

# *Course of Study*

## *Algebra II*

**Warren County Career Center**

**3525 North State Route 48  
Lebanon, Ohio 45036**

**Adopted \_\_\_\_\_**

*This document is for the use of the staff at Warren County Career Center.  
Credit is given the designer of the template, Upper Valley JVS, Piqua, Ohio.*

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# *Acknowledgements*

## **Algebra II Warren County Career Center**

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Warren County Career Center Administrative Team  
Warren County Educational Service Center  
Mr. Ali Mehdi  
Mr. Doug Bailey  
Mrs. Liz Rasch  
Mrs. Janet Wilmoth



## *Statement of Recommendation*

The Math Department at Warren County Career Center has reviewed this course of study and recommends it for use as the foundation for instruction in the Algebra II class.

The developers of this course of study have considered local labor market needs and the school's ability to offer specialized programs. The competencies have been reviewed and accepted as being congruent with our school's vision, mission, and strategic goals. When appropriate, additional competencies related to the program area have been incorporated into this course of study.

Achievement of technical competencies, utilizing proper attitudes, and demonstrating appropriate values are critical for successful employment and for furthering educational opportunities within a student's chosen field. We believe that this course of study adequately and correctly focuses upon student development.

This course of study is recommended on:

## ***Warren County Career Center Vision Statement***

WCCC is the valued partner of choice within the educational and economic systems of our communities, by providing quality academic and career technical education.

We pave the way for a future of opportunities unique to each of our learners.

## ***Warren County Career Center Mission Statement***

To prepare youths and adults to make informed career choices and to successfully enter, compete, and advance in a changing work world.

## ***Warren County Career Values***

- Treating each other with respect, dignity, trust and mutual value
- Communicating openly and honestly
- Taking ownership of personal actions and being held accountable for results
- Upholding and demonstrating high ethical, educational and fiscal standards
- Exhibiting high levels of professionalism
- Providing high quality instruction and highly qualified staff to ensure success for all learners
- Making quality customer service a high priority
- Promoting partnerships and a team environment
- Celebrating team and individual achievements
- Using data to drive planning, decision making and actions

## *Course Design*

Courses are designed to reflect career-focused education, which combines high-level academics with real-life technical skills. The intent is to maximize a student's present and future academic and career success.

Career-focused education enhances the integration of academic and technical skills, designs programs that prepare students with transferable skills and promotes each student's career opportunities.

## *Course Philosophy*

We believe that

- Mathematics literacy is needed to make everyday decisions such as choosing which product to purchase, interpreting information in news reports, and selecting insurance or health plans.
- Mathematical thinking and problem solving are needed in the workplace, and those who understand and can use mathematics have significantly enhanced opportunities and options.
- Mathematics plays a central role in modern culture, including aesthetic and recreational aspects, and an essential role in the scientific and technical community.
- Set high expectations and strong support for mathematics achievement by ALL students.
- Represent mathematics knowledge and skills needed to make successful transitions to post-secondary education, workplace and daily life.
- Reflect sound application of research on how students learn mathematics.
- Align with national standards documents and major studies in GGGeomathematics
- Address mathematics content knowledge and mathematical processes, including problem-solving, mathematical reasoning, communication, representation and connections.
- Focus on important mathematics topics that are well-articulated through benchmarks and grade-level indicators.
- Represent rigorous progression across grades and in-depth study within each grade.
- Provide an appropriate balance among conceptual understanding, procedural knowledge and skills, and application and problem solving.
- Incorporate use of technology by ALL students in learning mathematics
- Serve as the basis for classroom, district and state assessments.
- Guide the development of local mathematics curriculum and instructional programs.

## ***Course Goals***

The course goals for Algebra II are to:

### **Number, Number Sense and Operations Standard**

Students demonstrate number sense, including an understanding of number systems and operations and how they relate to one another. Students compute fluently and make reasonable estimates using paper and pencil, technology-supported and mental methods.

### **Patterns, Functions and Algebra Standard**

Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.

### **Data Analysis and Probability Standard**

Students pose questions and collect, organize, represent, interpret and analyze data to answer those questions. Students develop and evaluate inferences, predictions and arguments that are based on data.

## ***Course Description***

Algebra II include all the essential topics needed to be successful in College Algebra, Pre Calculus or Trigonometry. Topics covered are listed specifically under the scope and sequence and include: operations on vectors and matrices; factorial notation; analyzing families functions; quadratic formula; logarithms; trigonometric functions; families of functions with graphs that have rotation symmetry or reflection symmetry; graphs of conic sections; complex numbers; recursive functions; least squares regression lines; regression coefficient; correlation coefficient; random sampling; analyze and summarize data; use technology to compute standard deviation; and use of spreadsheets and graphing calculators

Algebra II meets 45 minutes each day and covers the entire school year. One math credit is earned.

Prerequisite for Algebra II: Students must earn a C or better in both Geometry and Algebra I or permission of the instructor.

## *Academic and Technical Integration*

Expectations of curriculum must be aligned with what is written, taught, assessed, and reported. Student expectations focus on active, project-centered learning—an approach to learning that emphasizes a connection between ideas in a discipline and the outside world. Educational programming and course content will clearly connect career and post-secondary opportunities. At the Warren County Career Center, the main goal is to design courses and projects that use strategies for authentic instruction. These characteristics of instruction focus on deep understanding, established opportunities for concept connections, provide anticipatory and abstract thinking, and emphasize genuine application.

The academic courses at the WCCC follow the state model curricula. They are designed to meet both associate school and state requirements. These standards respond to the need to improve student achievement, quality of curriculum and instruction, and strengthen school and community relationships.

## *Technology*

The Warren County Career Center board and staff believe that technology skills are essential for all students to achieve in the 21<sup>st</sup> century. It is the goal of this district to infuse technology into all facets of education:

- Instruction
- Assessment
- Administration
- Career planning
- Course design
- Professional development

Strategies to incorporate technology into all facets of education are a priority of the district and there is commitment to a continual process to provide updated hardware, software, and professional development for staff members for the purpose of providing a high quality education, with the integration of technology, for all students.

## *Students Served*

The population served by this program is juniors and seniors.

# *Scope and Sequence*

## **Number, Number Sense and Operations Standard**

Benchmark A. Demonstrate that vectors and matrices are systems having some of the same properties of the real number system.

1. Determine what properties hold for matrix addition and matrix multiplication; e.g., use examples to show addition is commutative and when multiplication is not commutative.
2. Determine what properties hold for vector addition and multiplication, and for scalar multiplication.

Benchmark B. Develop an understanding of properties of and representations for addition and multiplication of vectors and matrices.

1. Determine what properties hold for matrix addition and matrix multiplication; e.g., use examples to show addition is commutative and when multiplication is not commutative.
2. Determine what properties hold for vector addition and multiplication, and for scalar multiplication.
3. Model, using the coordinate plane, vector addition and scalar multiplication.

Benchmark C. Apply factorials and exponents, including fractional exponents, to solve practical problems.

1. Use factorial notation and computations to represent and solve problem situations involving arrangements. (Grade 10)
2. 8. Use fractional and negative exponents as optional ways of representing and finding solutions for problem situations; e.g.,  $27^{2/3} = (27^{1/3})^2 = 9$ .

Benchmark D. Demonstrate fluency in operations with real numbers, vectors and matrices, using mental computation or paper and pencil calculations for simple cases and technology for more complicated cases.

1. Use matrices to represent given information in a problem situation.
2. Compute sums, differences and products of matrices using paper and pencil calculations for simple cases, and technology for more complicated cases.

3. Use vector addition and scalar multiplication to solve problems.

Benchmark E. Represent and compute with complex numbers.

1. Represent complex numbers on the complex plane.
2. Compute sums, differences, products and quotients of complex numbers.

### **Patterns, Functions and Algebra Standard**

Benchmark A. Analyze functions by investigating rates of change, intercepts, zeros, asymptotes, and local and global behavior.

1. Describe and compare the characteristics of the following families of functions: quadratics with complex roots, polynomials of any degree, logarithms, and rational functions; e.g., general shape, number of roots, domain and range, asymptotic behavior.
2. Identify the maximum and minimum points of polynomial, rational and trigonometric functions graphically and with technology.
3. Identify families of functions with graphs that have rotation symmetry or reflection symmetry about the y-axis, x-axis or  $y = x$ .
4. Represent the inverse of a function symbolically and graphically as a reflection about  $y = x$ .
5. Describe the characteristics of the graphs of conic sections.
6. Describe how a change in the value of a constant in an exponential, logarithmic or radical equation affects the graph of the equation.

Benchmark B. Use the quadratic formula to solve quadratic equations that have complex roots.

1. Solve equations involving radical expressions and complex roots.

Benchmark C. Use recursive functions to model and solve problems; e.g., home mortgages, annuities.

1. Identify and describe problem situations involving an iterative process that can be represented as a recursive function; e.g., compound interest.

2. Translate a recursive function into a closed form expression or formula for the  $n$ th term to solve a problem situation involving an iterative process; e.g., find the value of an annuity after 7 years.

Benchmark D. Apply algebraic methods to represent and generalize problem situations involving vectors and matrices.

1. Model and solve problems with matrices and vectors.
2. Solve 3 by 3 systems of linear equations by elimination and using technology, and interpret graphically what the solution means (a point, line, plane, or no solution).

### **Data Analysis and Probability Standard**

Benchmark A. Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators.

1. Create a scatterplot of bivariate data, identify trends, and find a function to model the data.
2. Use technology to find the Least Squares Regression Line, the regression coefficient, and the correlation coefficient for bivariate data with a linear trend, and interpret each of these statistics in the context of the problem situation.
3. Describe the standard normal curve and its general properties, and answer questions dealing with data assumed to be normal.
4. Analyze and interpret univariate and bivariate data to identify patterns, note trends, draw conclusions, and make predictions.
5. Understand and use the concept of random variable, and compute and interpret the expected value for a random variable in simple cases.

Benchmark B. Use descriptive statistics to analyze and summarize data, including measures of center, dispersion, correlation and variability.

1. Describe how a linear transformation of univariate data affects range, mean, mode and median.

2. Use technology to find the Least Squares Regression Line, the regression coefficient, and the correlation coefficient for bivariate data with a linear trend, and interpret each of these statistics in the context of the problem situation.
3. Use technology to compute the standard deviation for a set of data, and interpret standard deviation in relation to the context or problem situation.
4. Analyze and interpret univariate and bivariate data to identify patterns, note trends, draw conclusions, and make predictions.

Benchmark C. Design and perform a statistical experiment, simulation or study; collect and interpret data; and use descriptive statistics to communicate and support predictions and conclusions.

1. Design a statistical experiment, survey or study for a problem; collect data for the problem; and interpret the data with appropriate graphical displays, descriptive statistics, concepts of variability, causation, correlation and standard deviation.
2. Describe the role of randomization in a well-designed study, especially as compared to a convenience sample, and the generalization of results from each.
3. Evaluate validity of results of a study based on characteristics of the study design, including sampling method, summary statistics and data analysis techniques.

Benchmark D. Connect statistical techniques to applications in workplace and consumer situations.

1. Design a statistical experiment, survey or study for a problem; collect data for the problem; and interpret the data with appropriate graphical displays, descriptive statistics, concepts of variability, causation, correlation and standard deviation.
2. Describe the role of randomization in a well-designed study, especially as compared to a convenience sample, and the generalization of results from each.
3. Evaluate validity of results of a study based on characteristics of the study design, including sampling method, summary statistics and data analysis techniques.
4. Examine statements and decisions involving risk; e.g., insurance rates and medical decisions.

# *Technology Standards*

## **Standard 1: Nature of Technology**

**Students develop an understanding of technology, its characteristics, scope, core concepts\* and relationships between technologies and other fields.**

Benchmark A: Synthesize information, evaluate and make decisions about technologies.

Benchmark B: Apply technological knowledge in decision-making.

Benchmark C: Examine the synergy between and among technologies and other fields of study when solving technological problems.

## **Standard 2: Technology and Society Interaction**

**Students recognize interactions among society, the environment and technology, and understand technology's relationship with history. Consideration of these concepts forms a foundation for engaging in responsible and ethical use of technology.**

Benchmark A: Interpret and practice responsible citizenship relative to technology.

Benchmark B: Demonstrate the relationship among people, technology and the environment.

Benchmark C: Interpret and evaluate the influence of technology throughout history, and predict its impact on the future.

Benchmark D: Analyze ethical and legal technology issues and formulate solutions and strategies that foster responsible technology usage.

Benchmark E: Forecast the impact of technological products and systems.

## **Standard 3: Technology for Productivity Applications**

**Students learn the operations of technology through the usage of technology and productivity tools.**

Benchmark A: Integrate conceptual knowledge of technology systems in determining practical applications for learning and technical problem-solving.

Benchmark B: Identify, select and apply appropriate technology tools and resources to produce creative works and to construct technology-enhanced models.

#### **Standard 4: Technology and Communication Applications**

**Students use an array of technologies and apply design concepts to communicate with multiple audiences, acquire and disseminate information and enhance learning.**

Benchmark A: Apply appropriate communication design principles in published and presented projects.

Benchmark B: Create, publish and present information, utilizing formats appropriate to the content and audience.

Benchmark C: Identify communication needs, select appropriate communication tools and design collaborative interactive projects and activities to communicate with others, incorporating emerging technologies.

#### **Standard 5: Technology and Information Literacy**

**Students engage in information literacy strategies, use the Internet, technology tools and resources, and apply information-management skills to answer questions and expand knowledge.**

Benchmark A: Determine and apply an evaluative process to all information sources chosen for a project.

Benchmark B: Apply a research process model to conduct research and meet information needs.

Benchmark C: Formulate advanced search strategies, demonstrating an understanding of the strengths and limitations of the Internet, and evaluate the quality and appropriate use of Internet resources.

Benchmark D: Evaluate choices of electronic resources and determine their strengths and limitations.

#### **Standard 6: Design**

**Students apply a number of problem-solving strategies demonstrating the nature of design, the role of engineering and the role of assessment.**

Benchmark A: Identify and produce a product or system using a design process, evaluate the final solution and communicate the findings.

Benchmark B: Recognize the role of teamwork in engineering design and of prototyping in the design process.

Benchmark C: Understand and apply research, development and experimentation to problem-solving.

## **Standard 7: Designed World**

**Students understand how the physical, informational and bio-related technological systems of the designed world are brought about by the design process. Critical to this will be students' understanding of their role in the designed world: its processes, products, standards, services, history, future, issues and career connections.**

Benchmark A: Classify, demonstrate, examine, and appraise energy and power technologies.

Benchmark B: Classify, demonstrate, examine and appraise transportation technologies.

Benchmark C: Classify, demonstrate, examine and appraise manufacturing technologies.

Benchmark D: Classify, demonstrate, examine and appraise construction technologies.

Benchmark E: Classify, demonstrate, examine and appraise information and communication technologies

Benchmark F: Classify, demonstrate, examine and appraise medical technologies.

Benchmark G: Classify, demonstrate, examine and appraise agricultural and related biotechnologies.

# *Performance Measures/Student Assessment/Instructional Strategies*

## **Assessments/Evaluations**

- Observations
- Demonstrations
- Portfolios
- Standardized Tests
- Class Assignment
- Quizzes/Tests/Exams

## **Instructional Strategies**

- Teacher-Directed & Student-Centered Activities
- Case Study Problem Solving
- Cooperative Learning
- Project-Based Learning
- Career-Based Learning (Internships/Shadowing/Placement)
- Community-Based Learning (CTSOs and Other)
- Exploratory Learning
- Independent Research
- Team Teaching

## **Content Specific Strategies**