into several bands, including the visible spectrum.</td>
<td>4. The student is instructed to describe, as detailed as possible, about the source, nature and use of one of the seven bands of the electromagnetic spectrum.</td>
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<tr>
<td>2</td>
<td>(5) Generate the path of light rays according to the laws of reflection and refraction</td>
<td>5. A spherical convex mirror has a radius of curvature with a magnitude of 10.0 cm. Determine the magnification and position of the virtual image, for a real object at a distance from the mirror of 5.0 cm: a) graphically, by drawing a ray diagram. b) algebraically.</td>
<td></td>
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</tbody>
</table>
|   | (6) Predict the behavior of basic optical systems constructed from lenses and mirrors, both graphically | 6. Given a diagram showing or describing the nature of a lens or mirror, and the location of a real or virtual object, the student is instructed to locate the image,
and algebraically either through ray tracing or through the use of the focal length equation. In addition the student is instructed to either draw or describe the nature of the resulting image.