OFFICE OF CURRICULUM, INSTRUCTION & PROFESSIONAL DEVELOPMENT

ACADEMIC COURSE OUTLINE

<table>
<thead>
<tr>
<th>Department</th>
<th>Mathematics</th>
<th>Course Title</th>
<th>Introduction to Applied Mathematics</th>
<th>Course Code</th>
<th>2974</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Level</td>
<td>11 - 12</td>
<td>Short Title</td>
<td>APPLIED MATH INTRO</td>
<td>Grad Requirement</td>
<td>Math</td>
</tr>
<tr>
<td>Course Length</td>
<td>2 semesters</td>
<td>Credits per Semester</td>
<td>5</td>
<td>Approved for Honors</td>
<td>No</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>Successful completion of Algebra 1 is required.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-requisites</td>
<td>Articulated with LBCC</td>
<td>No</td>
<td>Articulated with CSULB</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Meets UC “a-g” Requirement</td>
<td>No</td>
<td>Meets NCAA Requirement</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching Credential(s)</td>
<td>Teachers with any of these credentials are authorized to teach this course:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Single Subject Credential in Mathematics (SS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Single Subject Credential in Foundational Mathematics (SSFM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Multiple Subject Credential or Single Subject Credential in content other than math, with a Single Subject Authorization in Introductory Mathematics (SMA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COURSE OVERVIEW:**
The Introduction to Applied Math course will prepare students to enter the work force or to attend college with an understanding of the mathematics in the real world. The course will help students develop quantitative literacy as a habit of mind and an approach to problems that employs and enhances both statistics and mathematics. The main goal of the course is for students to see that mathematics is a powerful tool for living, as they develop confidence with mathematics, habits of inquiry and logical thinking, and the ability to use mathematics to make decisions in everyday life. Topics address the math used to run our country’s households, businesses, and governments, such as the mathematics of consumption, inflation, depreciation, borrowing, saving, and taxation, as well as the mathematics of logic, likelihood, statistics, and sports.

**EXPECTED OUTCOMES**
Students are expected to perform at a proficient level on a variety of tasks and assessments addressing the Common Core Standards for Mathematical Practice and selected high school Common Core State Standards for Math. Levels of proficiency are defined near the end of this course outline under Performance Criteria.

**Common Core State Standards for Mathematical Practice (SMP)**

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.
### Common Core State Standards for Mathematical Content (CCSS-M)

#### Number and Quantity

<table>
<thead>
<tr>
<th>Quantities</th>
<th>N-Q</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N-Q.A</strong></td>
<td>Reason quantitatively and use units to solve problems.</td>
</tr>
<tr>
<td><strong>N-Q.1</strong></td>
<td>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.</td>
</tr>
<tr>
<td><strong>N-Q.2</strong></td>
<td>Define appropriate quantities for the purpose of descriptive modeling.</td>
</tr>
</tbody>
</table>

#### Functions

<table>
<thead>
<tr>
<th>Linear, Quadratic, and Exponential Models*</th>
<th>F-LE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F-LE.A</strong></td>
<td>Construct and compare linear, quadratic, and exponential models and solve problems.</td>
</tr>
<tr>
<td><strong>F-LE.1</strong></td>
<td>Distinguish between situations that can be modeled with linear functions and with exponential functions.*</td>
</tr>
<tr>
<td>b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.*</td>
<td></td>
</tr>
<tr>
<td>c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.*</td>
<td></td>
</tr>
<tr>
<td><strong>F-LE.3</strong></td>
<td>Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.*</td>
</tr>
</tbody>
</table>

#### Statistics and Probability

<table>
<thead>
<tr>
<th>Interpreting Categorical and Quantitative Data</th>
<th>S-ID</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S-ID.A</strong></td>
<td>Summarize, represent, and interpret data on a single count or measurement variable.</td>
</tr>
<tr>
<td><strong>S-ID.2</strong></td>
<td>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.</td>
</tr>
<tr>
<td><strong>S-ID.3</strong></td>
<td>Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Making Inferences and Justifying Conclusions</th>
<th>S-IC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S-IC.B</strong></td>
<td>Make inferences and justify conclusions from sample surveys, experiments, and observational studies.</td>
</tr>
<tr>
<td><strong>S-IC.6</strong></td>
<td>Evaluate reports based on data.*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditional Probability and the Rules of Probability</th>
<th>S-CP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S-CP.A</strong></td>
<td>Understand independence and conditional probability and use them to interpret data.</td>
</tr>
<tr>
<td><strong>S-CP.5</strong></td>
<td>Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Using Probability to Make Decisions</th>
<th>S-MD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S-MD.A</strong></td>
<td>Calculate expected values and use them to solve problems.</td>
</tr>
<tr>
<td><strong>S-MD.B</strong></td>
<td>Use probability to evaluate outcomes of decisions.</td>
</tr>
<tr>
<td><strong>S-MD.7</strong></td>
<td>(+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game.)</td>
</tr>
</tbody>
</table>

### EXPECTED INTEGRATED OUTCOMES

(From the California Career Technical Education Model Curriculum Standards, adopted by the California State Board of Education in January, 2013)
Students are also expected to proficiently apply common skills that are relevant across curriculum areas and career pathways.

**Standards for Career Ready Practice (CR)**

1. **Apply appropriate technical skills and academic knowledge.**
   Career-ready individuals readily access and use the knowledge and skills acquired through experience and education. They make connections between abstract concepts with real-world applications and recognize the value of academic preparation for solving problems, communicating with others, calculating measures, and performing other work-related practices.

2. **Communicate clearly, effectively, and with reason.**
   Career-ready individuals communicate thoughts, ideas, and action plans with clarity, using written, verbal, electronic, and/or visual methods. They are skilled at interacting with others: they are active listeners who speak clearly and with purpose, and they are comfortable with terminology that is common to workplace environments. Career-ready individuals consider the audience for their communication and prepare accordingly to ensure the desired outcome.

3. **Develop an education and career plan aligned with personal goals.**
   Career-ready individuals take personal ownership of their educational and career goals and manage their individual plan to attain these goals. They recognize the value of each step in the educational and experiential process, and they understand that nearly all career paths require ongoing education and experience to adapt to practices, procedures, and expectations of an ever-changing work environment. They seek counselors, mentors, and other experts to assist in the planning and execution of education and career plans.

4. **Apply technology to enhance productivity.**
   Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring and using new technology. They understand the inherent risks - personal and organizational - of technology applications, and they take actions to prevent or mitigate these risks.

5. **Utilize critical thinking to make sense of problems and persevere in solving them.**
   Career-ready individuals recognize problems in the workplace, understand the nature of the problems, and devise effective plans to solve the problems. They thoughtfully investigate the root cause of a problem prior to introducing solutions. They carefully consider options to solve a problem and, once agreed upon, follow through to ensure the problem is resolved.

6. **Practice personal health and understand financial literacy.**
   Career-ready individuals understand the relationship between personal health and workplace performance. They contribute to their personal well-being through a healthy diet, regular exercise, and mental health activities. Career-ready individuals also understand that financial literacy leads to a secure future that enables career success.

7. **Act as a responsible citizen in the workplace and the community.**
   Career-ready individuals understand the obligations and responsibilities of being a member of a community and demonstrate this understanding every day through their interactions with others. They are aware of the impacts of their decisions on others and the environment around them, and they think about the short-term and long-term consequences of their actions. They are reliable and consistent in going beyond minimum expectations and in participating in activities that serve the greater good.

8. **Model integrity, ethical leadership, and effective management.**
   Career-ready individuals consistently act in ways that align with personal and community-held ideals and principles. They employ ethical behaviors and actions that positively influence others. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the direction and actions of a team or organization, and they recognize the short-term and
long-term effects that management’s actions and attitudes can have on productivity, morale, and organizational culture.

9. Work productively in teams while integrating cultural and global competence.
Career-ready individuals contribute positively to every team, as both team leaders and team members. To avoid barriers to productive and positive interaction, they apply an awareness of cultural differences. They interact effectively and sensitively with all members of the team and find ways to increase the engagement and contribution of other members.

10. Demonstrate creativity and innovation.
Career-ready individuals recommend ideas that solve problems in new and different ways and contribute to the improvement of the organization. They consider unconventional ideas and suggestions by others as solutions to issues, tasks, or problems. They discern which ideas and suggestions may have the greatest value. They seek new methods, practices, and ideas from a variety of sources and apply those ideas to their own workplace practices.

11. Employ valid and reliable research strategies.
Career-ready individuals employ research practices to plan and carry out investigations, create solutions, and keep abreast of the most current findings related to workplace environments and practices. They use a reliable research process to search for new information and confirm the validity of sources when considering the use and adoption of external information or practices.

12. Understand the environmental, social, and economic impacts of decisions.
Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact other people, organizations, the workplace, and the environment. They are aware of and utilize new technologies, understandings, procedures, and materials and adhere to regulations affecting the nature of their work. They are cognizant of impacts on the social condition, environment, workplace, and profitability of the organization.

COURSE CONTENT AND SUGGESTED TIME ALLOTMENT:
Content sequencing, activities, and time allocations are only suggestions and may be adjusted to suit school site curriculum plans, available materials, and student needs.

Unit 1: The Mathematics of Calculation

Duration: 16 days

Description:
Students use computational skills to make sense of and solve problems in real-world contexts. First, students use the order of operations to evaluate expressions including formulas. Next, they use technology to solve problems, analyzing the results in terms of the context to determine if solutions are reasonable. Then, students solve a variety of real-world problems involving percent. Finally, they use units as a way to understand problems and to guide the solution of multi-step problems.

Materials: Math & You, The Power and Use of Mathematics textbook Chapter 1

Standards Addressed:
Common Core Standards for Mathematical Practice 1-8
CCSS-M Cluster N-Q.A

Unit 2: The Mathematics of Consumption

Duration: 15 days
**Description:**
In this unit, students study the mathematics involved in making purchases and budgeting. Students will analyze and compare unit prices in making purchases. They will find markup and discounts, including finding final prices after multiple discounts. Students will find sales tax, excise tax, and value-added tax on items. Finally, students will learn how to create, balance and analyze a monthly budget, write checks and balance a checkbook.

**Materials:** *Math & You, The Power and Use of Mathematics* textbook Chapter 2

**Standards Addressed:**
Common Core Standards for Mathematical Practice 1-8

---

**Unit 3:** The Mathematics of Logic and the Media

**Duration:** 17 days

**Description:**
In this unit, students study the mathematics involved in logic and the media. Students use set and set diagrams to describe unions, intersections and complements of sets. Students will study statements and negations, deductive an inductive reasoning, and recognize fallacies in logic.

**Materials:** *Math & You, The Power and Use of Mathematics* textbook Chapter 3

**Standards Addressed:**
Common Core Standards for Mathematical Practice 1-8
CCSS-M Cluster S-IC.B

---

**Unit 4:** The Mathematics of Inflation and Depreciation

**Duration:** 16 days

**Description:**
In this unit, students study the mathematics involved in inflation and depreciation. Students will study exponential growth and decay, inflation and the consumer price index, and depreciation.

**Materials:** *Math & You, The Power and Use of Mathematics* textbook Chapter 4

**Standards Addressed:**
Common Core Standards for Mathematical Practice 1-8
CCSS-M Cluster F-LE.A

---

**Unit 5:** The Mathematics of Taxation

**Duration:** 15 days

**Description:**
In this unit, students study the mathematics involved in taxation. Students will study flat tax and political philosophy, graduated income tax, property tax, social security and payroll taxes.

**Materials:** *Math & You, The Power and Use of Mathematics* textbook Chapter 5
### Standards Addressed:
Common Core Standards for Mathematical Practice 1-8

#### Unit 6: The Mathematics of Borrowing and Saving

**Duration:** 16 days

**Description:**
In this unit, students study the mathematics involved in borrowing and saving. Students will be introduced to lending, including promissory notes and loans. They will create an amortization table and analyze the cost of buying on credit. Students will compare rates and terms for home mortgages, and compare the costs of buying and renting. Finally, students will analyze savings and retirement plans.

**Materials:** *Math & You, The Power and Use of Mathematics* textbook Chapter 6

#### Standards Addressed:
Common Core Standards for Mathematical Practice 1-8

#### Unit 7: The Mathematics of Patterns and Nature

**Duration:** 15 days

**Description:**
In this unit, students study the mathematics involved in patterns and nature. Students will recognize and describe linear, exponential, quadratic, and other patterns in nature, art, and science.

**Materials:** *Math & You, The Power and Use of Mathematics* textbook Chapter 7

#### Standards Addressed:
Common Core Standards for Mathematical Practice 1-8
CCSS-M Cluster F-LE.A

#### Unit 8: The Mathematics of Likelihood

**Duration:** 15 days

**Description:**
In this unit, students study the mathematics of likelihood. Students will use probability to describe the likelihood of an event, analyze likelihood of a risk, and describe actuarial data. They will find theoretical and experimental probability, and find expected values for events.

**Materials:** *Math & You, The Power and Use of Mathematics* textbook Chapter 8

#### Standards Addressed:
Common Core Standards for Mathematical Practice 1-8
CCSS-M Cluster S-CP.A, S-MD.A, S-MD.B

#### Unit 9: The Mathematics of Description

**Duration:** 15 days
Description: In this unit, students study the mathematics of description. Students will read, interpret and create stacked area graphs and radar graphs. Students will use mean, median and mode to describe average value of a data set, and understand the effect of outliers on averages. They will read and understand box-and-whisker plots and histograms. Students will use standard deviation to describe dispersion of a data set, and compare different types of distributions. Finally, students will study various sampling methods.


Standards Addressed:
Common Core Standards for Mathematical Practice 1-8
CCSS-M Cluster S-ID.A

Unit 10: The Mathematics of Fitness and Sports

Duration: 16 days

Description: In this unit, students study the mathematics involved in fitness and sports. Students will study various statistics related to a person's fitness and health, and also statistics used in a variety of sports activities.


Standards Addressed:
Common Core Standards for Mathematical Practice 1-8

INSTRUCTIONAL METHOD AND/OR STRATEGIES:
A variety of instructional strategies will be utilized to accommodate all learning styles. See the “Using Formative Assessment to Address the Specific Learning Needs of Low Achieving Students, High Achieving Students, Students with Disabilities and English Language Learners in K-12 MATHEMATICS” document.

COURSE MATERIALS:
Core Text: Math & You The Power and Use of Mathematics, Ron Larson, Bedford, Freeman & Worth, © 2013
Supplemental Materials: In addition to the basic text, a variety of instructional tools will be used to meet the needs of all students.

RESOURCES:
Documents
- Using Formative Assessment for Differentiation............................... LBUSD Math/ELA Curriculum Documents
- Work-Based Learning Continuum .............................................. LBUSD Work-Based Learning Webpage
- ELD Standards ................................................................. http://www.cde.ca.gov/sp/el/er/eldstandards.asp

District Offices
- Math Curriculum Office ................................................................. (562) 997-8000, ext. 2962
- Research Office ............................................................................. (562) 997-8143
PERFORMANCE CRITERIA:
Defines how good is good enough on which measures to demonstrate achievement of content standards.

Classroom Performance Standards
The objective of instruction is to help all students achieve at or above the Proficient Level and receive a C or better in the course.

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>D</th>
<th>C</th>
<th>B</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit Tests</td>
<td>0 – 59%</td>
<td>60 – 69%</td>
<td>70 – 79%</td>
<td>80 – 89%</td>
<td>90 – 100%</td>
</tr>
<tr>
<td>Chapter Tests</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quizzes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classwork</td>
<td>0 – 59%</td>
<td>60 – 69%</td>
<td>70 – 79%</td>
<td>80 – 89%</td>
<td>90 – 100%</td>
</tr>
<tr>
<td>Homework</td>
<td>0 – 59%</td>
<td>60 – 69%</td>
<td>70 – 79%</td>
<td>80 – 89%</td>
<td>90 – 100%</td>
</tr>
</tbody>
</table>

Standard Grading Scale:

- **A** 90 – 100%
- **B** 80 – 89%
- **C** 70 – 79%
- **D** 60 – 69%
- **F** 0 – 59%

Suggested Grade Weighting:

1. **Assessment** 60 – 80%
   - Graded work assessing a student’s mastery of mathematics such as any of the following:
     - Tests (district exams and classroom tests)
     - Quizzes
     - Project work that assesses a student’s understanding

2. **Classwork/Activities** 10 – 25%
   - Graded work completed in class such as any of the following:
     - In class assignments
     - Project work completed in class
     - Notes
     - Warm-ups
     - Graded participation

3. **Homework** 5 – 15%
   - Graded work completed outside of class such as any of the following:
     - Assignments
     - Project work completed outside of class

Submitted by: Becky Afghani
Submission Date: 6/1/2016
School/Office: Math Curriculum Office

Original Board Approval Date: 8/17/16
Revised Board Approval Date: