## Math

<table>
<thead>
<tr>
<th>Subject</th>
<th>Elementary Math</th>
<th>Mid-level Math</th>
<th>Algebra</th>
<th>Algebra II</th>
<th>Geometry</th>
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<tbody>
<tr>
<td>Elementary Trigonometry</td>
<td>Trigonometry</td>
<td>Pre-Calculus</td>
<td>Calculus</td>
<td>Calculus BC</td>
<td>Multivariable Calculus</td>
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<tr>
<td>Elementary Differential Equations</td>
<td>Differential Equations</td>
<td>Quantitative Methods</td>
<td>Quantitative Reasoning</td>
<td>Data Analytics</td>
<td>R Programming</td>
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## Science & Engineering

<table>
<thead>
<tr>
<th>Subject</th>
<th>Engineering</th>
<th>Science</th>
<th>Biology</th>
<th>Microbiology</th>
<th>Environmental Science</th>
<th>Physics – Calculus Based</th>
<th>Physics – Algebra Based</th>
<th>Astronomy</th>
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## Health & Medical

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<thead>
<tr>
<th>Subject</th>
<th>Health Administration</th>
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<tr>
<td>Anatomy &amp; Physiology</td>
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<td>Advanced Nursing</td>
<td>Mental Health &amp; Psychiatric Nursing</td>
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<td>Nutrition &amp; Dietetics</td>
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## English/Humanities

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<thead>
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<th>Subject</th>
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<th>Literature</th>
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<td>Secondary Writing</td>
<td>Primary ELL</td>
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## Business

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<td>Managerial Accounting</td>
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<td>Govt/Nonprofit Accounting</td>
<td>Intro Economics</td>
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<td>Advanced Accounting</td>
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<td>Auditing</td>
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<td>Intro Ethics</td>
<td>Intro Philosophy</td>
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</table>
Elementary Math (Grades 4-6)

Counting and Cardinality
- One to One Correspondence
- Number recognition
- Count sequence
- Compare numbers - More or Less than or Equal
- Skip counting
- Odd and Even
- Number sequence
- Sets and Classifying objects

Operations and Algebraic Thinking
- Patterns
- Addition - Putting together / Adding to
- Subtraction - Taking apart / Taking From
- Addition and Subtraction
- Foundation of Multiplication
- Multiplication and Division
- Relationship of multiplication and Division
- Word Problems - Multiple steps
- Property of Operations
- Order of Operations
- Understanding Addition, Subtraction, Multiplication, and Division
- Equations
- Numerical Expression
- Functions
- Number Theory - Factors, Multiples, Primes, Divisibility
- Ratios, Rates, Proportions, Percent, Square Roots

Number Operations Base Ten and Fractions
- Parts and Wholes
- Base Ten
- Place Value
- Whole Numbers
- Fractions - Compare and Order
- Fractions - Read, Write, Model
- Decimal notation
- Decimals - Read, Write, Compare
- Equivalent Numbers - Decimals and Fractions
- Integers
- Divide Fraction by Fraction
- Build Fractions
- Money - Count bill coins, and Collection of Money

Measurement and Data
- Describe and Compare measurable attributes
- Sort and Classify Objects
- Time - Tell and write with both analog and digital
- Represent and Interpret Data
- Measurements - Compare Objects, Measure with Different objects
- Estimates
- Units and Tools
- Probability
- Geometric Measurement
- Conversion of Measurements and units
- Money
- Measurements of Angles
- Volume
- Graphing data points

Geometry
- Spatial Sense - Position of Objects
- Two Dimensional Shapes - Identify, Compare, Sort
- Composite and Real-World Shapes
- Composes Shapes
- Three Dimensional Shapes - Identify, Compare, Sort
- Identify Lines and Angles
- Perimeter, Area, Volume
- Coordinates
- Similar, Congruent, Symmetric Shapes
- Sorting and Classifying - by shape attributes
- Graph Coordinates

Additional Topics
- The number system
- Exponents
- Equations and Inequalities
- Dependent and Independent Variables
- Variability
- Summarize and Describe distributions
Elementary Math Methods

Planning, Teaching and Assessing
- Develop a Lesson
- Develop Assessments
- Evaluate Learning

Mathematical Practices and Processes
- Solve Problems using various and appropriate strategies
- Reason abstractly and quantitatively
- Construct and evaluate mathematical arguments
- Use representations to model with mathematics, such as counters, linked cubes, a balance and a number line
- Use tools strategically
- Use precise mathematical language, symbols and units
- Find and use patterns to make generalizations
- Determine if repeated processes are reasonable
- Make connections among mathematical ideas

Number Sense
- Classify numbers and use numbers in patterns
- Use conservation, group recognition, comparison, one-to-one correspondence
- Develop counting strategies counting on, counting back or skip counting
- Use place value to introduce the base 10 number system and decimals

Operations, Basic Facts and Computation
- Apply properties of operations
- Solve problems involving the four operations with whole numbers and fractions
- Add and subtract whole numbers within 20 fluently
- Multiply and divide whole numbers within 100 fluently
- Write and interpret numerical expressions
- Use models (such as geometric shapes and other objects) to order fractions, understand equivalent fractions and compute with fractions
- Compare decimal quantities and convert from fractions

Measurement and Data
- Solve problems involving measurement and estimation
- Represent and interpret data
- Tell and write time using analog and digital clocks
- Solve problems involving money
- Find the perimeter, area and volume of objects
- Convert like measurement units within a given measurement system
- Measure and sketch angles

Geometry
- Draw and identify lines and angles
- Classify shapes by properties of their lines and angles
- Graph points on the coordinate plane to solve problems
- Reason with shapes and their attributes
Mid-Level Math (Grades 7-8)

**Algebra, Patterns and Relationships**
- Algebraic Expressions
- Formulas
- Functions
- Graphing Relationships
- Inequalities
- Linear Relationships
- Number and Geometric Patterns
- Solving Equations
- Systems of Equations
- Variables and Substitution

Represent and Analyze Quantitative Relationships between Dependent and Independent Variables
Use Properties of Operations to Generate Equivalent Expressions
Work with Radicals and Integer Exponents
Understand the Connections between Proportional Relationships, Lines and Linear Equations
Analyze and Solve Linear Equations and Pairs of Simultaneous Linear Equations
Define, Evaluate and Compare Functions
Use Functions to Model Relationships between Quantities

**Data and Graphs**
- Experiments and Data Collection
- Infer, Predict, Evaluate, Compare Data
- Measures of Central Tendency and Variation
- Represent, Read, Interpret Data Displays

**Geometry**
- Circles and Pi
- Classify Two- and Three-Dimensional Figures
- Coordinate Plane
- Drawing, Modeling, and Constructing Figures and Describe the Relationships between them
- Formulas for Perimeter, Area, Surface Area, Volume
- Logic and Reasoning
- Points, Lines, and Planes
- Properties of Two-Dimensional Figures
- Understand and Apply the Pythagorean Theorem
- Similarity, Congruence, and Symmetry Transformations

**Measurement**
- Estimate and Measure
- Measurement Systems
- Measurement Tools
- Rates, Indirect Measurements, Proportion

**Numbers**
- Compare and Order Numbers
- Equivalent Forms of Rational Numbers
- Estimation and Rounding
- Exponents and Roots
- Number Properties
- Number Theory Concepts
- Operations to Solve Problems
- Operations with Integers and Absolute Value
- Operations with Real Numbers
- Order of Operations
- Percents
- Ratios, Rates, Proportions
- Understand Ratio Concepts and Use Ratio Reasoning to Solve Problems
- Real Number System

**Probability**
- Develop Understanding of Statistical Variability
- Summarize and Describe Distributions
- Sample Space, Combinations, Permutations
- Theoretical and Experimental Probability
- Use Random Sampling to Draw Inferences about a Population
- Draw Informal Comparative Inferences about Two Populations
- Investigate Chance Processes and Develop, Use, and Evaluate Probability Models
- Understand Patterns of Association in Bivariate Data
Algebra

Absolute Value Equations and Inequalities
- Graphing Absolute Value Equations and Inequalities
- Solving Absolute Value Equations and Inequalities

Algebraic Expressions
- Add, Subtract Expressions
- Multiply, Divide, Factor Expressions including Exponents
- Variables and Expressions

Linear Equations and Inequalities
- Slope, Intercepts, Points on a Line
- Solving Linear Equations
- Solving Linear Inequalities
- Solving Problems with Equations and Inequalities
- Systems of Equations and Inequalities
- Writing and Graphing Linear Equations
- Writing and Graphing Linear Inequalities

Numbers
- Exponents and Roots
- Number Properties
- Number Theory Concepts
- Operations with Real Numbers
- Ratios, Proportions, Percents and Rates

Patterns and Functions
- Composition and Operations on Functions
- Graphing Functions and Transformations
- Inverse of Function
- Patterns
- Properties of Functions - Domain and Range
- Properties of Functions - Zeros, End Behavior, Turning Points
- Relations and Functions
- Solving Problems with Functions
- Translate Between Forms

Probability
- Counting Principles and Sample Spaces
- Theoretical and Experimental Probability

Quadratic Equations, Inequalities, and Functions
- Factoring Quadratic Equations
- Graphing and Properties of Quadratic Equations
- Solving Quadratic Equations and Inequalities
- Systems of Nonlinear Equations and Inequalities

Radical, Exponential and Logarithmic Equations and Functions
- Graphing Exponential and Logarithmic Functions
- Properties of Exponents and Logarithms
- Radical Expressions, Equations and Rational Exponents
- Solving Exponential and Logarithmic Equations and Inequalities
- Solving Problems with Exponential and Logarithmic Functions

Statistics
- Data Analysis – Data Collection – Data Displays – Measures of Data
Algebra II

Absolute Value Equations and Inequalities
   Graphing Absolute Value Equations and Inequalities
   Solving Absolute Value Equations and Inequalities

Conic Sections
   Properties of Conic Sections
   Solving Problems with Conic Sections

Linear Functions, Equations, and Inequalities
   Slope, Intercepts, Points on a Line
   Solving Linear Equations
   Solving Linear Inequalities
   Solving Problems with Equations and Inequalities
   Systems of Equations and Inequalities
   Writing and Graphing Linear Equations
   Writing and Graphing Linear Inequalities

Matrices
   Matrices Operations and Problems

Numbers
   Complex Numbers
   Number Properties
   Operations with Real Numbers

Patterns and Functions
   Composition and Operations on Functions
   Graphing Functions and Transformations
   Inverse of Function
   Patterns
   Properties of Functions - Domain and Range
   Properties of Functions - Zeros, End Behavior, Turning Points
   Relations and Functions
   Solving Problems with Functions

Translate Between Forms

Polynomial, Rational Expressions, Equations and Functions
   Solving and Graphing Polynomial Equations
   Solving and Graphing Rational Equations

Probability
   Counting Principles and Sample Spaces
   Theoretical and Experimental Probability

Quadratic Equations, Inequalities, and Functions
   Complex Solutions to Quadratic Equations
   Factoring Quadratic Equations
   Graphing and Properties of Quadratic Equations
   Solving Quadratic Equations and Inequalities
   Systems of Nonlinear Equations and Inequalities

Radical, Exponential and Logarithmic Equations and Functions
   Graphing Exponential and Logarithmic Functions
   Properties of Exponents and Logarithms
   Radical Expressions, Equations and Rational Exponents
   Solving Exponential and Logarithmic Equations and inequalities
   Solving Problems with Exponential and Logarithmic Functions

Sequences and Series
   Properties of Sequences and Series
   Solving Problems with Sequences and Series

Statistics
   Data Analysis
   Data Collection
   Data Displays
   Measures of Data
Geometry

Measurement
  Formulas and Measurement
  Indirect Measurements, Ratios, and Rates
  Units, Unit Conversions, and Error

Points, Lines, Angles, Planes
  Angle Relationships and Problems
  Coordinate Geometry - Slope, Distance, Midpoint
  Geometric Constructions

Proofs and Logic
  Conditional Statements
  Conjectures, Axioms, Theorems, Proofs
  Inductive and Deductive Reasoning

Two- and Three- Dimensional Shapes
  Congruency
  Relationship Between Plane and Solid Figures
  Right Triangles, Including Pythagorean Theorem
  Similarity
  Symmetry and Transformations
  Theorems and Problems with Circles
  Theorems and Problems with Polygons
  Theorems and Problems with Quadrilaterals
  Theorems and Problems with Triangles
  Three-Dimensional Figures
  Trigonometric Ratios in Right Triangles


**Trigonometry**

**Complex Numbers**
- Polar Coordinates, DeMoivre’s Theorem
- Trigonometric Form
- \( z \) Complex Number

**Introduction to Trigonometry: Linear Relationships and Functions**
- Introduction to Trigonometry
- Introduction to Trigonometry: Linear Relationships and Functions
- Relations, Functions, and Graphs
- Defining and Finding Trigonometric Functions
- Slope, Linear Relations, Scatter Plots, and Piecewise Functions
- Introduction to Trigonometry: Linear Relationships and Functions Unit Review

**Trigonometric Ratios**
- Trigonometric Ratios
- Angles and Angle Measures
- Measuring angles using radian and degree measures
- Right Triangles and Trigonometric Ratios
- The Unit Circle
- Trigonometric Ratios Unit Review

**Graphing Trigonometric Functions**
- Introduction to Graphing Trigonometric Functions
- Graphing Trigonometric and Inverse Functions
- Inverse Trigonometric Functions
- Transformations of Trigonometric Functions
- Real-world Applications of Trigonometric Functions
- Vectors
- Graphing Trigonometric Functions Unit Review

**Trigonometric Laws and Identities**
- Trigonometric Laws and Identities
- Law of Sines and Law of Cosines
- Trigonometric Identities and Equations
- Area of Triangles
- Angular and Linear Velocities
- Trigonometric Laws and Identities Unit Review
- Modeling Periodic Phenomenon

**Vectors**
- Graphing and Operations with Vectors
- Solving problems with Vectors
Pre-Calculus

Functions
Know and use a definition of a function
Write a function that describes a relationship between two quantities
Perform algebraic operations on functions and apply transformations
Write an expression for the composition of one given function with another and find the domain, range, and graph of the composite function
Determine whether a function has an inverse and express the inverse, if it exist
Know and interpret the function notation for inverses
Identify and describe the discontinuities of a function and how these relate to the graph
Understand the concept of limit of a function as x approaches a number or infinity
Analyze a graph as it approaches an asymptote
Computer limits of simple functions
Explain how rates of change of functions in different families differ

Exponents and Logarithms
Use the inverse relationship between exponential and logarithmic functions to solve equations and problems
Graph logarithmic functions
Graph translations and reflections of functions
Compare the large-scale behavior of exponential and logarithmic functions with different bases and recognize that different growth rates are visible in the graphs of the functions
Solve exponential and logarithmic equations
Find an exponential or logarithmic function to model a given set of data or situation
Solve problems involving exponential growth and decay

Quadratic Functions
Solve quadratic type equations by substitution
Apply quadratic functions and their graphs in the context of motion under gravity and simple optimization problems
Find a quadratic function to model a given set of data or situation

Polynomials
Given a polynomial function, find the intervals on which the function's values are positive and those where it is negative
Solve polynomial equations and inequalities of degree of three or higher
Graph polynomial functions given in factored form using zeros and their multiplicities, testing the sign on intervals and analyzing the function's large scale behavior

Rational Functions and Difference Quotients
Solve equations and inequalities involving rational functions
Graph rational functions; identify asymptotes, analyzing their behavior for large x values and testing intervals
Given vertical and horizontal asymptotes, find an expression for a rational function
Know and apply the definition and geometric interpretation of difference quotient
Simplify difference quotients
Interpret difference quotients as rates of change and slopes of secants lines

Trigonometric Functions
Define and graph and use all trigonometric functions of any angle
Convert between radian and degree measure
Calculate arc lengths in given circles
Graph transformations of the sine and cosine functions
Explain the relationship between constants in the formula and transformed graph
Know basic properties of the inverse trigonometric functions, including their domains and ranges. Recognize their graphs
Know the basic trigonometric identities for sine, cosine, and tangent
Pythagorean identities
Sum and difference formulas
Co-functions relationships
Double-angle and half angle formulas
Solve trigonometric equations using basic identities and inverse trigonometric functions
Prove and derive trigonometric identities
Find a sinusoidal function to model a given set of data or situation

**Vectors, Matrices and Systems of Equations**
- Perform operations on vectors in the plane
- Solve applied problems using vectors
- Know and apply the algebraic and geometric definitions of the dot product of vectors
- Know the definitions of matrix addition and multiplication
- Add, subtract and multiply matrices
- Multiply a vector by a matrix
- Represent rotations of the plane as matrices and apply to find the equations of rotated conics
- Define the inverse of a matrix and computer the inverse of two-by-two and three-by-three matrices
- Computer determinants of two-by-two and three-by-three matrices
- Write systems of two and three linear equations in matrix form
- Solve systems using Gaussian elimination or inverse matrices
- Represent and solve inequalities in two variables
- Linear programming

**Sequence, Series and Mathematical Induction**
- Know, explain and use sigma and factorial notation
- Write an expression for the nth term
- Write a particular term of a sequence when given the nth term
- Understand, explain and use the formulas for the sums of finite arithmetic and geometric sequences
- Compute the sums of infinite geometric series
- Understand and apply the convergence criterion for geometric series
- The principle of mathematical induction
- Pascal’s triangle
- Binomial theorem

**Polar Coordinates, Parameterizations, and Conic Sections**
- Convert between polar and rectangular coordinates
- Graph functions given in polar coordinates
- Write complex numbers in polar form
- De Moivre’s theorem
- Evaluate parametric equations for given values of the parameter
- Convert between parametric and rectangular forms of equations
- Graph curves described by parametric equations
- Use parametric equations in applied contexts to model situations
- Identify parabolas, ellipses and hyperbolas from equations
- Write the equation in standard form and graph parabolas, ellipses and hyperbolas
- Derive the equation for a conic section from given geometric information
- Identify key characteristics of a conic section from its equation or graph
- Identify conic sections whose equations are in polar or parametric form

**Modeling Mathematics**
- Construct a tangent from a point outside a given circle to a circle
- Cavalieri’s principle
- Identify the shapes of two dimensional cross sections of three dimensional objects
- Identify three dimensional objects generated by rotations of two-dimensional objects
**Calculus**

**Limits of functions (including one-sided limits)**
- Calculate limits using algebra
- Estimating limits from graphs or tables
- Limits proofs for linear functions
- Vertical asymptotes and infinite limits
- Horizontal asymptotes and limits to infinity
- L'Hospital's Rule

**Continuity**
- Understanding continuity in terms of limits
- Types of discontinuity (infinite, jump, removable)
- Determining continuity from a graph or rule for a function
- Intermediate Value Theorem

**Derivatives**
- Compute derivatives of functions: power, exponential, logarithmic, trigonometric, inverse trig
- Apply Product Rule, Quotient Rule, Chain Rule, etc.
- Understand the first and second derivative graphically
- Approximate derivative from graph or tables
- Interpretation of the derivative as a rate of change (limit of an average rate of change)
- Relationship between differentiability and continuity
- Tangent line to curve
- Linear approximation and differentials
- Relationship between increasing and decreasing behavior and the sign of the derivative
- Mean Value Theorem
- Relationship between concavity and the sign of the second derivative
- Inflection Points
- Optimization Problems
- Related Rates Problems
- Implicit differentiation
- Antiderivatives and initial value problems
- Particle motion (position, velocity, acceleration)
- Slope fields and solution curves for differential equations

**Integrals**
- Riemann sums
- Basic properties of definite integrals
- Applications of integrals (including areas, arc length, volumes for solids of revolution)
- Fundamental Theorem of Calculus, Parts I and II
- Definite and indefinite integrals of basic functions
- Techniques of Integration (Substitution, Parts, Partial Fractions, Trigonometric Substitution)
- Improper Integrals
- Numerical Approximation of Integrals
- Separable differential equations

**Parametric and Polar Curves**
- Graphs, derivatives, areas, arc length

**Series and Sequences**
- Sequence convergence
- Partial Sums and the definition of series convergence
- Geometric Series and their sums
- Tests for series convergence
- Test for divergence (nth term test)
- Integral test and p-Series
- Alternating series
- Comparison test and limit comparison test
- Ratio and Root Test
- Power series, radius and interval of convergence
- Maclaurin and Taylor series

In addition, the concepts below are frequently seen by students in pre-Calculus courses and ones that all Calculus tutors are expected to know and be able to assist students with:
- Circle, ellipse, hyperbola, and parabola
- Trigonometric graphs
- Perform translations for various conic sections
- Law of Cosines and Law of Sines
- Arithmetic and Geometric sequences
- Functions and Graphs (Linear and Polynomial)
- Trigonometric Ratios and Identities
- Exponential and Logarithmic Functions
- Maclaurin and Taylor series
Calculus BC

Calculus Basics
  Combining Functions
  Patterns in Graphs

Limits and Continuity
  Finding Limits Analytically
  Asymptotes as Limits
  Relative Magnitudes for Limits
  When Limits Do and Don't Exist
  Continuity
  Intermediate and Extreme Value Theorems

Derivatives
  Slope and Change
  Derivatives at a Point
  The Derivative
  The Power Rule
  Sums, Differences, Products and Quotients
  Graphs of Functions and Derivatives
  Continuity and Differentiability
  Rolle's and Mean Value Theorems
  Higher Order Derivatives
  Concavity
  Chain Rule
  Implicit Differentiation

Rates of Change
  Extrema
  Optimization
  Tangent and Normal Lines
  Tangents to Polar Curves
  Tangent Line Approximation
  Rates and Derivatives
  Rectilinear Motion
  Motion with Vector Functions

Integrals
  Riemann's Sums
  Area Approximations
  The Definite Integral
  Properties of Integrals
  Graphing Calculator Integration
  Application of Accumulated Change
  The Fundamental Theorem of Calculus
  Definite Integrals of Composite Functions
  Analyzing Functions and Integrals
  Area Between Curves
  Volumes of Revolution
  Cross Sections
  Arc Length

Inverse and Transcendental Functions
  Derivatives of Inverses
  Inverse Trigonometric Functions
  Logarithmic and Exponential Review
  Transcendentals and 1/x
  Derivatives of Logarithms and Exponentials
  L'Hopital's Rule
  Analysis of Transcendental Curves
  Integrating Transcendental Functions
  Partial Fractions
  Integration by Parts
  Improper Integrals
  Application of Transcendental Integrals
  Derivatives of Parametric Functions
  Integrating Parametric and Polar Functions

Separable Differential Equations and Slope Field
  Slope Fields
  Differential Equations and Models
  Euler's Method
  Exponential Growth
  Application of Differential Equations

Sequences and Series
  Sequences
  Series
  Convergence Tests
  Radius of Convergence
  Functions Defined by Power Series
  Taylor and Maclaurin Series
  Taylor's Theorem and Lagrange Error
Multivariable Calculus

Vectors & Geometry of Space in Multiple Dimensions
  Two Dimensional Coordinate Systems
  Three Dimensional Coordinate Systems
  Vectors
  Cylindrical Coordinates
  Spherical Coordinates
  The Dot Product
  The Cross Product
  Equations of Lines and Planes
  Cylinders and Quadric Surfaces
  Functions of Several Variables

Vector Functions
  Vector Functions and Space Curves
  Derivatives of Vector Functions
  Integrals of Vector Functions
  Tangent, Normal, and Binormal Vectors
  Arc Length and Curvature
  Motion: Position, Velocity, and Acceleration

Multivariable Differentiation
  Limits and Continuity
  Partial Derivatives
  Differentials
  Chain Rule
  Tangent Planes and Linear Approximations
  The Gradient Vector Operator and Directional Derivative
  Critical Points: Relative and Absolute Extrema
  Lagrange Multipliers

Multivariable Integration
  Double Integrals over General Regions
  Double Integrals in Polar Coordinates
  Applications of Double Integrals
  Triple Integrals
  Triple Integrals in Cylindrical and Spherical Coordinates
  Applications of Triple Integrals
  Change of Variables: Jacobian of a Transformation

Vector Calculus: Line Integrals
  Vector Fields
  Line Integrals
  The Fundamental Theorem For Line Integrals
  Conservative Vector Fields
  Potential Functions of Vector Fields
  Green’s Theorem
  The Divergence and Curl Vector Operators

Vector Calculus: Surface Integrals
  Parametric Surfaces and Area
  Surface Integrals
  Stokes’ Theorem
  Gauss’ Divergence Theorem
Finite Math

Solve linear equations and inequalities.
Graph linear equations in two variables.
Use mathematical modeling and linear regression to make predictions.
Solve function problems.
Quadratic Functions
Polynomial and Rational Functions
Solve exponential function problems.
Solve logarithmic function problems.
Solve simple interest problems.
Solve compound interest problems.
Solve problems involving future and present value of annuities. (sinking funds and amortization)
Solve systems of linear equations.
Gauss Jordan Elimination
Perform operations on matrices.
Inverse of a square matrix
Solve matrix equations.
Apply matrices in a real world scenario.
Inequalities in two variables
Systems of linear inequalities in two variables
Solve linear programming problems geometrically
Geometric Introduction to the Simplex Method
Maximization and Minimization with Mixed Problem Constraints
Basic Counting Principles
Permutations and Combinations
Sample Spaces, Events and Probability
Apply counting principles to solve problems.
Conditional Probability, Intersection and Independence
Solve probability problems.
Random Variables, Probability Distribution and Expected Value
Solve problems involving discrete probability.
Solve problems involving discrete probability.
Make decisions by computing the expected value of random variables.
Summarize and present data using graphs, measures of central tendency, and measures of dispersion.
Bernoulli Trials and Binomial Distribution
Normal Distributions
Solve linear programming problems geometrically.
Solve linear programming problems by the simplex method.
Solve problems involving Markov chains.
Properties of Markov Chains
Regular Markov Chains
Absorbing Markov Chains
Solve problems involving game theory.
Strictly Determined Games
Mixed Strategies Games
Linear Programming and 2 x 2 games - geometric approach
Linear programming and m x n games - simplex method and the dual
Discrete Math

- Apply basic enumeration techniques.
- Simplify assertions and compound statements in first-order logic.
- Apply basic set-theoretic concepts.
- Apply the principles of mathematical induction and recursion.
- Apply the basic concepts of computational complexity and algorithmic analysis.
- Solve problems of iteration.
- Manipulate relations and simple functions and their inverses.
- Use the properties of relations.
- Apply the properties of equivalence relations and partitions.
- Use the Principle of Inclusion and Exclusion.
- Identify graph isomorphism, planarity, connected components, and chromatic numbers.
- Identify properties of a tree.
- Apply properties of general graphs.
- Apply the basic concepts of Boolean algebra.
- Use the basic laws of Boolean algebra.
- Convert Boolean expressions into a disjunctive or conjunctive normal form.
Statistics

**Analyze Data**
- Confidence Intervals
- Correlation
- Expected Values and Probability Distributions
- Hypothesis Testing
- Infer and Predict
- Regression
- Sample Distributions and Central Limit Theorem

**Collect Data**
- Experiments and Data Collection
- Sampling

**Probability**
- Computing Probability
- Counting - Combinations and Permutations

**Summarize Data**
- Data Distribution
- Display Data
- Measures of Data
- Read, Interpret, Classify Data
Intermediate Statistics

Probability
- Probability Theory
- Random Variables
- Simulations (including Monte Carlo)

Discrete Probability Distributions
- General
- Binomial & Negative Binomial
- Geometric & Hypergeometric
- Poisson
- Multinomial

Continuous Probability Distributions
- Normal/Student’s T
- Log Normal
- Bivariate
- Gamma & Beta
- Exponential
- Chi-square
- F

Statistical Inference
- Confidence Intervals
- Hypothesis Testing
- Errors, Power, & Effect Size

ANOVA
- One-way ANOVA
- Two-way ANOVA
- Factorial – interactions
- Randomized block ANOVA
- Repeated Measures
- Post-hoc analysis/multiple comparisons (Bonferroni, Tukey, LSD)

Nonparametric Tests
- 1-sample sign test
- Wilcoxon rank tests
- Kruskal-Wallis Test
- Friedman Test
- Mann-Whitney Test
- Mood’s Median Test
- Spearman Rank Correlation

Regression and Correlation
- Simple Linear Regression
- Multiple Regression
- Logistic Regression
- Polynomial Regression
- ANCOVA
Quantitative Reasoning

Logic/Critical Thinking
- Truth Tables
- Simple Statements
- Venn Diagrams
- Compound Statements
- Analyzing Arguments

Arithmetic Knowledge
- Fractions
- Decimals and Rounding
- Scientific Notation, Powers of 10, and Approximations
- Rate, Ratio and Proportion
- Percentages
- Uses and Abuses of Percentages
- Index Numbers
- Unit Conversions
- Interpretation of Graphs

Geometry/Trigonometry
- Perimeters and Areas of Basic Geometric Shapes
- Measures of Distance and the Pythagorean Theorem
- Volume and Surface Area
- Basic Trigonometry
- Graphs of the Trigonometric Functions
- Applications of Trigonometry

Functions
- Definition and the Vertical Line Test
- One-to-one and Inverse Functions, the Horizontal Line Test
- Linear Functions (Standard and Slope-intercept Forms of Equations)
- Applications of Linear Models
- Linear Inequalities
- Nonlinear Models (Exponential, Power, Logarithmic)
- Graphing Functions (Excel or TI-84/83)
- Solving systems of equations (Linear & Nonlinear)
- Linear Programming (Graphical Method)
- Linear Programming (Simplex Method)

The Mathematics of Finance
- Simple Interest
- Compound Interest (Lump Sums and Annuities)
- Applications of Compound Interest
- Amortization Schedules

Descriptive Statistics
- Measures of Central Tendency
- Measures of Spread/Dispersion/Variation
- Percentiles & Z-scores
- Graphing Tools Used to Summarize Data

Designing & Analyzing Studies
- Observational vs Experimental Studies
- Sampling Methods (Strengths and Weaknesses)
- Critical Evaluation of Statistical Studies

Probability Rules & Simulation
- Counting Methods - Multiplication Principle, Permutations, Combinations
- Probability Concepts and Rules
- Independent vs. Dependent Events
- Joint vs. Disjoint (Mutually Exclusive) Events
- Law of Large Numbers
- Simulation Using TI-84/83 or MS Excel
- Probability Distributions
- Discrete vs Continuous Distributions
- Normal Distribution
- Random Variables and Probability Distributions
- Expected Value & Risk Assessment
- Binomial and Geometric Distributions, including Normal Approximation to the Binomial Distribution

Inductive/Deductive Reasoning

Inference & Regression
- Central Limit Theorem
- Logic of Confidence Intervals
- Logic of Hypothesis Testing
- One Sample Inference Testing
- One Sample Inference About a Population Mean
- One Sample Inference About a Population Proportion
- Scatterplots & Correlation
- Simple Linear Regression
Quantitative Methods

Applications and Limitations of Quantitative Analysis
- Business and Decision Analysis
- Arts and Social Sciences
- Medical and Health Sciences

Data and Terms
- Data Quality and measures
- Multivariate data
- F Statistic
- Coefficient Interpretation
- Data Sensitivity
- Hypothesis Testing

Decision Models
- Maximin and Maximax
- Hurwicz
- Expected Value and Expected Value Perfect Information
- Decision Tree
- Equal Likelihood
- Highest Value vs Lowest Cost

Forecasting
- Linear Regression
- Non-Linear Regression
- Moving Average
- Exponential Smoothing
- Seasonal Index

Linear Algebra
- Vector
- Matrix
- Determinant
- Solving systems

Calculus
- Functions
- Derivatives
- Optimization

Advanced Statistical Modeling
- Chi Square
- Data Clustering
- ANOVA
- Simulation
- Probability Modeling
Data Analytics

Predictive Analytics and Machine Learning
  Support Vector Regression
  Naive Bayes
  Neural Networks
  K-Means

Applications and Limitations of Quantitative Analysis
  Business and Decision Analysis
  Arts and Social Sciences
  Medical and Health Sciences

Data and Terms
  Data Quality and measures
  Multivariate data
  F Statistic
  Coefficient Interpretation
  Data Sensitivity
  Hypothesis Testing
  Data Aggregation
  Data Slicing
  Data Cleansing
  Python Data Analytics Libraries (pandas, numpy, matplotlib, sickit-learn)

Decision Models
  Maximin and Maximax
  Hurwicz
  Expected Value and Expected Value Perfect Information
  Decision Tree
  Equal Likelihood
  Highest Value vs Lowest Cost

Forecasting
  Linear Regression
  Non-Linear Regression
  Moving Average
  Exponential Smoothing
  Seasonal Index

Linear Algebra
  Vector
  Matrix
  Determinant
  Solving systems

Calculus
  Functions
  Derivatives
  Optimization

Advanced Statistical Modeling
  Chi Square
  Data Clustering
  ANOVA
  Simulation
  Probability Modeling
Linear Algebra

**Systems of Linear Equations**
- Homogeneous and non-homogeneous systems
- Matrix representation of system
- Row reduction and echelon forms
- Gaussian and Gauss-Jordan elimination
- Consistent and inconsistent systems

**Matrix Properties and Arithmetic**
- Addition, Subtractions, Scalar Multiplication
- Matrix multiplication
- Transpose of a matrix
- Special Matrices - Identity, zero, diagonal, etc.
- Elementary matrices and elementary row operations
- Row equivalence

**Determinants**
- Determinant of 2 x 2 and 3 x 3 matrices
- Co-factor expansion
- Cramer’s Rule
- Theorems involving determinants and invertibility
- Properties of determinants

**Linear Transformations**
- Properties of linear transformations
- Matrix representation of linear transformation
- Kernel
- Range
- Change of basis

**Vector Spaces**
- Linear dependence and independence
- Rank and nullity of a matrix
- Properties of vector spaces
- Subspaces
- Span of a vector space
- Basis of a vector space
- Properties of vectors and vector arithmetic

**Eigenvalues and Eigenvectors**
- Eigenvalues and Eigenvectors
- The Characteristic Equation

**Matrix Decomposition**
- LU decomposition
- QR decomposition
- Diagonalization
- Singular Value decomposition

**Orthogonality/Least Squares**
- Inner product spaces
- Orthogonality
- Orthonormal bases
- Gram-Schmidt orthonormalization
- Least squares regression
Differential Equations

Introduction to Ordinary Differential Equations
- Define and classify differential equations
- Determine whether a function is a solution to a DE
- Existence and Uniqueness Theorem
- Principle of Superposition

1st order Ordinary Differential Equations
- Identify 1st order linear, separable, exact, Bernoulli, and homogeneous 1st order ODEs
- Find general solution for 1st order ODEs
- Solve 1st order initial value problems
- Construct and solve ODEs for applications such as mixtures, populations, and Newtonian Mechanics

Gaining information about ODEs without solving
- Identify autonomous 1st order ODEs
- Find and classify equilibrium solutions to autonomous 1st order ODEs with constant coefficients
- Predict end behavior of solution to autonomous ODE given initial condition
- Construct, identify, and interpret slope/direction fields
- Euler’s method

Higher Order ODEs
- Linear independence of solutions
- Construct and solve problems involving harmonic motion, electrical circuits, and projectile motion
- Solve linear higher order ODEs with constant coefficients using method of undetermined coefficients
- Find second solution to 2nd order ODE using method of Reduction of Order
- Find particular solution to 2nd order nonhomogeneous ODE using variation of parameters
- Solve Cauchy-Euler equations

Laplace Transforms
- Compute Laplace transforms of simple functions using definition of Laplace transform
- Compute Laplace transforms of polynomial, exponential, and trig functions using table
- Solve IVPs using Laplace transforms

Power Series Solutions of ODEs
- Manipulate power series
- Identify ordinary and singular points of ODEs
- Evaluate recurrence relations
- Find power series solutions of ODEs

Systems of 1st Order Differential Equations
- Use row operations to reduce matrices
- Compute eigenvalues and eigenvectors of square matrices
- Solve system of two 1st order linear ODEs with constant coefficients using matrix methods
- Convert 2nd order linear ODE to a system of two first order linear ODEs
- Orthogonality
- Orthonormal bases
- Gram-Schmidt orthonormalization
- Least squares regression
Business Statistics
  Data Interpretation
  Graphs and Charts
  Measures of Central Tendency

Consumer Credit
  Credit
  Depreciation
  Loans and Mortgages

Equations
  Formulas
  Solving Equations
  Writing Equations

Investing
  Bank Accounts
  Interest
  Present and Future Value
  Stocks, Bonds, and Mutual Funds

Numbers
  Decimals
  Fractions
  Whole Numbers and Integers
  Probability
  Ratios and Proportions
  Real Number System

Payroll
  Deductions
  Gross Pay
  Taxes

Percent
  Converting
  Discounts
  Markups and Markdowns
  Problem Solving
  Sales Terms
Elementary Science

Grades 4-6
- 5 Senses
- Animals
- Astronomy
- Atmosphere
- Atoms
- Basic Needs for Living Organisms
- Calendar
- Carbon Cycle
- Cells
- Classifying Living Things
- Earthquakes
- Earth’s Resources
- Earth’s Surface
- Ecosystem
- Electricity
- Energy
- Energy Conservation
- Environment
- Food Chain/Web
- Forces and Motion
- Fossils
- Genetics
- Heat
- Insect Life Cycle
- Invertebrates
- Investigation
- Light
- Light Energy
- Magnets
- Matter
- Nitrogen Cycle
- Organ Systems
- Plants
- Reproduction
- Resources
- Rock Cycle
- Rocks
- Seasons
- Simple Machines
- Soil
- States of Matter
- Tools
- Vertebrates
- Volcanoes
- Water
- Weather
- Work

(Grades 7-8)
- Astronomy
- Cell Structure and Function
- Earth
- Ecology
- Genetics
- Human Body
- Living Organisms
- Matter
- Metric system
- Motion
- Optics
- Periodic Table
- Scientific Method
- Scientific Tools
Earth Science

Math basics
  Algebra
  Dimensional analysis
  Metric system
  Scientific notation
  Significant digits

Nature of Science
  Accuracy and precision
  Bias and Ethics
  Communication
  Data collection and analysis
  Graphical interpretations
  Models
  Scientific Method
  Scientific Quantities
  Scientific Thinking
  Scientists and Discoveries
  Theories and Laws
  Tools and Measurement

Geology
  Biomes
  Chemical Cycles
  Climate change
  Ecosystems
  Energy flow – Carbon cycle – Population Growth
  Erosion and Weathering
  First Principle of Geology
  Fossils
  Glaciers
  Human impact/changes to planet
  Law of Superposition
  Minerals
  Natural disasters – causes, effects, impact
  Natural Resources
  Plate Tectonics
  Pollution
  Population
  Principle of Uniform Process
  Radioactive dating of rocks
  Relative Age
  Soil
  Time
  Types of Rock and the Rock Cycle
  Unconformity
  Water

Meteorology
  Air
  Weather Conditions and how they are created
  Global Weather
  Predication, forecast and measurement
  Tools for measuring weather conditions
  Weather map construction and interpretation
  Clouds
  Air Mass
  Climates

Oceanography
  Sea Floor Profile
  Parts of the Ocean
  Salinity
  Contributors to the water in the ocean
  Resources
  Coriolis Effect
  Major currents in the world and features
  Waves
  Tsunami characteristics

Astronomy
  Earth, Sun, and Moon System
  Features of the Moon
  Theories of the creation of the moon
  Sun
  Solar system
  Stars
  Galaxies
  Big Bang Theory and evidence
  Space probes and exploration
  Telescopes
**Biology**

**Chemistry of Life**
- Atoms
- Carbohydrates, Lipids, Proteins, and Nucleic Acids
- Chemical Gradients
- Important properties of water
- Molecular Movement, Osmosis and Diffusion
- Monomers and Polymers
- Origins of life
- pH

**Cell Structure and Function**
- Active and Passive Transport
  - Cell junctions
  - Cellular Transport across the Cell Membrane
  - Facilitated Diffusion
  - Fluid Mosaic Model of the Cell Membrane and Semi-permeability
- Prokaryotic and eukaryotic cells
- Receptor Proteins
- Signaling Molecules
- Structure and function of cellular components

**Cellular Energetics**
- Autotrophs and Heterotrophs
  - Calvin Cycle
- Cell cycle
- Cell Cycle Checkpoints
- Cell Reproduction
  - Change in free energy
  - Chemosynthesis
  - Coupled reactions, activation energy, and ATP
- Electron Transport Chain
- Enzymes, enzymatic functions, and enzymatic pathways
- Exergonic and Endergonic Reactions
- Fermentation
- G0, G1, S, G2, and M Phases of the Cell Cycle
- Glycolysis
- Krebs Cycle
- Light-Dependent Reactions of Photosynthesis
- Meiosis
- Mitosis
- Oncogenes and Tumor Suppressors in relation to cell cycle
- Ploidy

**Molecular Biology**
- DNA and genome structure
- Famous experiments
- Genetic Engineering Techniques and Their Uses
- Introns and mRNA splicing
- Mutations and Chromosomal Abnormalities
- Regulation of Gene Expression and Epigenetics
- Semi-conservative replication
- Translation
  - Translation and protein processing

**Heredity**
- Dominance, co-dominance, and incomplete dominance
- Inheritance
- Mendel’s Law of Heredity
- Mitochondrial DNA
- Monohybrid, Dihybrid, and Trihybrid Crosses
- Pedigree Analysis
- Probability of Genotypes or Phenotypes based on Genetic Crosses
- Sex-linked Traits

**Evolution and Phylogeny**
- Cell Theory and Characteristics of Life
- Common Ancestry
- Evidence Supporting Evolution
- Examples of Selective Pressures and Their Effects on Population
- Natural Selection and Fitness
- RNA World Hypothesis
- The Role of Genetic Drift, Mutation, and Sexual Reproduction in Evolution
- Theory of Endosymbiosis
- Three-Domain Hypothesis
- Types of Selection
- Hardy-Weinberg Equilibrium
- Phylogenetic Trees & Cladograms
- Speciation & Extinction
- Taxonomy

**Bacteria**
- Bacterial Conjugation
- Basic Structures
- Binary Fission
- Characteristics
Viruses
Basic Structure Including:
Capsid/Coat Proteins
Characteristics
Genetic Material (including Reverse Transcriptase for RNA viruses)
Lytic and Lysogenic Stages of Virus Life Cycle
Relationship of Cell Receptors to Entrance of Viruses into Host cells
Relationship of Viruses to Cancer
Role of Mutation on the Evolution of Viruses

Animal Form & Function
Animal Behavior
Animal Reproduction
Body Plan Development
Characteristics of the Following Taxa:
Endotherms and Ectotherms
Epithelial, Connective, Muscle, Nervous
Homeostasis, Feedback Loops, and Hormones
Origin and Function of the Following Cell Types
Protists, Porifera, Cnidaria, Nematoda, Mollusca, Annelida, Arthropoda, Echinodermata, Chordata
Surface Area to Volume
Tissues, Organs and Organ Systems

Plant Form & Function
Adaptations of Plants to Land
Alternation of Generations
Evolution of Plants from Algae
Plant Reproduction
Plant Structures
Pollen, Seeds, Flowers, and Fruit
Response to Stimuli (hormones involved)
Vascular and Nonvascular Plants

Fungi
Fungal Structures
Reproduction
Role in Decomposition

Ecology
Biodiversity
Biogeochemical cycles
Biomes
Biotic and Abiotic Factors Affecting Environments
Ecosystem Energy Flow
Interactions between species and types of symbiosis
Life History Strategies
Population Growth and Regulation
Producers, Consumers, and Decomposers

General Science
Assistance with Lab-related Assignments
Development of Science Fair Projects
Interpreting and Graphing Scientific Data
Interpreting and Summarizing Information from Literature
Reviewing Reports for Science Content

Lab techniques
Bacterial culturing
Centrifugation
Gel electrophoresis
Microscopy
Serial dilution
Spectrophotometry
Math basics
- Algebra
- Dimensional analysis
- Metric system
- Scientific notation
- Significant digits

Math and Science
- Algebra and Dimensional Analysis
- Scientific Notation
- Significant Digits
- The Metric System
- Measurements
- Chemistry and Other Fields
- Scientific Thinking
- The Scientific Method
- Laboratory Basics
- Lab Safety
- Lab tools and techniques
- Lab Report Writing

Atoms, Compounds, and the Periodic Table
- Atomic Theory and the Elements
- The Periodic Table
- Atom Nomenclature
- Periodic Trends
- Subatomic Particles
- Atomic Number, Mass, and Charge
- Isotopes and Ions
- Avogadro’s number and the Mole
- Molecules, Compounds, Mixtures, and Solutions
- Naming and Writing Compounds
- Empirical and Molecular Formula
- Electron Configuration
- Chemical and Physical Properties
- Chemical and Physical Changes

Bonding
- Molecular, Ionic, and Metallic Bonding
- Intermolecular Forces
- States and Types of Matter
- Solids, Liquids, and Gasses
- Valance Electrons

Chemical Reactions
- Completing Chemical Equations
- Balancing Chemical Equations
- Stoichiometry
- Limiting reactants
- Percent Completion and Excess Reagents
- Redox Reactions
- Gasses and Gas Laws
- Reaction Kinetics
- Rate Laws

Solutions
- Electrolytes
- Solubility and Colligative Properties
- Molarity and Other Concentrations
- Acids and Bases
- pH and pOH
- Strong and Weak Acids and Bases
- pKa and Buffers
- Chemical Equilibrium
- ICE Tables
- Electrochemistry

Physical Chemistry
- Quantum Theory
- Quantum Numbers
- Thermodynamics
- Exothermic and Endothermic
- Enthalpy and Entropy
- Nuclear Chemistry
- Radioactivity and Light

Introductory Organic Chemistry and Biochemistry
- Carbon Chain and Functional Group
- Nomenclature
- Cyclic Compounds and Sugars
- Proteins, Carbohydrates, and Nucleic Acids
Physics – Algebra-based

Math basics
- Algebra and Trigonometry
- Dimensional analysis
- Metric system
- Scientific notation
- Significant digits
- Vectors and scalars

Nature of Science
- Accuracy and precision
- Bias and Ethics
- Communication
- Data collection and analysis
- Models
- Pseudo Sciences
- Safety
- Science and Society
- Scientific Method
- Scientific Quantities
- Scientific Thinking
- Scientists and Discoveries
- Theories and Laws
- Tools and Measurement

Kinematics
- Position, Distance, and Displacement
- Speed and velocity
- Acceleration
- Position vs time graphs
- Velocity vs time graphs
- Kinetic equations under constant acceleration
- Free fall equations
- Projectiles
- Circular motion
- Center of mass

Dynamics
- Newton’s Laws

Work, energy and power
- Work and work-kinetic energy theorem
- Conservative forces and Potential energy
- Conservation of mechanical energy
- Power
- Simple Harmonic motion
- Momentum
- Sources of energy on Earth

Fluid Mechanics
- Density and Pressure
- Buoyancy – Archimedes’ Principle
- Fluid dynamics
- Fluid Flow continuity equation
- Bernoulli’s Equation

Fluid Mechanics (Cont’d)
- Hydrostatics
- Fluid Pressure

Thermal Physics
- Heat
- Temperature
- Mechanical Equivalent of heat
- Heat Transfer and thermal expansion
- Calorimetry
- Kinetic Theory
- Ideal Gases
- Gas laws
- Thermodynamics

Electrostatics
- Electric charges
- Conductors, insulators and semi-conductors
- Charging by conduction
- Charging by induction
- Coulomb’s Law
- Electric fields
- Gauss’ Law
- Electric Potential Energy and Electric Potential
- Motion of charges particles in electric fields
- Capacitance

Current Electricity
- EMF
- Circuits
- AC/DC
- Current
- Resistance
- Electric Power
- Electric Energy
- Resistors in series
- Resistors in Parallel
- Batteries and Internal Resistance
-Kirchhoff’s Law
- Ohm’s Law
- Voltmeters
- Ammeters
- RC circuits

Electromagnetism
- Force of a magnetic field on a moving charge
- Force of a magnetic field on a current carrying wire
- Torque on a current carrying loop
- Magnetic fields due to straight and coiled wires
- Electromagnetic Induction
- Magnetic flux
- Faraday’s Law
- Lens’s Law
Electromagnetism (cont’d)
- Motors
- Mass Spectrometers
- Generators

Wave Motion and Sound
- Description and characteristics of waves
- Types of waves
- Standing waves
- Beats
- Harmonics
- Wave on a string
- Wave in a tube
- Doppler Effect
- Sound intensity
- Sound Power
- Relative sound intensity

Optics
- Reflection
- Law of reflection
- Refraction
- Snell’s Law
- Total Internal reflection
- Critical angle
- Images formed by plane mirrors
- Images formed by spherical mirrors
- Images formed by parabolic mirrors
- Images formed by lenses
- Ray-diagrams
- Thin lens
- Mirror equation
- Image formation by a two-lens system
- Interference
- Diffraction
- Polarization
- The electromagnetic spectrum
- Inverse square law

Modern Physics
- Atomic Physics and Quantum Effects

Nuclear Physics
- Atomic mass
- Mass number
- Atomic number
- Mass defect and binding energy
- Nuclear processed
- Mass-energy equivalence
- Conservation of energy-mass
- Nuclear symbols
- Nuclear reactions
- Neutrino
- Chain reactions
- Isotopes
- States of matter
- Atomic Models
Physics – Calculus-based
This subject covers the material from AP Physics C-Mechanics, AP Physics C-Electricity and Magnetism, and introductory college level physics courses that require calculus as a prerequisite.

Math Basics
- Algebra, trigonometry and calculus
- Dimensional analysis
- Units and unit conversions
- Scientific notation
- Estimates and orders of magnitudes
- Significant figures
- Vectors and scalars
- Cross product, Dot product
- Derivatives, Integrals

Nature of Science
- Accuracy and precision
- Data collection via observation and measurement and the analysis of this data
- Error analysis
- Experimental design
- Models
- Scientific method
- Tools and measurement
- Communicating scientific results

Newtonian Mechanics

Kinematics (Motion Along a Straight Line)
- Position, distance, and displacement
- Average and instantaneous velocity
- Average and instantaneous acceleration
- Position vs time graphs
- Velocity vs time graphs
- Acceleration vs time graphs
- Differential determination of position, velocity and acceleration as a function of time
- Kinematic equations under constant acceleration

Dynamics
- Newton’s Laws of Motion
- Mass and weight
- Fundamental forces of nature
- Static and kinetic friction
- Air resistance
- Elevator problems
- Incline planes
- Atwood Machines
- Dynamics of circular motion

Work, energy, and power
- Work and the work-kinetic energy theorem
- Integrate to calculate the work performed by a varying force
- Conservative forces and potential energy
- Non-conservative forces

Work, energy, and power (cont’d)
- Conservation of mechanical energy
- Energy diagrams
- Power

Systems of particles, linear momentum, impulse and collisions
- Center of mass
- Two object system
- Momentum

Circular Motion and Rotations
- Uniform circular motion
- Angular velocity and acceleration
- Frequency and period
- Vertical circular motion
- Rotational kinematics
- Moment of inertia
- Rotational inertia
- Parallel axis theorem
- Rotational kinetic energy
- Work and power in rotational motion
- Torque
- Torque and angular acceleration for a rigid object
- Rotation of a rigid object around a fixed axis

Equilibrium and Elasticity
- Rotational equilibrium (torque)
- Conditions for static equilibrium
- Center of gravity
- Stress, strain, and elastic moduli
- Elasticity

Fluid Mechanics
- Density and Pressure
- Buoyancy – Archimedes’ Principle
- Fluid dynamics
- Fluid Flow continuity equation
- Bernoulli’s Equation
- Hydrostatics
- Fluid Pressure
- Viscosity and Turbulence

Gravitation
- Universal Gravitation
- Gravitational Fields
- Orbits
- Kepler’s Laws of Planetary Motion
- The Motion of satellites
- Apparent Weight
- Oscillatory Motion
Thermal Physics
Heat, Temperature
Mechanical Equivalent of heat
Heat Transfer and thermal expansion
Calorimetry
Kinetic Theory
Ideal Gases, Gas laws
Thermodynamics

Electricity and Magnetism
Electrostatics
Electric charges
Conductors, insulators and semiconductors
Charging by conduction and induction
Coulomb’s Law
Electric fields, Electric Field Lines
Electric Dipoles, Electric Flux
Gauss’s Law
Electric Potential Energy and Electric Potential
Potentials of charge distributions

Conductors, Capacitors and Dielectrics
Electrostatics with conductors
Equipotential surfaces
Capacitance
Dielectrics

Current and Resistance
Current
Resistivity
Resistance

Direct Current Electric Circuits
EMF
Electric Power, Electric Energy
Resistors in series and in parallel
Batteries and Internal Resistance
Kirchhoff’s Law, Ohm’s Law
Voltmeters, Ammeters
RC circuits

Magnetic Fields
Sources of magnetic fields
Right-hand rule
Left-hand rule
Force of a magnetic field on a moving charge
Force of a magnetic field on a current carrying wire
Torque on a current carrying loop

Magnetic fields due to straight and coiled wires
Birot-Savart Law, Ampère’s Law

Electromagnetism
Motion of charged particles in electric and magnetic fields
Electromagnetic induction
Magnetic flux
Inductance

Electromagnetism (Cont’d)
RL circuits, LC circuits, LRC circuits
Faraday’s Law, Lenz’s Law
Alternating current circuits
Displacement current
Maxwell’s equations
Motors
Mass spectrometers
Generators
Transformer

Wave, Motion, and Sound
Description and characteristics of waves
Types of waves
Standing waves
Beats
Harmonics
Wave on a string
Wave in a tube
Doppler Effect
Sound intensity
Sound Power
Relative sound intensity

Optics
Nature and Propagation of Light
Reflection, Law of reflection
Refraction
Snell’s Law
Total internal reflection
Critical angle
Geometric Optics
Physical Optics

Modern Physics
Quantum Mechanics and the nature of light
Relativity
Atomic physics and quantum effects
Nuclear physics
Anatomy & Physiology

Anatomical Terminology
Anatomical Regions, Cavities, Planes of Symmetry, and Directional Terms

General Chemistry
Protons, Neutrons, Electrons, Atoms, Elements, and Compounds
Bonding: Ionic, Covalent, and Hydrogen
pH scale, Acids and Bases, Organic and Inorganic Compounds
Macromolecules: Carbohydrates, Lipids, Proteins, and Nucleic Acids

Cellular Biology
Light and Electron Microscope Images and Uses
Cell Structure: Cell Membrane, Cytoplasm, Nucleus
Organelle Structure and Function
Protein Synthesis
Metabolism and Homeostasis
Mitosis and Meiosis

Histology
Structure, Function, Location, and Subtypes of Epithelial, Connective, Muscular, and Nervous Tissue

Embryology
Ectoderm, Mesoderm, and Endoderm and their derivatives

Organ Systems

Integumentary
Functions of the Integument
Layers composing the epidermis and dermis
Nutrient and Oxygen Supply to the epidermis and dermis
Subcutaneous layer
Accessory Organ Structure and Function: Hair, Nails, and Glands
Basic Knowledge skin cancer types and prognoses

Skeletal
Functions of the Skeletal System
Structure and Function of Cartilage
Bone Markings, Shapes, Matrix, Structures, and Names
Bone Cells Structure and Function: Osteocyte, Osteoclast, and Osteoblast
Differentiate between Compact & Spongy Bone
Differentiate between Endochondral and Intramembranous Ossification
Differentiate between Axial and Appendicular Skeleton
Basic knowledge of bone fractures and osteoporosis
Supporting Ligaments and discs
Types of Joints and their locations

Muscular
Functions of the Muscular System
Types and Locations of Muscular Tissue
Muscle Cell Structure and Function
Sliding Filament Theory & Excitation – Contraction Coupling
Sources of Energy for Muscle
Role of Exercise and Muscle Function
Knowledge of Names and Locations of muscles

Digestive
Structure and Function of Esophagus, Stomach, Small Intestines, Colon, Liver, Gall Bladder, Appendix and Rectum
Mechanical Digestion, Chemical Digestion
Absorption and transport of nutrients
pH balance and enzymatic function
Hormone regulation of digestive function and appetite
Extrinsic and Intrinsic Nervous function
Digestive Disease
Normal Flora of the gut

Nervous
Functions and Divisions of the Nervous System
Structure and Function of Neurons and Neuroglia
Generation and Propagation of an action potential
Synapses, Neurotransmitters, and Myelination
Brain Structure, Divisions, and Functions
Spinal Cord and Peripheral Nerve Structure and Function
Special Senses: Olfaction, Taste, Vision, Hearing, and Balance
Structure and Function of the Autonomic Nervous System

Endocrine
Second Messenger Pathways
Steroid production and function
Role of Hypothalamus
Structure & Function of Pituitary, Thyroid, Parathyroid, Adrenal, Pancreas, testes, Ovaries, and Pineal Glands
Hormones produced and their function

Cardiovascular
Functions and Composition of Blood
Clotting Cascade
Blood typing and diagnostic tests
Structure and Function of the heart
Electrical Activity of the Heart
Cardiac Cycle
Cardiac Output
Knowledge of Arteries and Veins that supply the body
Immunity & Lymphatic
Innate and Adaptive Immunity
Types and Functions of Immune Cells
Immunological Surveillance and Tolerance
Acquired Immunity
Structure and Function of Lymph Nodes, Spleen, Lymphoid Tissue, and Peyer’s Patches
Lymphatic Circulation

Respiratory
Functions of the Respiratory System
Anatomy and Histology of the Respiratory Tract and Lungs
Properties of Ventilation and Pulmonary Function Tests
Oxygen and Carbon Dioxide exchange and circulation

Urinary
Structure and Function of the Kidney
Glomerular Filtration and Tubular Section & Reabsorption
Renin-Angiotensin Aldosterone Pathway
Function of Vasopressin (ADH) and Atrial Natriuretic Peptide
Structure and Function of the Ureter, Bladder, and Urethra

Reproductive
Meiosis and Gamete Production
Structure and Function of the Male & Female Reproductive System
Fertilization and Pregnancy
The microbiology course is considered an advanced science course. It is expected that tutors are knowledgeable in foundational biological, chemical and mathematical concepts as they underlie and relate to microbiology.

**Basic Biology**
- Eukaryotes
- Prokaryotes
- Cellular division of eukaryotic and prokaryotic cells
- Functional anatomy of various cells
- Whitaker Five Kingdoms
- Woese Three Domain clarification

**Microbial Traits**
- Types
- Nutrition
- Growth
- Control in various environments
- Structure
- Metabolism
- Pathways
- Catabolism
- Anabolism
- Gram positive bacteria anatomy
- Gram negative bacteria anatomy
  - Deinococci
  - Nonproteobacteria
- Biochemistry processes
- Recombinant DNA technology
- Taxonomy and classification (Bergey)
- Cytology
- Cellular physiology

**Ecology**
- Biogeochemical cycling
- Microorganisms in marine and freshwater ecosystems
- Microorganisms in terrestrial ecosystems
- Symbiosis
- Mutualism
- Commensalism
- Parasitism

**Pathogenicity**
- Germ Theory
- Infection and reproduction
- Host and parasite relationship
- Infectious disease
- Disease transmission
- Nosocomial infections
- Mechanisms of pathogenicity
- Antimicrobial drugs
- Important pathogens and diseases
- Sterilization
- Disinfection

**Immunization**
- Innate host resistance
- Adaptive Immunity
- Sanitation
- Hygiene

**Health**
- Epidemiology
- Antimicrobial chemotherapy
- Microbiology of food
- Industrial microbiology

**Laboratory Techniques**
- Basic laboratory equipment identification
- Guidelines for safe handling of microorganisms and infectious materials
- Microscope use including oil emersion
- Methods for taking clinical samples
- Incubation techniques
- Inoculation techniques
- Isolation techniques
- Identification techniques
- Chromatography
- Spectrophotometry
- Serial dilution technique and calculations
Organic Chemistry

Structure & Bonding
- Electron Configurations of Atoms
- Chemical Bonding & Valence
- Charge Distribution in Molecules
- The Shape of Molecules
- Isomers
- Analysis of Molecular Formulas
- Resonance
- Atomic and Molecular Orbitals

Intermolecular Forces
- Boiling & Melting Points
- Hydrogen Bonding
- Crystalline Solids
- Water Solubility

Functional Groups – Properties, Nomenclature, Synthesis, & Reactions of...
- Alkanes
- Alkenes
- Alkynes
- Alkyl halides
- Alcohols
- Aromatics
- Ketones
- Ethers
- Esters
- Carboxylic acids
- Amides
- Amines

Acids & Bases
- Arrhenius acids and bases
- Lowry-Brønsted Acids & Bases
- Lewis Acids and Bases
- Acid dissociation constants and pH
- Effect on acidity

Stereochemistry
- Isomers
- Constitutional isomers
- Stereoisomers
- Chiral and achiral
- Enantiomers
- Optical activity
- R and S configurations
- Diastereomers
- Fischer projections
- Meso compounds

Nucleophilic Substitution, Elimination, and Addition reactions

Biochemicals – Structure & Function of...
- Carbohydrates
- Lipids
- Amino acids
- Proteins
- Enzymes
- Vitamins

Lab techniques
- Synthesis of compounds (solid and gas)
- Separation techniques
- Melting point determination
- Nuclear Magnetic Resonance (NMR)
spectrometer operation and analysis
- Infrared (IR) spectrometer operation and analysis
- Gas chromatography and Mass Spectrometry (GC-MS) analysis
Health Administration

Governance and Organizational Structure
Organizational structures, key players, and their impact on health care delivery system
Responsibility, authority, and accountability at each level of an organization
Developing, implementing, and updating strategic plans
Accreditation, regulatory, licensing, and certification programs

Quality and Performance Improvement
Quality assessment programs and procedures
Importance of regulation in health care organizations and its impact on continuous quality improvement
Processes of continuous quality improvement, including the cost-quality paradigm

Law, Ethics, and Professionalism
Government regulations and laws affecting the healthcare environment
Relationship between healthcare law and healthcare ethics
Application of moral, ethical, and legal principles in the delivery of healthcare
Role of healthcare workers in protecting patient rights

Human Resources
Assessing personnel needs
Recruitment, selection, compensation, and training of personnel
Evaluation of personnel including disciplinary actions

Management
General management principles
Role of leadership in promoting organizational effectiveness
Management change theories and strategic management

Healthcare Finance, Technology, and Information Management
Common financial tools, processes, and techniques used in healthcare
Revenue cycle & reimbursement
Financial considerations in the provision of health services (e.g. admitting and registration, case management/denials, credit and collections)
Management and clinical information systems
Electronic health records including legal and ethical issues

Healthcare
Trends that are likely to shape the future of healthcare
Role, structure, and funding of various health care organizations (e.g. physician’s office, walk-in clinic, hospital, ambulatory surgery center, rehabilitation center, etc.), community health services, and public health
Patient relations
Advanced Nursing

(Nursing Medical Surgical Fundamentals)
Tutors must be knowledgeable about the fundamentals of nursing including nursing roles, settings, health care trends, all body systems and their disorders, emergency and disaster management, and mental health nursing. In particular, tutors should be familiar with nursing care in all of the following areas:
- Role of the medical-surgical nurse
- Nursing practice and interventions
- Health and nursing assessments
- Diagnostic testing and evaluation
- Care of clients in the following areas:
  - Pain Management
  - Altered fluid electrolyte or acid-base balance
  - Trauma and shock
  - Pre- and post surgery
  - Infections
  - Altered immunity
  - Cancer
  - Loss, grief and death
  - Problems with substance abuse
- Maternal-Child Health (OB)
- Pediatrics
- Psychiatric Nursing

(Nursing Care Plans)
Tutors must be familiar with all aspects of the creation of nursing care plans including:
- Assessment
- Nursing diagnosis
- Outcomes and Interventions
- Creating the Nursing Care Plan
- Documentation
- Implementation of the Nursing Care Plan
- Evaluation of the Nursing Care Plan

(Nursing Pathophysiology)
Tutors must be knowledgeable of the following systems and associated disorders:
- Cardiovascular system
- Circulatory system
- Renal system
- Respiratory system
- Nervous system
- Gastrointestinal system
- Endocrine system
- Reproductive system
- Musculoskeletal system

(Nursing Pathophysiology (Cont’d))
- Integumentary system
- Cell and body tissue physiology
- Fluid and electrolyte balances
- Genetic and hereditary disorders
- Inflammation, infection and immune response systems
- Oncological diseases
- Otolaryngology
- Ophthalmology

(Nursing Pharmacology)
- Nursing process in drug therapy
- Pharmacologic principles
- Principles and practices of administration of medication
- Drug calculations
- Dosage calculations
- Legal and ethical requirements in drug therapy
- Life span of pharmaceuticals
- Gene therapy and pharmacogenetics
- Medication error response and prevention
- Essential knowledge of the following drug types:
  - Analgesic drugs
  - General and local anesthetics
  - Depressants and muscle relaxants
  - Stimulants and related drugs
  - Antiepileptic drugs
  - Psychotherapeutic drugs
  - Antiparkinsonian drugs
  - Adrenergic drugs
  - Cholinergic drugs
  - Heart failure drugs
  - Antidysrhythmic drugs
  - Antianginal drugs
  - Antihypertensive drugs
  - Diuretic drugs
  - Coagulation modifier drugs
  - Antilipemic drugs
  - Pituitary drugs
  - Thyroid and antithyroid drugs
  - Adrenal drugs
  - Women’s health drugs
  - Men’s Health drugs
  - Antihistamines, decongestants and antitussives
  - Bronchodilators and other respiratory drugs
Antibiotics
Antiviral drugs

Nursing Pharmacology (Cont’d)
Antitubercular drugs
Antifungal drugs
Antimalarial, antiprotozoal, anthelmintic
drugs
Anti-inflammatory and antigout drugs
Immunosuppressants
Immunizing drugs
Antineoplastic drugs
Biologic response drugs
Acid controlling drugs
Bowel disorder drugs
Antiemetic and antinausea drugs
Anemia drugs
Dermatologic drugs
Ophthalmic and otic drugs
Hormones that regulate calcium and bone
metabolism
Drugs used in oncologic disorders
OTC drugs, herbal and dietary
supplements
Basic Nursing

Systems and Associated Disorders
Cardiovascular and circulatory
Endocrine
Excretory
Gastrointestinal
Immune
Integumentary
Musculoskeletal
Nervous and sensory
Reproductive
Respiratory

Health Assessments
Communication with patients and family
Diagnostic testing and evaluation
Physical and developmental assessments

Health Promotion
Health promotion for pediatric patients
Health promotion for the families of pediatric patients
Influences of family on child health promotion
Influences of socioeconomics, culture, and religion on child health promotion

Nursing Care
Chronic illness
Cognitive and sensory impairment
Community-based nursing care
Disability
End-of-life care
Family-centered care

Interventions
Behavioral
Community
Family
Health System
Physiological
Safety

Professional Performance
Advocacy
Ethics
Evidence-based practice and research
Law and regulation

Fundamentals of nursing
Nursing roles, settings, and health care trends

Systems and associated disorders seen in all stages of childhood (newborn, infant, toddler, preschooler, school-age, and adolescent)
Cardiovascular system
Circulatory system
Excretory system
Respiratory system
Nervous system
Gastrointestinal system
Endocrine system
Reproductive system
Musculoskeletal system
Integumentary system
Immune system
Otolaryngology
Ophthalmology

Nursing care as it applies to pediatric patients
Communication with the patient and family
Pediatric nursing skills
Physical and developmental assessments
Diagnostic testing and evaluation
Health promotion for patients in all stages of childhood (newborn, infant, toddler, preschooler, school-age, and adolescent) and their families
Family, social, cultural, and religious influences on child health promotion
Community-based nursing care
Family-centered care at home and during hospitalization
Care of the child and family in the following contexts:
Chronic illness
Disability
Cognitive and sensory impairment
End-of-life care

Pediatric variations of standard nursing practices and interventions
Pain assessment and management
Altered fluid electrolyte or acid-base balance
Medication administration
Trauma and shock
Pre- and post-surgery
Infections
Altered immunity
Cancer
Abuse and Neglect
- Types of Violence
- Assessment and Physical Exam
- Nursing Interventions

Eating Disorders
- Types of Eating Disorders
- Risk Factors and Assessment
- Symptoms and Behaviors
- Diagnosis
- Treatments

Personality Disorders
- Types of Personality Disorders
- Risk Factors
- Assessment
- Symptoms
- Treatment

Neurocognitive Disorders
- Types of Neurocognitive Disorders
- Risk Factors
- Nursing Interventions

Depressive Disorders
- Types of Depressive Disorders
- Contributing Factors
- Treatment

Psychotic Disorders
- Types of Psychotic Disorders

Contributing Factors
- Treatment

Therapies
- Modeling
- Operant Conditioning
- Systematic Desensitization
- Aversion Therapy
- Natural Therapies (meditation, relaxation, deep breathing)

Suicide
- Risk Factors
- Assessment
- Treatment

Substance Use and Addictive Disorders
- Substance Abuse Defined
- Substance Assessment
- Dependency
- Withdrawal
- Common Abusive Substances
- Treatment

Psychopharmacological Therapies
- Medications for Anxiety
- Medication for Depressive Disorders
- Medication for Bipolar Disorder
- Medications for Psychotic Disorders
- Medications for Substance Abuse
Nutrition & Dietetics

Overview of Human Nutrition
- Nutritional sources biochemistry
- Metabolism of food types
- Nutrition through the ages effect on longevity
- Nutritional needs over a lifespan

Professional Nutrition Management
- Dietetics and Nutritional Counseling
- Adult education principles in practice
- Nutrition in Disease Management
- Nutrition for Athletics
- FDA, USDA and Non-Profit Agencies
- Professional Development as a Nutritionist
- Foodbank management

Dietetics and Nutrition for Healthy Lifestyles
- Principles of Nutrition for Health
- Nutrition concerns before and during pregnancy
- Dietetics to support breast feeding
- Nutritional needs birth to year one
- Nutritional requirements year one to year 10
- Designing nutritional programs for Jr. High students
- Great nutrition for High School students
- Creating Nutritional guidelines for Adults
- Teaching Adults nutrition choices for health
- Supermarket shopping/teaching nutrition

Cultural Dietetics and Nutrition
- Diet differences around the world
- Teaching nutrition for various cultures
- Food Alternatives & Upcycled Foods
- Meal planning for Healthcare, cultural considerations

Holistic Nutrition
- The Lymphatic Drainage System
- The Lungs
- The Digestive System
- The Liver
- The Skin
- The Skeletal System
- The Muscular System
- The Cardiovascular System
- Kidneys and Bladder
- Hormones
- Nervous System

Mental Health & Eating Disorders
- Anorexia nervosa
- Bulimia nervosa
- Binge Eating Disorder
- Avoidant-restrictive food intake Disorder
- Purging Disorder
Medical Coding & Billing

- Anesthesia
- Medicine
- Endocrine system
- Nervous system
- Urinary system
- Integumentary system
- Pathology
- Laboratory
- Hemic and lymphatic system
- Practice management
- Medical terminology
- Radiology
- Musculoskeletal system
- Digestive system
- Evaluation and management
- Respiratory system
- Mediastinum and diaphragm
- Male/female genital system
- Maternity and delivery
- Eye and ocular adnexa

- International Classification of Diseases, Tenth Revision, Clinical Modification (currently ICD-10-CM)
- International Classification of Diseases, Tenth Revision, Procedure Coding System (currently ICD-10-PCS)
- Healthcare Common Procedure Coding Systems (HCPCS)
Electrical Engineering

Communication skills in engineering
Overview of the process of engineering design for electrical and electronic systems
Electrical and Electronic Careers
Engineering Notation & Measurements
Fundamental Electrical Properties
  Ohm’s Law and Power
  Measuring voltage, current, and resistance with multimeters
  Preparing electrical cables (Romex) for use in residential wiring
  Series circuits
  Parallel circuits
  Wiring a basic lighting circuit
Analog and Power Electronics
Digital Electronics & Design
Measurements & Instrumentation
Mathematical Modelling and Analysis
AC Circuit Analysis
  Complex Numbers and Phasors in Polar or Rectangular Form
  AC Circuits Phasors and Impedance Transformers
Computer Organization & Architecture
Physics of Electronics and Nanotechnology
Programming and Control systems
Photonics and Communication Systems
Transducer & Sensors
Microprocessor and Microcontrollers
Electromagnetic Theory and Semiconductor Devices
Electrical Machine Design & Signal Processing
Materials Science
Labs:
  Circuits & Network Lab
  Electrical & Electronic Measurement Lab
  Data Structure Lab
  Numerical Methods & Programming Lab
  Analog Electronic Circuits Lab
  Digital Electronics & Integrated Circuits Lab
  Electronic Measurements & Instrumentation
  Transducer & Sensors Lab
  Technical Report writing for the Lab
Environmental Science

Chemistry of Environmental Science
- Atmosphere & pollution
- Air composition
- Particulate matter
- Analytical methods and equipment
- Health effects
- Ozone
- Regulations
- Toxicology

Ecosystem Ecology
- Flora and fauna
- Biodiversity
- Nutrient cycling
- Biogeography
- Forestry
- Invasive species
- Ecological Disturbance and Successions
- Biotic and abiotic factors
- Biomes and ecosystems

Energy and the environment
- Renewable energy sources
- Non-renewable energy sources
- Environmental impacts of fossil fuels
- Energy efficiency and conservation

Human Population Impact
- Human population growth
- Consumption
- Deforestation
- Urbanization
- Waste management

Energy and the environment
- Renewable energy sources
- Non-renewable energy sources
- Environmental impacts of fossil fuels
- Energy efficiency and conservation

Water resources and pollution
- Water cycle
- Chemistry of water
- Physical properties of water
- Freshwater systems
- Salt water systems
- Groundwater
- Water contamination
- Water treatment
- Water sampling and analysis
- Regulations

Soil, Agriculture, and Food Sources
- Soil composition formation and development processes
- Soil physical properties
- Soil chemical properties
- Agriculture
- Soil and/or groundwater pollution
- Threats to the environment by soil pollution
- Remediation
- Soil sampling and analysis
- Regulations
- Solid hazardous waste

Environmental management
- Environmental economics
- Environmental policies, procedures, and strategies
- Sustainability
- Green business
- Environmental Ethics & Equity

Conservation & Climate Change
- Greenhouse gases
- Impacts
- Technologies
- policies
- Orbital and solar forcing
- Properties of light and albedo
- Climate and weather
- Climate modeling
- Paleoclimate and proxies

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Astronomy

History/Philosophy of Astronomy
  Geocentrism vs. Heliocentrism
  Ptolemy and Aristotle
  Copernicus and Galileo

Astronomical Instruments
  Telescopes and Light
  Radio Telescopes
  Terrestrial vs. Orbitsing Telescopes

Orbits and Gravity
  Isaac Newton and Gravity
  The Laws of Planetary Motion
  Gravity with More than two bodies

Stellar Nucleosynthesis and The Origin of the Solar System
  Stellar Nucleosynthesis
  Stellar Mass and H-R Diagram
  Origin of the Solar System

Terrestrial Planets
  Mercury Geology and Meteorology
  Venus Geology and Meteorology
  Earth Geology and Meteorology
  Mars Geology, Meteorology, and Divergent Planetary Evolution

Earth and Moon Dynamics
  Origin of the Moon
  Lunar Cycles
  Tidal Relationships with the Moon

Gas Giants
  Overview of Gas Giants
  Meteorology of Gas Giants
  Rings, Moons, and Pluto

Interstellar Space and Celestial Distances
  Fundamental Units of Distance
  The Interstellar Medium
  The Life Cycle of Cosmic Material

Asteroids, Comets, and Black Holes
  Asteroid Characteristics
  Comet Characteristics
  Black Hole Overview
Biochemistry

Biomolecules
  Informational macromolecules (Proteins and Nucleic acids)
  pH and aqueous chemistry
  Protein folding
  Structure and function of proteins
  Protein binding
  Protein purification
  Sugars and Polysaccharides
  Lipids and membranes

Enzymatic reactions
  Enzymatic catalysis
  Substrate specificity
  Reaction Kinetics
  Inhibitors
  Signal transduction

Metabolism
  Thermodynamics of biomolecular bonds
  Glycolysis
  Glycogen metabolism
  Citric Acid Cycle
  Oxidative phosphorylation
  Photosynthesis
  Lipid, amino acid, and nucleotide metabolism
  Hormone signaling

Molecular genetics
  DNA structure
  DNA replication and repair
  Transcription
  Translation
  Chromosome structure and organization
  Bacterial gene expression (operons)
Mechanical Engineering

ME Basics
- Unit systems
- Engineering drawing practice
- Ethics
- Economic analysis

Fluids
- Compressible fluid dynamics
- Fluid properties
- Fluid statics
- Fluid flow parameters
- Fluid dynamics
- Hydraulics
- Fluid power
- Fans and ductwork

Thermodynamics
- Inorganic chemistry
- Fuels and combustion
- Energy, work and power
- Thermodynamic properties of substances
- Changes in thermodynamic properties

Power Cycles
- Vapor power equipment
- Vapor power cycles
- Combustion power cycles
- Power-generating systems
- Gas compression cycles
- Refrigeration cycles

Heat Transfer
- Modes of heat transfer
- Units and parameters of heat transfer
- Conduction
- Convection
- Radiation
- Natural convection, evaporation, and condensation

HVAC
- Psychrometrics
- Ventilation
- Heating and cooling loads
- AC Systems and controls

Statics
- Beams
- Trusses
- Cables and pulleys

Materials
- Engineering materials
- Material properties and testing
- Thermal treatment of metals
- Properties of areas
- Strength of materials
- Failure

Machine Design
- Types of columns
- Types of beams
- Types of tanks
- Types of connections and joints
- Compression and tension of members
- Springs
- Gears
- Bearings

Dynamics and Vibrations
- Kinematics
- Dynamics
- Mechanisms and power transmission
- Vibrating systems (mass, spring, damper)

Control Systems
- Modeling systems
- Feedback
- Steady state analysis
- Transient analysis

Plant Design
- Plant management
- Instrumentation and measurements
- Manufacturing processes
- Transient
Social Studies K-8

Ancient Civilizations
- Political Practices
- Religious Beliefs
- Cultural Traditions

World Trade & Exploration
- Major European Explorers 120-1519
- Major European Discoveries 120-1519
- 16-17th century world trade
- 18-19th century world trade

The Middle Ages
- The Renaissance - major philosophers
- The Renaissance - major theories
- Sociopolitical and Sociocultural Practices
- The Medieval Pyramid

World Religions & Cultures
- Major World Religions
- Family structures
- World holidays
- Cultural diversity

Geography
- Continents of the World
- Oceans of the World
- U.S. Geographic Regions
- Early map skills

Early American Settlements
- Roanoke Colony
- Jamestown Colony
- Plymouth Colony
- The 13 Colonies

The U.S.
- U.S. States and Capitals
- U.S. Presidents 1789-present
- Founding fathers
- Founding documents

Government
- Early U.S. Political Systems
- Early European Political Systems
- Early Asian Political Systems

Civics
- Democracy
- The Voting Process
- Immigration
- Voting Rights

Civil Rights
- Civil Rights Advocates
- Civil Rights Movement
- The Civil Rights Act

U.S. Wars
- 1754-1812
- 1813-1865
- 1866-1975

World Wars
- World War 1
- World War 2
- The Cold War

Westward Expansion
- The Louisiana Purchase
- The Monroe Doctrine
- The Indian Removal Act

Slavery
- Pre-Civil War
- The Slave Trade 1480-1865
- Post-Civil War

Major Historical Figures
- American Inventors
- Women's Rights Activists
- Civil Rights Advocates

The Information Age
- The rise of Mass Media
- The Digital Era
- Forms of Virtual Communication
Geography

Basic Geography Skills
- Interpreting Maps and Diagrams
- Defining Regions and Places
- Space and Distance

Cultural Patterns and Influences
- Formation of Social/Cultural Groups
- Diffusion and Migration
- Rural and Urban Land Use
- Impacts of Industrialization and Agriculture

Political Patterns and Influences
- Political Territories and Boundaries
- Types of Political Regions
- Interaction and Conflict

Natural Features
- Types of Natural Regions
- Change and Sustainability

Interrelationships and Causes
- Spatial Association
- Cause and Effect
- Analyzing and Interpreting Data
- Identifying Patterns
US History

American Identity
- Native Americans
- Colonization/Road to Revolution
- Citizenship, Rights, Voting
- Liberty, Equality, Freedoms
- Sectionalism/States vs National
- THE vs THESE United States
- New World Power
- Individualism

Politics and Power
- Representation
- Fight for Suffrage
- Role and expansion of federal government
- Segregation/desegregation/Jim Crow Laws
- Political Parties

Work, Tech, Exchange
- Agrarian America - Cash crops and early economies
- Economic change overtime (Mercantilism - Capitalism - Laissez-faire)
- Panic, Recession, Bust
- Industrialization, Boom
- Labor and Unions
- Invention and Innovation
- Communication and Transportation

Culture and Society
- Religious influences
- Reform Movements
- Minorities and Immigrants
- Social Revolutions (women, Civil Rights, family)
- Gender Roles over Time

Migration and settlement
- Push/Pull Factors
- Manifest Destiny/Westward Expansion
- Rural-Urban/Urban-Suburban
- Government policies towards immigration
- Immigration patterns over time
- forced and voluntary immigration
- Internal migrations

Geography/Environment
- Patterns of settlement
- Pollution
- Westward expansion/frontier
- Conservation and Energy Management
- Regional specialization

America in the World
- Emergences as a world power
- Involvement in international conflicts
- Imperialism
- Superpower
- The Slave Trade
- Internal Conflicts
- Democracy
World History

Historical time periods - Ancient civilizations
  Greece
  Rome
  River Valley civilizations

Historical time periods - Middle Ages
  Early
  Late
  High

Renaissance
  Art
  Religion
  Philosophy

Historical themes
  War and conflict
  Revolutions
  Cultural development

Modern Times
  Enlightenment
  Industrial Revolution
  Europe - Napoleonic Era
Student Success and Parent Coaching

Academic Strategies
- Note-taking Techniques
- Studying Techniques
- Homework
- Selecting a Major
- Managing Knowledge Gaps
- Scholarly Resources
- Using Technology

Habits for Success
- Organizational Skills
- Attendance & Punctuality
- Motivation & Goals

Stress Management
- Healthy Habits
- Finding Balance
- Building a Support System

Non-Traditional Students
- Work/Life/Family Balance
- Learning New Technologies
- Financial Planning
- Career Transition
- Scheduling & Organization

Parent Coaching for Student Success
- Scheduling & Organization
- Setting Expectations
- Studying Techniques
- Using Resources
- Motivation & Goals
- Managing Knowledge Gaps
- Finding Balance
Employment Strategies
   Self-evaluation of qualifications
   Educational Requirements
   Salary Requirements
   Benefits Requirements
   Scheduling and hours
   Promotion / progression potential
   Immediate needs v. long term goals

Employment Searches
   Targeted job searches
   Navigating online job forums
   Submitting digital records
   Follow-up strategies

Resume Writing
   Templates and formatting
   Appropriate email address
   Resume language v. conversational language
   Identifying and using key words
   Screen-out factors
   Resume length

Cover Letter Writing
   Customizing cover letters to employers
   Confidence v. unrealistic expectations
   Brevity
   Professional information v. personal information
   Controlling emotional appeals

Interview Preparation
   Appropriate attire
   What to bring
   Scheduling
   Punctuality
   Preparing answers and questions

Military Specific Factors
   MOS skills transfer
   Crossover language for military skills and qualifications
   Applicable certifications v. unrelated/military specific training
   Translating military acronyms and jargon
Art History and Appreciation

Art Historical Periods
- Prehistory
- Ancient Near Eastern/Mesopotamia
- Ancient Egyptian
- Classical - Crete/Greece/Etruria/Rome
- Late Antique/Medieval (Europe)
- Byzantium/Islam
- Pre-Columbian/South American/North American
- African Art and Architecture
- Art of Asia and Oceania
- Renaissance/Baroque/Rococo
- 19th Century
- 20th Century
- Global Modern/Contemporary (since 1950 CE)

Formal Elements and Principles of Design
- Composition
- Color
- Texture
- Value
- Line
- Shape/Form
- Balance
- Emphasis
- Unity/Variety
- Scale/Proportion
- Rhythm
- Time/Motion

Artistic Devices
- Chiaroscuro
- Tenebrism
- Linear Perspective
- Composite view/twisted perspective
- Hierarchy of scale
- Calligraphy
- Trompe l’oeil
- Foreshortening
- Impasto
- Plein-air painting
- Memento mori

Artistic Media
- Drawing
- Painting (tempera/oil/watercolor/fresco)
- Collage
- Sculpture
- Mosaic
- Photography

Artistic Movements
- Impressionism
- Post-Impressionism
- Abstraction/Expressionism
- Realism
- Neo-Classicism/Romanticism
- Cubism
- Pop Art
- Surrealism/Dada
- Performance art

Theoretical Approaches
- Feminist
- Psychoanalysis
- Modernism/Post-modernism
- Queer theory
- Hermeneutics
- Archaeology of Knowledge
- Reader-response theory
- Marxist
- Formalism/Semiotics
- Post-Colonial
- Structuralism/Post-structuralism
- Deconstruction

Art Terms
- Sublime
- Miniature
- Portrait
- Decorative arts
- Academy/Salon
- Aesthetics
- Narrative
- Still-life
- Avant-garde
- Genre painting
- Iconography
- Landscape
- Symbol
- Naturalism
- Vanishing point
- History painting
English

Elementary (Grades 4-6)
- Adjectives
- Adverbs
- Antonyms
- Compare/Contrast
- Connotation
- Contraction
- Cross-Curricular
- Reading/Writing
- Denotation
- Extract ideas from a variety of texts
- Fiction
- Grammar
- Graphemes
- Letter Writing
- Literary Analysis
- Literary Device
- Literary Themes
- Non-Fiction
- Nouns
- Paragraphs
- Parts of Speech
- Phonemes
- Plays and Theater
- Poetry
- Point of View
- Prefix/Suffix
- Presentations
- Pronouns
- Punctuation and Capitalization
- Reading Comprehension
- Research Skills
- Root Words
- Sentence Structure
- Synonyms
- Verbs
- Vocabulary
- Writing Sentences

Middle Grades (Grades 7-8)
- Characterization
- Connotation
- Content Area Literacy
- Contextual Analysis
- Denotation
- Elements of a Story
- Grammar
- Interdisciplinary Subjects
- Interpreting Graphs in Text
- Literary Analysis
- Literary Criticism
- Literary Devices
- Literary Themes
- Modes of Persuasion
- Narrative
- Non-Fiction
- Oral Communication
- Plays and Theater
- Poetry
- Point of View
- Prose and Poetry
- Punctuation and Capitalization
- Reading Comprehension
- Research Skills - Sources and Documentation
- Sentence Structure
- Subject Area Themes
- Theme
- Vocabulary

High School (Grades 9-12)
- Argument
- Copyright
- Exposition
- Expression through writing and presenting
- Figures of Speech
- Functional Texts
- Grammar
- Literary Analysis
- Literary Criticism
- Literary Devices
- Literary Periods
- Literary Themes
- Logical Development of Ideas
- Multimedia Communication
- Oral Communication
- Organizational Features of Text
- Persuasion
- Plays and Theater
- Point of View
- Presenting Media
- Prose and Poetry
- Punctuation and Capitalization
- Reading Comprehension
- Research Skills
- Sources and Documentation
- (APA/MLA/Chicago/Turabian)
- Viewing Media
- Visual Communication
- Vocabulary
Literature

Literary Periods and Movements
- British Literature
- The Enlightenment
- Existentialism
- Medieval Literature
- Modernism
- Multi-Media
- Naturalism
- Post-Colonial Literature
- Post Modernism
- Realism
- Religious Texts
- Renaissance Literature
- Romanticism
- Transcendentalism
- Victorian Literature

Literary Criticism
- Feminist and Gender Criticism
- Formalism
- Historical Criticism and New Historicism
- Marxist Criticism
- Mythological Criticism
- Psychological/Sociological Criticism
- Reader Response Criticism
- Structuralism/ Deconstruction

Prose Non-Fiction
- Biography
- Creative Non-Fiction
- Essay
- News Media
- Non-Fiction

Dramatic Elements/Genres
- Classical Drama
- Comedy of Manners/Farce/Satire
- Drama: Tragedy/Comedy/Tragicomedy/Heroic
- Medieval Mystery/Miracle Plays
- Renaissance Theater
- World Drama Traditions

Prose Fiction
- Ballad
- Elegy
- Epic
- Lyric
- Novellas
- Novels
- Poetry
- Prosody: Rhyme/Meter/Rhythm/Stanza
- Short Stories
- Sonnet Italian/English
- World Fiction Traditions
- World Poetry Traditions

Literary Elements
- Character Development
- Character Types
- Narrative Point of View: First, Second, Third Person
- Plot Structure
- Setting: Geographic, Historical, Socio-Economic
- Stylistic Characteristics of Literature
- Thematic Characteristics of Literature
- Theme
- Versification

Literary Devices
- Allegory
- Irony: Verbal/Dramatic
- Figurative Language: Imagery
- Hyperbole and Synecdoche
- Mimesis/Metonymy
- Symbolism/Metaphor/Simile
Essay Writing

Business Writing
Citation and Documentation
College and Job Application Writing
Cover Letter Writing
Creative Writing
Descriptive Essay
Editing and Proofreading
Elements of Composition
Expository Essay
Five Paragraph Essay
Functional Writing
Grammar
Interdisciplinary Writing
Journal Writing
Literary Analysis Writing
Narrative
Organization and Outlining Essays
Paragraphs
Persuasive Essay
Poetry Writing
Pre-writing Skills
Punctuation and Capitalization
Research Skills and Resources
Resume Writing
Source Documentation (APA/MLA/Chicago/Turabian)
Speech Writing
Story Writing
Technical Writing
Thesis Statements
Topic Sentences
Transitions
Use of Literary Devices
Vocabulary and Word Choice
Voice
Writing Conclusions
Writing for Standardized Tests
Writing Leads, Introductory Paragraphs, Conclusions
Writing Research Papers
Writing Process
Writing Sentences
Writing Strategies
Writing Styles
College English

Grammar
  - Parts of Speech
  - Sentence Structure
  - Ending Strategies
  - Consistent Tense
  - Subject-Verb Agreement
  - Noun-Pronoun Agreement

Mechanics and Usage
  - Punctuation
  - Spelling
  - Capitalization
  - Homophones
  - Comma-splices
  - Run-ons
  - Incomplete Sentences

Reading
  - Evaluating Sources
  - Summary/Paraphrase
  - Analyzing Texts
  - Literary Devices

Source Documentation
  - APA (American Psychological Association)
  - MLA (Modern Language Association)
  - Chicago/Turabian

Style
  - Varied Sentence Structure
  - Qualifiers
  - Positive Form
  - Concrete Language
  - Concise Writing

Tone
  - Formality
  - Word Choice
  - Clarity
  - Academic Expression
  - Point of View
  - Bias
  - Active vs. Passive Voice

Vocabulary
  - Synonyms/Antonyms
  - Academic Word Choice

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**College Essay Writing**

**NOTE:** Tutors wishing to tutor College Essay Writing are expected to be familiar with all concepts on this list in addition to the College English list.

**Reading**
- Literary Devices
- Comprehension
- Summary/Paraphrase

**Source Documentation**
- APA/MLA/Turabian-Chicago
- Evaluating Sources
- Integrating Sources

**Modes of Persuasion**
- Logical Fallacies
- Argument Types (Toulmin, Rogerian, Classical/Aristotelian)

**Writing Process**
- Prewriting Strategies
- Thesis Statement
- Organizational Structure
- Grammar and Mechanics

**Writing Purpose**
- Analysis
- Narrative
- Persuasive
- Work-Related
- Speech Writing
Doctoral Writing

Proofreading
  Spelling, punctuation, capitalization

Copy Editing
  Grammar
  Syntax
  Consistency of terms

Formatting
  Reference page
  Citations
  Headings
  Auditing references and citations
  Table of Contents
  Headers and footers
  Appendix, tables and figures
  Spacing
  Pagination

Scholarly Writing
  Concise language
  Sentence structure
  Transitions between paragraphs
  Organization of thoughts and sections
  Flow
  Academic Tone

Argument
  Clarity of ideas
  Non-biased, logical argument
  Alignment of argument throughout the manuscript
Primary Reading

Comprehension
- Main idea and supporting details
- Synthesizing
- Summarizing
- Making predictions and inferences
- Questioning

Vocabulary and Word Recognition
- Root words and affixes
- Syllabication patterns
- Spelling patterns
- Context clues
- Phonemic awareness

Author’s Craft
- Tone and mood
- Figurative language
- Point of view
- Author’s purpose
- Theme
- Literary devices
- Types of genres

Text Structure
- Literary elements
- Cause and effect
- Problem / solution
- Compare and contrast
- Order and sequence
- Description
- Summarization

Understanding Features of Genres
- Poetry
- Fictional narratives
- Drama
- Informational texts
- Non-fiction
Describe features of different genres of writing or poetry. Apply suitable analysis strategies.

Fiction - narrative - identify features and analyze
Fiction - mystery/suspense - identify features and analyze
Poetry - identify features and analyze
Nonfiction - informational - identify features and analyze
Nonfiction - persuasive - identify features and analyze
Biography - identify features and analyze
Other

Identify main ideas and details, both explicit and implied, within a text.

Main idea - explicitly stated
Main idea - implied
Locating details

Draw valid inferences from a written text and be able to identify supporting text evidence.

Create valid inferences
Locate text evidence to support an inferred claim

Correctly identify point of view (first person, second person, third, etc.) and analyze for potential bias within a text.

First person point of view features and characteristics
Second person point of view features and characteristics
Third person point of view features and characteristics
Omniscient and Limited Omniscient Points of View
Reliable/Unreliable point of view narration

Identify text structures (cause and effect, chronological order, etc.) within a given text.

Cause and Effect
Problem solution
Compare/Contrast
Description
Main idea and Details
Chronological Order (Sequence)

Use an appropriate graphic organizer or other systematic approach (i.e. note-taking) to demonstrate conceptual understanding of a text.

Venn Diagram
Identify an Author's purpose for writing
Alphanumeric/Structured outline format
Timeline
Concept Web
T-chart
Other

Draw valid generalizations from a given text.

Create and/or identify valid generalizations from a text.
Locate text evidence to support a generalization

Correctly establish facts from opinions within a text.

Identify facts from a text
Identify opinions from a text

Evaluate how graphic sources such as graphs, tables, charts, and other visual images increase understanding of a text.

Analysis - graph, chart or table in a text
Analysis - picture
Other graphics in text context
Integrate main ideas and key details or events to create an effective summary of a text, passage, or book.

- Summarizing a passage
- Details in a summary
- Evaluate a given summary for completeness

Evaluate word meaning within a passage context, or in isolation.

- Vocabulary in isolation
- Vocabulary in context

Assess an author’s purpose, use of tone, and theme based on a given text.

- Identify an Author’s purpose for writing
- Identify tone of a given text
- Identify theme of a given text

Evaluate reliability of sources, giving consideration to tone, mood or potential bias of the author.

- Tone of text/effect on reliability
- Mood of text/effect on reliability
- Potential bias of author/effect on reliability

Evaluate persuasive writing to determine if an argument is presented logically, clearly, and adequately to influence the reader.

- Text features of persuasive writing
- Argument effectiveness

Formulate connections between texts, compare and contrast two texts on related topics.

- Text connections
- Compare/contrasts related texts

Explain pre-reading activities that increase comprehension.

- Justify pre-reading strategies
- Analyze effective pre-reading activities

Utilize figurative language and textual elements to gain a better understanding of literature.
Primary ELL

Use of English
- Articles
- Comparisons and Superlatives
- Conditionals
- Contractions
- Countable and uncountable nouns
- Determiners
- Indirect speech
- Participial adjectives
- Passive and active voice
- Passive causatives
- Phrase usage
- Prepositions
- Pronouns
- Relative clauses
- Tag questions
- Time expressions
- Uses of gerunds and infinitives
- Using dictionaries
- Verbs
- Vocabulary
- Word form

Writing
- Conventions of standard written English syntax
- Linking words and text organizers
- Essay structure and development
- Parallel structure
- Research skills

Spelling
- Stages of the writing process

Speaking
- Daily communication
- Differences between English pronunciation and spelling
- Idioms
- Presentations
- Phonemic awareness

Listening
- Identifying main ideas vs. details
- Listening comprehension strategies
- Processing contextual audio
- Visual organizers

Reading
- Analysis of figurative language
- Concepts of print
- High-frequency sight words
- Reading comprehension strategies
- Phonics as used in Primary ELL
- Rhyme
- Segmenting
- Visual organizers

Pedagogy of ELL
- Concept of communicative competence
- Differences among languages
- Error correction strategies
- Literacy learning strategies
### English Language Use
- Word form
- Verbs followed by gerunds or infinitives
- Verb tense formation and uses
- Time expressions
- Tag questions
- Subjunctive mood
- Subject-verb agreement
- Relative clauses
- Pronouns
- Prepositions
- Phrase usage: Neither, nor, such, so
- Phrasal verbs
- Passive causatives
- Passive and active voice
- Parts of a sentence
- Participial adjectives
- Modal verbs
- Irregular verb forms
- Indirect speech
- Countable and non-countable nouns
- Conditionals
- Comparisons
- Articles
- Sentence Diagramming
- Vocabulary--finding meaning in context
- Vocabulary--dictionary definitions, appropriate usage, collocations, word families, and connotations
- Using dictionaries

### English Writing
- Conventions of standard written English syntax
- Inversion
- Linking words and text organizers
- Parallel structure
- Prewriting--Brainstorming, outlining
- Finishing the writing process--revising & editing
- Avoiding Plagiarism
- Using sources--credibility, citation, synthesizing info
- Introductions and thesis statements
- Conclusions
- Paragraph construction (topic sentence, body, concluding sentence)

### Types of Writing
- Critical Response
- Synthesis
- Argumentative
- Analysis
- Compare/contrast
- Narrative
- Descriptive
- Opinion
- Process
- Summary/paraphrase
- Research Papers

### Speaking
- Presentations
- Daily communication--giving directions, giving advice, etc.
- Pronunciation--Stress and intonation patterns
- Pronunciation--Phonetic (International Phonetic Alphabet) transcription
- Pronunciation--Identification of cause of pronunciation errors

### Listening
- Note taking
- Processing academic discourse (lectures, presentations, videos, etc.)
- Identifying main ideas vs. details
- Visual Organizers (Venn diagrams, concept maps, etc.)
- Predicting

### Reading
- Note taking
- Reading and processing academic texts
- Identifying main ideas vs. details
- Visual Organizers (Venn diagrams, concept maps, etc.)
- Skimming/scanning
- Predicting
Symbolic Logic

Inferences and Arguments (Premises and Conclusions)
- Recognition of argument
- Validity
- Soundness
- Contingency
- Factual Statements
- Invalidity
- Form versus Content
- Statements and Propositions
- Deductive versus inductive logic
- Sentential logic
- Terms, predicates, variables, and pronouns
- Compound formals
- Necessary versus sufficient conditions
- Statement connectives
- Truth-functional derivations

Categorical Propositions
- Components of a Categorical Proposition
- Venn diagrams and the square of opposition
- Aristotelian versus Boolean logic

Categorical Syllogisms
- Standard form, mood and figure
- Venn diagrams applied to syllogisms
- Rules
- Fallacies of Relevance
- Fallacies of Ambiguity

Propositional Logic
- Symbols and translation
- Truth functions
- Truth tables
  - Tautology, contradiction, contingency, and replacement
- Complex truth-functional formals
- If statements versus Only if statements
- Symbolizing the statement form

Natural deduction in propositional logic
- Rules of implication and replacement
- Proving logical truths

Predicate Logic
- Symbols and translation
- Change of Quantifier
- Relational and Overlapping Quantifiers
- Translations in monadic predicate logic
- Translations in polyadic predicate logic
- Complex predicates
- Wide-scope quantifiers
- Derivations in predicate logic
- Symbolizing the statement form

Logic Truth Trees
- Propositional Logic
- Predicate Logic
Introduction to Criminal Justice

Ethical Issues in Justice and Security
Criminological Theory
Information Technology
Policy Issues
Physical and Personal Protection
Response Planning and Crisis Management
Weapons and Personal Protective Equipment
Management of Criminal Justice Organizations
Victimology
Critical Incident Planning and Preparedness
Governmental Regulation of Policing Policies
Forensic Science
Introduction to Ethics

Normative Ethical Theories
- Egoism
- Consequentialism
- Deontological Ethics
- Obligatory and Super obligatory Actions
- Hedonism
- Stoic Ethics
- Pragmatic Ethics
- Virtue Ethics
- Existentialism/Radical Freedom
- Feminist Ethics

Metaethics
- Moral Realism and Anti-Realism
- Naturalism and Non-Naturalism
- Cognitivism and Non-Cognitivism
- Objectivism and Subjectivism
- Divine Command Theory (Theological Voluntarism)
- Error Theory
- Is-Ought Gap
- Moral Relativism

Applied Ethics
- Bioethics
- Business Ethics
- Animal Ethics
- Religious Ethics
- Political Ethics
- Sexual Ethics
- Environmental Ethics
- Social Justice

Key Ethical Terms
- Autonomy
- Free Will and Determinism
- Sympathy and Empathy
- Good and Evil
- Happiness
- Pleasure and Pain
- Normative
- Justice

Key Ethical Thought Experiments
- Trolley Problem
- Veil of Ignorance
- Utility Monster
- Experience Machine
- Violinist
- Ring of Gyges
- Drowning Child
- Organ Transplant

Key Ethical Philosophers
- Plato
- Aristotle
- Thomas Aquinas
- Immanuel Kant
- John Stuart Mill
- Peter Singer
- Derek Parfit
- John Rawls
- Robert Nozick
- Philippa Foot
- Judith Butler
Introduction to Philosophy

Ancient Philosophy
- Greek (Thales, Pythagoras, Zeno of Elea, Skeptics, Socrates, Plato, Aristotle)
- Hellenistic Philosophy (Epicurus, Stoicism)
- Philosophy & religion (Saint Augustine, Thomas Aquinas, Anselm of Canterbury)

Early Modern Philosophy
- The Renaissance (Humanism, Machiavelli, Hobbes)
- Descartes (Doubt & Existence, Mind & Body)
- Locke (Origin of ideas, British Moralists)
- Hume (Empiricism, Scientific Methods, Skepticism)

Recent Modern Philosophy
- The Enlightenment
  - Kant (Ethics, Philosophy of Mind, Moral Philosophy)
  - Idealism (Transcendental Ego, Objective Reality)
  - Utilitarianism (John Stuart Mill, Women’s Rights, Individual Liberty)

Contemporary Philosophy
- Phenomenology
- Existentialism (Kierkegaard, Nietzsche)
- Pragmatism (Charles Sanders Pierce, William James, John Dewey)
- Post Modernism
  - Ludwig Wittgenstein (Analysis of Language)

Eastern Philosophy
- Buddha
- Daoism
- Confucius

Branches and Foundations in Philosophy
- Metaphysics (Ontology, Mind, Spirit)
- Epistemology (Agnotology, Alethiology, Truth, Belief, Validity)
- Axiology (Value Theory)
- Ethics
- Aesthetics
- Logic & Reasoning (Critical thinking, Deductive, Inductive, Syllogism, Formal, Informal)
- Applied Philosophy (Law, Education, Math, Religion, Science, Engineering)
- Metatheory
- Schools & Traditions
- Social Philosophy (Feminism, Politics, Language)
Introduction to Psychology

History and Research
- Approaches/schools of psychology
- Research approaches
- Ethics in research, clinical and applied psychology

Biopsychology
- Physiological research techniques
- Nervous system – functional organization
- Neurons, electrical and chemical signaling
- Neuroanatomy
- Endocrine system
- Animal models in psychology, evolution
- Genetics
- Neuroplasticity

Sensation and Perception
- Sensory systems & receptors
- Attention
- Perceptual processes
- Psychophysical mechanisms

Consciousness
- Sleep and dreaming
- Sleep and dreaming
- Meditation
- Psychoactive drugs and consciousness

Conditioning and Learning
- Biological (neural) basis for learning
- Classical conditioning
- Operant conditioning
- Observational learning
- Cognitive processes in learning
- Constructivism
- Social learning, Implicit learning

Cognition
- Memory
- Language
- Thinking
- Problem solving
- Intelligence

Motivation, emotion
- Biological basis
- Social motivation
- Theories of emotion
- Stress

Developmental
- Types of development
- Gender, sex, and sexuality
- Heredity and environment
- Lifespan: prenatal through geriatric
- Developmental research methods

Personality
- Assessment: measuring personality
- Theories of personality
- Self-concept and self-esteem

Psychological disorders
- Defining “normality” and “abnormality”
- Anxiety disorders
- Dissociative disorders
- Mood disorders
- Neurocognitive disorders
- Personality disorders
- Psychoses
- Somatoform disorders
- Health, stress, coping

Treatment
- Psychological therapies
- Medical therapies, psychopharmacology
- Community psychology

Social psychology
- Aggression & antisocial behavior
- Attitudes, attitude change
- Attribution processes
- Conformity, compliance & obedience
- Group dynamics
- Interpersonal perception
- Cultural influences

Statistics, tests, measurement
- Descriptive & inferential statistics (definitions)
- Measurement, operational definitions
- Reliability and validity
- Samples, populations, standardization & norms
Cultural Anthropology

Cultural Anthropology
  Subdisciplines of Anthropology
  Culture
  Method and Theory
  Applied Anthropology

Language and Art
  Communication and Language
  Art and Media

Ethnicity, Gender and Religion
  Race and Ethnicity
  Gender and Sexuality
  Religion

Politics and Economics
  Subsistence
  Political Arrangements

Kinship and Marriage
  Kinship
  Marriage

Global Perspective
  Colonialism and Global Systems
  Trade
  Ecology
  Current Issues
Political Science

American Politics
- Structure of Federal and Local Governments
- Civil Rights and Liberties
- Political Behavior and Culture
- Communication and Political Strategies
- Homeland Security
- Current Political Issues
- Institutions

Comparative Politics
- The Modern State
- Identity
- Regimes and Governing Institutions
- Participation and Representation
- Political Economy
- Conflicts and Violence
- Intercultural Awareness

International Relations
- Realist Theories
- Liberal and Social Theories
- Globalization and Global Citizenship
- Violence, Terrorism and Counter-Terrorism
- International Organizations and Law
- Foreign Policy
- International Security and Military Strategies
- Geopolitics and Human Geography

Methodology in Political Science
- Research Design
- Research Ethics
- Qualitative Method
- Quantitative Method
- Statistical Inference
- Data Collection and Interpretation

Political Thoughts
- The Meaning of Politics
- Freedom and Social Contract
- Power, War and Conflicts
- Justice and Law
- Individual v. Collective Rights
- Political Culture and Behavior

Public Policy
- Contexts of Public Policy
- Economic Issues
- Environmental Policies
- Criminal Justice
- Morality and the Role of Religion
- Social Policies
- Defense Policies Subdisciplines of Anthropology
Research Methods

Scientific Method
- Cause and effect
- Research hypotheses
- Testability

Developing research ideas
- Defining and using constructs
- Theories, models, and hypotheses
- Pilot research

Literature searches
- Conducting a literature search
- Evaluating quality of sources
- Peer review
- Reading journal articles

Research ethics
- Belmont report
- Deception
- Institutional Review Boards and human-subjects research
- Animal Care and Use Committees and non-human subjects

Bias
- Experimenter bias
- Participant bias
- Research and Culture

Sampling
- Populations and samples
- Probability sampling methods
- Nonprobability sampling
- Sampling Error

Validity and Reliability
- Internal validity
- External validity
- Threats to validity
- Measurement
- Inter-rater reliability

Non-Experimental & Quasi-Experimental Research
- Correlational studies
- Pre-Post, time-series, and longitudinal designs
- Quasi-independent variables
- Ex Post Facto research
- Survey construction and administration
- Likert scale questions
- Tests, Inventories, and self-report

Qualitative research
- Naturalistic observation
- Case study
- Focus groups
- Coding and categorizing

Small-N and single-subject designs
- Phases and phase changes
- Reversal designs
- Multiple baseline designs
- Evaluating single-subject research

Quantitative research and Experimental Design
- Independent variables
- Dependent variables and measurement choices
- Control
- Counterbalancing
- Extraneous variables
- Confounding variables
- Group selection
- One factor, two or more groups
- Factorial designs
- Interaction
- Sample size and power

Evaluating Research
- Hypothesis testing
- Appropriate statistical tests for experimental design
- Interpreting statistical results
- Effect size
- Drawing conclusions
- Generalizability
- Causality

Tutors should be familiar with parametric and nonparametric hypothesis tests included in the College Statistics subject.
Introduction to Sociology

History and Theory
- Purpose of Sociology
- Sociological Imagination
- Structural Functionalism
- Conflict Theory
- Symbolic Interactionism
- Social Exchange Theory
- Ethnomethodology
- Individual and Society
- Social Context of Time, Place, and Location
- Macro- and Micro- Approaches

Theories of Self
- Socialization and the Self
- Looking Glass
- "I" and "Me"
- Dramaturgy
- Status
- Role Conflict, Strain, Performance, and Expectation
- Emotions

Culture and Society
- Norms, Customs, Traditions, Values, Symbols, and Language
- Ethnocentrism
- Cultural Relativism
- Group Behavior
- Power
- Authority
- Leadership

Social Class
- Class Systems
- Inequality
- Income and Wealth
- Subcultures
- Labor Market
- Division of Labor
- Economic Systems
- Privilege and Oppression
- Social Mobility

Deviance and Social Control
- Deviance
- Labelling
- Misdemeanor and Felony
- Group Dynamics
- Criminal Justice, Punishment
- Social Control
- Stigma

Race/Ethnicity
- Common Culture
- Shared Experience
- Divisions

Race/Ethnicity (Cont'd)
- Inequalities
- Dominant Group
- Minority Group(s)
- Discrimination, Prejudice, Racism
- Homogeneity and Heterogeneity

Gender/Sex
- Biological Traits
- Gender Norms
- Gender Orders
- Masculinity/Femininity
- Personal Identity
- Feminism
- Heterosexism

Sexuality
- Sexual Attraction
- Relationship with Sex and Gender
- Non-binary sexuality
- Sexual Harassment
- Homophobia

Social Institutions and the Family
- Education
- Schooling and Social Class
- Types of Families
- Nuclear/Extended
- Types of Marriage
- Religion
- Protestant Work Ethic
- Religious Organization - Denominations, Cult,
  Church, Sect
- Types of Politics
- Capitalism, Socialism, and Communism
- Demography
- Deindustrialization
- Migration
- Health
- Morbidity and Mortality

Social Change
- Social Change and Dilemmas
- Threat to Social Order
- Group Reluctance
- Social Change and Movements

Research Methods
- Qualitative Methods
- Quantitative Methods
- Mixed Methods
- Independent and Dependent Variables
- Mean/Median/Mode
- Sample
- Hypothesis
Introductory Accounting

Financial Reporting and Accounting Cycle
- Accrual vs. cash accounting
- Worksheets and t-accounts
- Adjusting Entries
- Financial Statement Preparation (including direct/indirect statement of cash flows)
- Closing Entries

Accounting for Service and Merchandising Companies
- Journal Entries
- Multi-step income statements
- Perpetual vs. periodic
- LIFO, FIFO, & weighted average
- Accounting for uncollectible accounts (allowance method vs. direct write off method)

Internal Controls & Cash
- Bank reconciliations
- Petty cash

Accounting for Property, Plant, and Equipment
- Entries for PPE purchases
- Entries for PPE sales/disposal
- Depreciation (straight-line, double-declining-balance, units-of-production)

Accounting for Partnerships
- Forming a partnership
- Income allocation
- Partner admission/withdrawal
- Partnership liquidation

Accounting for Corporations
- Entries for stock
- Entries for dividends
- Stock splits
- Financial ratio analysis
- Treasury stock

Accounting for Investments
- Accounting for investments in stocks (purchase, sale, equity method, fair value method, etc.)
- Accounting for investments in bonds

Bonds Payable
- Accounting for bonds
- TVM Analysis for bonds
- Amortization & amortization tables

Payroll and Taxes
- Accounting for taxes
- Accounting for payroll

Managerial Accounting
- Job order costing
- Process costing
- Activity-based costing
- Cost-volume-profit analysis
- Variable vs. absorption costing
- Budgets

Planning, control, and performance evaluation
- Differential analysis
- Capital investment decisions
Intermediate Accounting

Accounting Cycle, Income Statement, Balance Sheet
- Accrual vs cash
- Adjusting entries
- Extraordinary items
- Financial statement presentation and disclosures

Statement of Cash Flows
- Indirect method of cash flows
- Direct method of cash flows
- Investing & financing cash flows

Time value of money
- PV and FV of lump sum
- PV and FV of annuities
- Deferred annuities

Revenue recognition issues
- General criteria for recognizing revenue
- Long term contracts
- Installment sales
- Multi-component contracts

Revenue, Receivables and Cash Cycle
- Sales adjustments (discounts, returns, allowances)
- Notes receivable
- Sale of receivables
- Cash equivalents
- Estimating uncollectible accounts & net realizable value

Inventory & Cost of Goods Sold
- Perpetual vs periodic systems
- Inventory valuation methods
- Lower of cost or market
- Special issues: in transit, consignment, purchase adjustments

Noncurrent operating assets
- Establishing asset cost
- Valuation of assets and impairment
- Depreciation and amortization methods
- Retirement, sale or exchange of assets
- Error corrections

Debt
- Short term liabilities
- Bond pricing
- Bond issues and retirements

Equity
- Issuance of capital stock
- Treasury stock transactions
- Cash and stock dividends
- Accounting for share-based compensation

Investment in Debt & Equity Securities
- Classification of investment securities
- Recognition of revenue from investment securities
- Accounting for the change in value of securities
- Sale of securities

Leases
- Lease classification criteria
- Accounting for capital leases
- Accounting for operating leases

Income Taxes
- Computation of deferred assets and liabilities
- Carryback and carryforward of operating losses

Earnings Per Share
- Basic EPS
- Diluted EPS

Pensions

Contingencies

Accounting Changes and Error Corrections
- Changes in accounting principle
- Changes in accounting estimate
Cost Accounting
Activity Based Costing
Budgetary Planning and Control
Cost & Revenue concepts
Cost-Volume-Profit
Inventory Valuation
Job Order Costing
Manufacturing inventories
Motivating Employees to Perform
Process Costing
Ratio Analysis
Transfer Pricing
Working Capital Management
Govt/Nonprofit Accounting

In addition to a fundamental knowledge of Accounting, tutors will need to know specific applications with regard to:

- Governmental Transactions
- Budgeting
- Nonprofit Transactions
- Financial Reporting
Managerial Accounting
Budgetary Planning and Control
Capital Budgeting
Capital Structure
Cost-Volume-Profit
Incremental Analysis
Job Order Costing
Manufacturing inventories
Motivating Employees to Perform
Process Costing
Product costs v. period costs
Ratio Analysis
Transfer Pricing
Working Capital Management
Tax Accounting

1120
Business Income and Deductions
Compensation
Corporate Formation, Reorganization, and Liquidation
Corporate Operations
Corporation: Nonliquidating Distributions
Dispositions of Partnership Interests
Entities Overview
Forming and Operating Non-Profits
Forming and Operating Partnerships
Income and Exclusions
Individual Deductions
Individual Income Tax
Individual Income Tax Computation and Tax Credits
Intro to Tax
Investments
Property Acquisition and Cost Recovery
Property Dispositions
Retirement Savings and Deferred Compensation
S Corporations
State and Local Taxes
Tax Compliance
Tax Consequences of Home Ownership
Tax Planning
Transfer Taxes and Wealth Planning
U.S. Taxation of Multinational Transactions
Advanced Accounting

**Intercorporate Investments**
- Investments in Financial Assets
- Investments in Associates
- Business Combinations
- Special Purpose Entities
- Equity Method
- Cost Method
- Acquisition Method
- Goodwill

**Consolidations**

**Segment and Interim Reporting**

**International Accounting**
- Foreign Currency Transactions
- Foreign Subsidiaries
- Foreign Exchange Risk and Hedging
- US GAAP vs. IFRS
- Translation of Foreign Currencies
- Financial Statement Conversions

**Financial Reporting and Standards**
- SEC
- SOX
- Ethical Standards

**Accounting for Derivatives**

**Corporations in Financial Difficulty**
- Legal Reorganizations
- Liquidations
- Accounting for Bankruptcy

**Partnerships**
Auditing

Audit Reports
  Types of Audit Reports and Audit Opinions
  Components of an Audit Report

Quality Control Standards
  Elements of a System of Quality Control
  Acceptance and Continuance of Client Relationships
  Evaluating and Communicating Deficiencies
  Documentation of the system of internal control

Audit Risk and Analytical Procedures
  Materiality and Risk
  Audit Risk Model
  Internal Control and Control Risk
  Inherent Risk
  Planned Detection Risk
  Analytical Review Techniques

Professional Ethics and Legal Liability
  Auditor selection, compensation and termination
  Auditor vs Client responsibility for auditing statements
  Rights and Responsibilities of Auditors

Audit Evidence
  Types of Audit Evidence
  Procedures for Obtaining Evidence
  Sources of Substantive Audit Evidence

Fraud
  Types of Fraud
  Assessing the Risk of Fraud
  Responsibilities When Fraud is Suspected
Introductory Economics

Intro Microeconomics
Basic Supply and Demand (Algebra-Based)
  The Demand Curve and Quantity Demanded
  The Supply Curve and Quantity Supplied
  Equilibrium and Market Demand
  Shortages, Surpluses, and Subsidies
  Taxes, Regulations, Price Controls, Price Ceilings, and Price Floors
  Consumer Surplus and Producer Surplus
  Deadweight Loss
  Income Effect and Substitution Effect
Production Possibilities Frontier (Algebra-Based)
  Opportunity Cost
  Comparative Advantage and Absolute Advantage
  Gains and Losses from Trade
  Marginal Rate of Substitution
Consumer Theory (Algebra-Based)
  Price Elasticity of Demand
  Cross-Price Elasticity
  Price Elasticity of Supply
  Consumer Utility and Marginal Utility
Monopoly and Oligopoly Behavior (Algebra-Based)
  Monopoly Structure and Power
  Monopoly Price Determination and Monopoly
  Marginal Revenue
  Monopoly Deadweight Loss and Inefficiency
  Price Discrimination
  Monopolistic Competition
  Economies of Scale
  Oligopoly Structure and Power
  Cartels, Cheating, and Breakdown of Cartels
Perfect Competition and Managerial Economics (Algebra-Based)
  Profit Maximization
  Short-Run Costs and Lost-Run Costs
  Marginal Cost, Average Cost, Fixed Costs, Variable Costs, and Total Cost
  Marginal Profit, Average Profit, and Total Profit
  Industry Supply and Demand Curves
  Uncertainty and Sunk Costs
Game Theory
  Nash Equilibrium
  Prisoners’ Dilemma
  Application to Oligopoly and Competition
Behavioral Economics
  Market Efficiency, Market Inefficiency, and Market Failure
  Positive Externalities, Negative Externalities, and Solutions for Externalities

Behavioral Economics (Cont’d)
  Adverse Selection and Moral Hazard
  Public Goods and Private Goods
  The Tragedy of the Commons and the Coase Theorem
Introduction to the Labor Market
  Supply of and Demand for Labor
  Marginal Product of Labor
  Types of Wages
  Tournament Theory

Intro Macroeconomics
National Economic Models and Growth Theories
  Classical and Neoclassical Economic Models
  Keynesian and New Keynesian Economic Models
  Business Cycles and Shocks to Aggregate Demand
  Classical Growth Models
  Solow–Swan Growth Model
National Accounts, Price Indices, and the Circular Flow of Expenditures
  Gross Domestic Product and Gross Domestic Income
  Gross National Product and Gross National Income
  GDP Cycles, Real GDP, and Nominal GDP
  Economic Growth and Loss
  GDP Deflator
  Consumer Price Indices
  CPI Deflator
National Investment and Savings
  Marginal Propensity to Consume
  Marginal Propensity to Save
  The Multipliers
National Labor Market and Labor Force Participation
  Supply of and Demand for Labor
  National Labor Market Equilibrium
  Causes and Types of Unemployment
  Labor Force Participation Rates
  Full Employment Output
Fiscal Policy, Taxation, and Federal Spending
  Income Taxes and Corporate Income Taxes
  Balanced Budgets and Government Debt
  Transfer Payments and Federal Spending
  Insurance and Welfare
Monetary Policy and National Banking
  Fractional Reserve Banking System and Reserve Ratios
  The Power, Functions, and Tools of the Federal Reserve
Monetary Policy and National Banking (Cont’d)
Levels of the Money Supply
Positive and Negative Shocks to the Money Supply

Inflation and Quantity Theory of Money
Types and Causes of Inflation
The Phillips Curve
Quantity Theory of Money

Introduction to Savings, Investment, and Finance
The Market for Loanable Funds
Supply of and Demand for Money
The Role of Intermediaries and Types of Investments
Stocks, Bonds, and Returns on Investment
Simple and Compound Interest

Economic Ethics and Public Policy
Cultural Goods, Paternalism, and Exploitation
Fair and Equal Treatment

Economic Ethics and Public Policy (Cont’d)
Immigration and Meddlesome Preferences
Poverty, Inequality, and Distribution of Income
Special Interest Groups

Political Economy
Democracy, Growth, and Famine
Median Voter Theorem
Rational Ignorance and Voter Myopia
Political Business Cycles

International Economics
Balance of Payments
Imports, Exports, and Trade Balance Behavior
Tariffs and Protectionism
Types of Exchange Rates
Currency Speculation
Intermediate Macroeconomics

Capital, Investment, and Market for Loanable Funds*
- Changes in and Factors of Capital Stock: Tobin’s Q
- Cost of Capital and the Demand for Investment
- The Market for Loanable Funds
- Keynesian Cross
- Marginal Product of Capital
- Types of Interest Rates

National Consumption and National Savings*
- Budget Constraints and Consumption Functions
- Income Shocks and Intertemporal Choice
- Measuring National Savings
- The Marginal Propensity to Consume, the Marginal Propensity to Consume, and the Multipliers

National Economic Models and Growth Theories*
- Classical and Neoclassical Economic Models
- Savings and Investment Economic Models
- Consumption and Savings Economic Models
- Keynesian and New Keynesian Economic Models
- Business Cycles
- Fischer Economic Models
- Stylized Facts
- Classical Growth Models
- Endogenous Growth Model
- Solow-Swan Growth Model

Endowment and Production Economies
- Production Economy Model and Production Economy Problems
- Effects of Change in Production Economies
- Production Equilibrium
- Endowment Economy Model and Endowment Economy Problems
- Endowment Equilibrium

Fiscal Policy and Government Debt
- Balanced Budgets, Tax Smoothing, Stabilization Policies
- Government Deficits and Government Spending
- Government Transfer and Taxation Policies
- Traditional View of Government Debt
- Ricardian Debt and Ricardian Equivalence Theorem

National Accounts, Price Indices, and the Circular Flow of Expenditures
- Gross Domestic Product/Gross Domestic Income
- Gross National Product/Gross National Income
- GDP Cycles, Real GDP, and Nominal GDP
- Economic Growth and Loss
- GDP Deflator
- Consumer Price Indices
- CPI Deflator

National Labor Market and Labor Force Participation
- Supply of and Demand for Labor
- National Labor Market Equilibrium
- Causes and Types of Unemployment
- Labor Force Participation Rates
- Full Employment Output
- Labor/Leisure Choice
- Productivity Shocks
- Reservation Wages and Wage Determination

Aggregate Supply and Demand*
- The AS-AD Model
- Aggregate Demand and Long Run Aggregate Supply
- Shifting Aggregate Demand and Aggregate Supply and the AS-AD Equilibrium
- The IS-LM Model
- Shifting the IS-LM Curves and the IS-LM Equilibrium

Inflation, Quantity Theory of Money, and Theory of Liquidity
- Causes and Types of Inflation
- Inflation and Unemployment: The Phillips Curve
- Quantity Theory of Money
- Velocity of Money
- Levels of the Money Supply
- Positive and Negative Shocks to the Money Supply
- Theory of Liquidity

Monetary Policy and National Banking
- National Banking Systems, Tools, Federal Reserve
- The Role and Structure of Intermediaries
- The Fisher Effect and the Laffer Curve
- The Supply of and Demand for Money
- Money Neutrality, Money Non-Neutrality, and Monetary Equilibrium
- Rational and Irrational Expectations
- Welfare Improving Stabilization Policy
- Currency Printing and Seigniorage
- Ex Ante Outcomes, Ex Post Outcomes, Multiple Equilibria, and Animal Spirits

International Economics
- Imports, Exports, and Trade Policies
- Trade Balance Behavior
- Foreign Exchange Markets/Foreign Exchange Rates
- Currency Speculation and Signal Watching
- Balance of Payments
- Income Equality and Inequality: The Gini Coefficient and Autarky
- Poverty and Distribution of Income
- Immigration, Exploitation, and Paternalism

*Calculus-based
Intermediate Microeconomics

Consumer Theory (Calculus-Based)
- Budget Constraints and Consumer Surplus
- Consumer Choice and Demand
- Consumer Preferences and Utility
- Insurance, Lotteries, and Risk Aversion
- Compensating Variation and The Slutsky Equation
- Price Elasticity

Game Theory
- Nash Equilibrium, Mixed Strategies, and Dominant Strategies
- Sequential Games and Subgame Perfection
- Bayesian Equilibrium and Signaling
- Separating Equilibrium
- Adverse Selection
- Threats, Commitments, and Credibility

Behavioral Economics
- Asymmetric and Incomplete Market Information
- Positive Externalities, Negative Externalities, and Market Failures
- Solutions for Negative Externalities and Markets for Positive Externalities
- Moral Hazard and the Principal-Agent Problem
- Warranties, Quality, Uncertainty, and Signaling
- Risks, Risk Preferences, and the Demand for Risky Assets
- Public, Private, and Network Goods
- Tragedy of the Commons and the Coase Theorem

Monopoly and Monopsony (Calculus-Based)
- Monopoly Structure and Power
- Monopoly Marginal Revenue and Monopoly Profit Maximization
- Price Discrimination
- Social Costs of Market Power
- Monopoly Advertising and Building
- Monopsony Structure and Power
- Tariffs, Price Ceilings, and Price Floors

Monopolistic Competition and Oligopoly (Calculus-Based)
- Market for Factor Inputs
- Structure and Power of Monopolistic Competition
- Oligopoly Structure and Power: Cournot and Stackelberg Models
- Price Competition
- Prisoner’s Dilemma and Price Setting
- Cartels and Breakdown of Cartels

Theory of the Firm and Managerial Economics (Calculus-Based)
- Cost Minimization and the Cost Function
- Profit Maximization and the Profit Function
- Consumption Duality
- Long-Run Costs and Short-Run Costs
- Long-Run Supply and Short-Run Supply
- The Shutdown Condition
- Economies of Scope and Economies of Scale
- Technology, Inputs, and Outputs
- Marginal Product of Capital

Labor Market (Calculus-Based)
- Supply of and Demand for Labor
- Managerial Wage Determination and Minimum Wage
- Total Labor and Marginal Product of Labor
- Labor Market Efficiency Wage Theory
- Labor Unions
Finance

Role and objective of financial management
- Review of the four basic financial statements
- Analysis of financial statements and financial performance

Markets and Financial Institutions
Stock and Bond Valuation
Time Value of Money
Techniques of Analysis (cash flow valuation; capital budgeting and risk analysis)

Financial Choices of Firms
- Distributions to shareholders
- Dividends and share repurchases/treasury stock
- Managing current assets/working capital
- Financing current assets/managing current liabilities

The Financial Environment
- Markets, institutions, interest rates, and taxes
- Risk and rates of return
- Bonds and their valuation
- Stocks and their valuation
- Cost of capital
- Capital budgeting, including cash flow estimation, decision criteria, and risk analysis
- Capital structure and leverage
- Distributions to shareholders
- Dividends and share repurchases/treasury stock
- Managing current assets/working capital
- Financing current assets/managing current liabilities
- Financial planning, budgeting, and forecasting.
Principles of Management

History and Theories of Management
- Scientific Management
- Organizational Developments
- Sociotechnical Theory
- Hierarchy of Needs
- Five disciplines of the Learning Organization

The Role of Customer Relations
- Building customer relationships
- Promotions, Pricing & Credit
- Environmentalism (burdens and potentials)
- Psychological & Sociological influences

Professional Management & Managing Growth
- Managing Human Resources
- Managing Operations
- Managing Risk
- Leadership & Authority
- Time management

Entrepreneurial Opportunities
- Small Businesses Concepts

Ethics in Business
- Integrity framework
- Supporting Organizational Culture

Business Analysis
- SWOT
- Internal & External (outside-in analysis & inside-out analysis)

The Business Plan
- Function of and formatting plan
- Main types of plans

Employee Relations & Leadership
- Roles in motivation
- Specifying structure and creating balance

Legal forms of Organizations
- Sole proprietorship, partnerships, C Corp, LLC, etc.

Financial Planning
- Income statement
- Balance sheet
- Cash Flow statement
- Financial forecasting
- Debt & Equity

Product & Supply Chain Management
- Product lifecycle
- Branding, labeling, strategies
Business Law

Foundations of Law
- Criminal vs. Civil Law
- Substantive vs. Procedural Law
- Sources of Law
- Administrative Law & Regulation
- Consumer Protection Laws
- Anti-Trust Regulations
- Unfair Trade Practices
- Employment Law & Labor Relations
- Professional Liability and Accountability
- Environmental Law

Dispute Settlement
- Means of Dispute Settlement
- State and Federal Court Organization
- Alternative Dispute Resolution
- Court Procedure
- Criminal Concerns
- Intentional Torts
- Liability

Contracts & E-Contracts
- Elements of Contracts
- Offer & Acceptance (Agreement)
- Consideration
- Form and Meaning
- Capacity
- Consent, Mistakes, Fraud, Undue influence & Duress
- Statute of Frauds & Writing Requirement
- Third Party Rights
- Performance and Discharge
- Breach & Remedies

Sales & Lease Contract Formation
- Uniform Commercial Code (UCC)
- Title
- Risk
- Insurable Interest
- Performance, Breach and Remedies
- Warranties & Limitations
- Products Liability

Agency and Employment
- Agency Formation and Duties
- Agency Rights and Remedies
- Agency Liability and Termination
- Employment at Will
- Employment Discrimination
- Employment & Immigration

Business Organization
- Partnerships
- Hybrid Business Forms
- Corporations Formation
- Management of Corporations

Property
- Personal Property vs. Real Property
- Landlord-Tenant Relationships
- Zoning & Government Regulations
- Estates and Trusts
- Insurance Terms, Concepts & Types
- Intellectual Property

Commercial Paper
- Negotiable Instruments Definition
- Transferability & Holder in Due Course
- Liability of Parties
- Checks and Electronic Fund Transfers
- E-money & Online Banking

Creditor Rights
- Creditor Rights and Remedies
- Debtor Protections
- Surety & Guarantees
- Bankruptcy Concepts
- Mortgage and Foreclosure

Introductory Legal Research and Writing
- Effective Legal Research Strategies
- Researching Cases, Statutes, and Regulations
- Legal Databases and Governmental Codes
- Organizing Legal Research Notes
- Summarizing Case Law
Marketing

Marketing Strategy Fundamentals
   Establishing SMART marketing objectives, strategies, and tactics
   Identifying target markets
   Understanding the marketing mix or Four Ps
   Conducting situation and competitor analysis
   Navigating B2B, B2C, and non-profit marketing

Product or Service Development
   Designing a product or service concept and prototype
   Formulating brand positioning
   Calculating development costs and projecting sales
   Preparing a launch strategy

Market Research and Data Analysis
   Writing research proposals
   Planning the research design
   Conducting research through focus groups, surveys, and interviews
   Analyzing and Interpreting data
   Reporting on research findings

Consumer Behavior
   Understanding consumer decision making process
   Examining consumer information searches
   Exploring subcultures influencing consumer behavior
   Distinguishing between planned versus impulse purchases
   Defining brand equity, perception, and reputation

Public Relations and Communications
   Composing ethical marketing policies
   Determining social responsibility strategies and campaigns
   Pitching compelling stories for the media
   Designing a crisis communication plan
   Recognizing owned, earned and paid media methods
   Measuring and evaluating public relations results

Supply Chain and Distribution Logistics
   Creating supply chain management processes
   Implementing a customer service management system
   Negotiating for suppliers, vendors, and intermediaries
   Estimating and fulfilling orders
   Planning warehousing and distribution logistics

Creative Strategy, Advertising, and New Media
   Writing a creative brief
   Formulating promotional strategies via traditional
   Constructing digital marketing and social media strategies
   Developing interactive and mobile marketing strategies
Proficiency with Access 2010 required, preferably older and newer versions as well. English version required.

**Database Relations and Development**
- Database Terminology
- Primary and Secondary Keys - Creating Relationships
- Enforcing Referential Integrity in Key Relationships
- Creating a Database
- Creating a Database from a Template

**Tables**
- Types of Tables within a DB
- Creating Tables
- Creating Linked Tables
- Changing Tables
- Entering New Data
- Adding Descriptions
- Indexing a field
- Data Validation
- Hiding Fields
- Validating and Managing Records within a Table - Adding and Updating

**Queries**
- Using Queries within a Database
- Running a Query
- Creating a Simple Query
- Creating a Crosstab Query
- Creating a Parameter Query
- Operators and Expressions in a Query
- Creating an Aggregate Query
- Create an Action Query
- Create a Multiple Table Query
- Saving Queries

**Forms**
- Using Forms within a Database
- Creating a Blank Form
- Creating a Form from a Template
- Saving Forms
- Adding and Moving Form Controls
- Managing Labels
- Adding Sub-Forms
- Working with Data on Forms
- Modifying Print Settings
- Inserting backgrounds, headers, and footers

**Reports and Reporting Tools**
- Creating a New Report
- Creating a Report Based on a Query
- Creating a Report Using a Wizard
- Selecting Summary options
- Group and Sort Report Fields
- Report Text Box Controls
- Modify Data Sources
- Inserting headers, footers, and applying themes
- Formatting Reports

**Macros**
- Using Macros
- Understanding Security
- Creating a Macro
- Sub Macros
- Handling Macro Errors

**Importing/Exporting**
- Creating a DB by importing
- Importing Data into Tables
- Exporting Data

**Data Analysis**
- Transforming Data
- Calculations and Dates
- Parametrized Queries
- Entering SQL
- Subqueries and Aggregation
Note: Proficiency with Excel 2010 required, preferably older and newer versions as well. English version required.

Environment & Capabilities
- File Tab
- Excel Options – including finding and customizing
- Templates – including finding and implementing
- Add-Ins – including finding and installing

Toolbars
- Ribbon – including identification, usage, customization, etc.
- Quick Access Toolbar – including identification, usage, customization, etc.
- Custom Tabs – including creation and arrangement of custom tabs, custom groups, etc.
- Formula Bar and Name Box

Spreadsheet Basics
- Rows and Columns
- Ranges – including selecting, naming, finding, using named ranges, etc.
- Views – including page layout, page break, custom, etc.
- Entering Data
- Printing
- Worksheet Management – including inserting, deleting, hiding, unhiding, moving, copying, etc.
- Panes and Page Breaks
- Headers and Footers – inserting, using templates, customizing, etc.
- Keyboard Shortcuts

Formatting
- Formatting Cells, Worksheets, Workbooks
- Format Painter
- Paste Special
- Conditional Formatting – including built-in styles and formula-based styles

Filtering & Sorting
- Filters – including implementing, using, customizing, etc.
- Sorting – including basic and custom sorts

Formulas & Functions
- Entering Formulas – including basic formula syntax, etc.
- Using Functions – including commonly used functions, using function helper, etc.
- Evaluating Formulas and Function Results – including tracing formulas/precedents, error checking, etc.
- Interpreting and Troubleshooting Formulas and Functions
- Calculation Operations – including manual vs. automatic

Charts, Tables, & PivotTables
- Creating, Using, and Formatting Charts
- Creating, Using, and Formatting Tables
- Creating, Using, and Formatting PivotTables
- Smart Art and Illustrations
- Sparklines

Importing & Exporting
- Importing and Exporting Data/Documents
- Importing and Exporting Pictures
- Picture Editing

Macros
- Recording Macros
- Running Macros

Saving, Sharing & Protecting
- Auto-Save – including default settings and customizing
- Recovery
- File Types (e.g., .xls, .xlsx, .xlsm, etc.)
- Sharing and Protecting Worksheets and Workbooks
- Evaluating Changes in Shared Documents
**MS Word**

*Note: Proficiency with Word 2010 required, preferably older and newer versions as well. English version required.*

**Program Fundamentals**
- Giving Commands in Word
- Using Command Shortcuts
- Creating, Opening, Previewing, Printing, Saving, and Closing a Document
- Using Help

**Getting Started with Documents**
- Entering, Deleting, Selecting, and Replacing Text
- Navigating, Browsing, and Viewing a Document
- Working with the Document Window and Viewing Multiple Document Windows

**Working With and Editing Text**
- Checking Spelling and Grammar
- Finding and Replacing Text
- Using Word Count and the Thesaurus
- Inserting Symbols and Special Characters
- Copying and Moving Text
- Collecting Multiple Items to Move or Copy
- Using Undo, Redo, and Repeat

**Formatting Characters and Paragraphs**
- Changing Font Type, Size, Color, Highlighting, Styles, and Effects
- Applying Spacing and Ligatures
- Creating Lists
- Changing Paragraph Alignment, Paragraph Spacing, and Line Spacing
- Adding Paragraph Borders and Shading
- Copying Formatting
- Setting, Adjusting, and Removing Tab Stops
- Using Left and Right Indents, and First Line and Hanging Indents

**Formatting the Page**
- Adjusting Margins, Page Orientation, and Size
- Using Columns, Page Breaks, Section Breaks, Line Numbers, and Hyphenations
- Working with the Page Background
- Rearranging, Numbering, and Viewing an Outline
- Rearranging and Navigating Long Documents
- Using Headers, Footers, Bookmarks, Cross-references, Footnotes, Endnotes, Citations, and Bibliographies
- Working with Picture Captions
- Adding a Table of Contents, Index, Cover Page, and Page Numbers

**Working with Themes and Styles**
- Creating, Modifying, Applying, and Deleting a Style
- Working with the Styles Gallery
- Creating a New Quick Style Set
- Selecting, Removing, and Printing Styles
- Comparing and Cleaning Up Styles
- Applying Document Themes
- Creating and Saving New Theme Colors and Fonts

**Working with Shapes and Pictures**
- Inserting and Formatting Clip Art, Screenshots, Pictures, Text Boxes, Shapes, and Graphics Files
- Removing a Picture’s Background
- Formatting and Otherwise Altering the Look of Pictures and Graphics
- Resizing, Moving, Copying, Positioning, Grouping, and Deleting Objects
Applying Special Effects  
Aligning, Distributing, Flipping, Rotating, and Layering Objects

**Working with WordArt, SmartArt, and Charts**  
Inserting, Editing, and Formatting WordArt  
Inserting and Formatting SmartArt  
Working with SmartArt Elements  
Inserting, Editing, and Formatting a Chart  
Working with Labels  
Using Chart Templates

**Working with Tables**  
Creating, Resizing, Moving, and Manipulating a Table  
Adjusting Table Alignment and Text Wrapping  
Working with Cell Formatting  
Merging and Splitting Cells and Tables  
Inserting and Deleting Rows and Columns  
Adjusting Row Height and Column Width  
Using Table Drawing Tools  
Working with Sorting and Formulas  
Working with Borders and Shading  
Using Table Styles and Table Style Options  
Converting or Deleting a Table  
Using Quick Tables

**Working with Mailings**  
Setting Up the Main Document for Mail Merge  
Creating and Editing a Data Source  
Selecting an Existing Data Source  
Inserting Merge and Rules Fields  
Previewing and Completing a Mail Merge  
Creating Labels and Envelopes

**Using Collaborative Editing Tools**  
Tracking, Accepting, and Rejecting Revisions  
Using Comments  
Comparing and Combining Documents  
Protecting a Document (with or without password)

**Working with Templates**  
Creating and using a Document Template  
Creating and Using Building Blocks and AutoText  
Attaching a Different Template to a Document  
Copying Styles between Documents and Templates

**Working with Forms**  
Creating a New Form  
Adding Content Controls  
Assigning Help to Form Content Controls  
Preparing the Form for Distribution  
Filling Out a Form

**Customizing Word**  
Customizing the Ribbon and Quick Access Toolbar  
Using and Customizing AutoCorrect  
Changing Word’s Default Options

**More Topics**  
Converting an Older Document to Word 2010  
Translating Text  
Publishing a Blog Entry  
Using Hyperlinks  
Viewing Document Properties and Finding a File  
Recovering Your Documents  
Managing Versions  
Recording, Playing, and Deleting a Macro
MS PowerPoint

Note: Proficiency with PowerPoint 2010 required, preferably older and newer versions as well. English version required.

Apply and change advanced options
Customizing the ribbon
Customizing the quick access toolbar
Creating/using macros
Using different view options
Proofreading options
Creating presenter notes
Setting up a slideshow
Adding animations
Utilizing transitions
Using & creating themes
Inserting charts & graphs
Inserting images
Grouping shapes and pictures
Creating tables
Inserting text options
Using audio & video in presentations
Working with watermarks
Creating and printing handouts
Adding headers & footers
Flowchart creation
Using and creating templates
Using drawing tools
Adding, removing, publishing slides
Creating layouts
Save & send options
Font options
Print options
Properties and Protecting File
Windows

*Note: Those wanting to tutor MS Windows must be proficient with BOTH the user side of Windows and the admin side of Windows.*

Windows Installation and Setup
- Preparing for Installation
- Adding/Managing User Accounts
- Display Settings & Personalization Options
- Power Settings
- Privacy / Security Settings
- Accessibility Options

File and Folder Operations
- Desktop, Start Menu & Taskbar
- Navigating with File Explorer
- Creating Folders and Saving Files
- Move, Copy, Delete, and Rename Files/Folders
- Folder Views and Settings
- File/Folder Searches
- Managing Hard Drives and Storage - Local, Removable, and Cloud

Windows Utilities
- Desktop Accessories
- Control Panel
- Backup and Recovery Tools
- Security - Antivirus, Antimalware, and Firewall Tools
- Windows Update

Basic Software & Hardware Management
- Windows Apps & Microsoft Store
- Adding/Removing Programs
- Adding/Removing/Managing Printers
- Adding/Removing/Managing Bluetooth Devices
- Locating and Running Programs

Accessing the Internet
- Connecting to a Network - Ethernet & Wi-Fi
- Accessing the Internet with Internet Explorer, Microsoft Edge
- Email and the Mail app
- Searching the Internet/Default Search Engine

Basic Troubleshooting
- Viewing System Information
- Task Manager - Monitoring System Performance
- Windows Troubleshooter
- Safe Mode
Adobe Illustrator

Program Basics
Working with Layers
Colors
Selection Tools
Drawing Tools
Shape Tools
Typography Tools
Painting Tools
Modifying Tools
Automation
Other Program Features
Adobe InDesign

Program Basics
Working with Objects
Drawing and Color Tools
Typography
Page Tools
Using Styles
Other Features
Adobe Photoshop

Program Basics
Working with Layers
Painting, Coloring, and Drawing Tools
Editing Images
Typography
Using Shapes
Animation and Action Panel
Making Selections
Other Program Features
Internet Fundamentals
  Layers of the Internet (application, transport, etc.)
  URL
  Pathway
  FTP and File Management
  Protocols (HTTP, HTTPS)

HTML
  Basic XML
  HTML Structure
  Lists
  Classes and IDs
  Tables
  Linking Resources
  Special Tags
  Div. and Span
  Forms

CSS
  Selectors
  Alignment
  Element Position
  Padding and Margins
  Content Decoration
  Variables
  Layout
  Multiple Browser Support

Fundamental JavaScript
  Basic programming concepts (functions, loops, etc.)
  DOM
  Events

PHP
  Variables, including PHP Reserved Variables
  Control Structures
  Functions
  Mixing HTML and PHP
  Handling Input (e.g. GET, POST, PUT, DELETE)
  REGEX for PHP
  php.ini

Accessibility
  Web Accessibility Standards
  Presentation of content
  Operable and understandable user interfaces
  Different web browsers and devices like mobile
Database Systems

**Database Design**
- Methodology - Conceptual/Logical/Physical
- ER Modeling
- Advanced ER
- Normalization
- Security and Administration

**Structured Query Language**
- CRUD Statements
- Aggregates
- Subqueries
- Filtering Query Output
- JOINs

**Advanced Queries**
- Designing Advanced queries
- Query optimization
- Common Table Elements
- Constraints
- Triggers

**Business Intelligence**
- Designing a client application
- Data Warehousing
- Reporting

**Database Management Systems**
- SQL Server
- Oracle
- MySQL
- Cloud Computing/Web DBMS
NOTE: Computer Science tutors are expected to be familiar with all concepts on this list in addition to the language-specific list of the subject(s) they would like to tutor.

Object-Oriented Program Design
Program design
Read and understand a problem description, purpose, and goals
Apply data abstraction and encapsulation.
Read and understand class specifications and relationships among the classes (“is-a,” “has-a” relationships).
Understand and implement a given class hierarchy.
Identify reusable components from existing code using classes and class libraries.
Class design
Design and implement a class.
Choose appropriate data representation and algorithms.
Apply functional decomposition.
Extend a given class using inheritance.

Program Analysis
Testing
Test classes and libraries in isolation.
Identify boundary cases and generate appropriate test data.
Perform integration testing.
Debugging
Categorize errors: compile-time, run-time, logic.
Identify and correct errors.
Debugging, adding extra output statements, hand-tracing code.
Understand and modify existing code
Extend existing code using inheritance
Understand error handling
Understand runtime exceptions.
Reason about programs
Pre- and post-conditions
Assertions
Analysis of algorithms
Informal comparisons of running times
Exact calculation of statement execution counts
Basic big-O questions
Numerical representations and limits
Representations of numbers in different bases
Limitations of finite representations (e.g., integer bounds, imprecision of floating-point representations, and round-off error)

Program Implementation
Implementation techniques
Methodology
Object-oriented development
Top-down development
Encapsulation and information hiding
Procedural abstraction
Programming constructs
Primitive types vs. objects
Constant declarations, Variable declarations
Class declarations
Interface declarations
Method declarations, Parameter declarations
Console output (System.out.print/println)
Control
Methods
Sequential
Conditional
Iteration
Understand and evaluate recursive methods

Standard Data Structures
Simple data types (int, Boolean, double)
Classes
Lists
Arrays
Sets and Multisets
Stacks
Dictionaries
Queues
Trees, binary trees, and binary search trees

Standard Algorithms
Operations on data structures previously listed
Traversals
Insertions, Deletions
Searching
Sequential
Binary
Bubble Sort, Selection Sort, Insertion Sort
Merge sort

Computing in Context
System reliability
Privacy
Legal issues and intellectual property
Social and ethical ramifications of computer use
Software Methodology
** NOTE:** Computer Science tutors wishing to tutor C++ are expected to be familiar with all concepts on this list *in addition to* the Computer Science Principles list.

- Namespaces
- Functions
- **Control Structures**
  - Conditional (if, if else, else, switch statements)
  - Iteration (for, while, do-while loops)
  - Break and continue
- **Input/Output**
  - Standard (iostream)
  - File I/O (fstream)
- **Strings**
- **Pointers**
- **Exception Handling**
  - Try/Catch blocks
  - Throw statement
- **Arrays**
- **Classes and Structs**
- **Operator Overloading**
- **Parameters**
  - Call by reference vs Call by value
- **Inheritance**
NOTE: Computer Science tutors wishing to tutor C are expected to be familiar with all concepts on this list in addition to the Computer Science Principles list.

**Syntax and Structures**
- Variables
- Data Types
- Arrays (single and multidimensional)
- Strings
- Operators
- Structures (struct)

**Control Flow**
- If/Else Statements
- Iterators
- Break/Continue
- Switch
- Goto

**Input/Output**
- Standard I/O
- Formatting
- Error Handling
- Preprocessor
- Streams

**C Fundamentals**
- Functions
- Standard Library
- Data Structures

**Pointers**
- Declaration and Usage
- Arrays and Pointers
- Pointer to Pointer
- Pointers and Functions
COMPTIA A+  
Principles and Procedures  
Safety and Security  
Windows 10  

Hardware Overview  
Processors  
Memory  
BIOS  
Motherboards  
Storage  
Power  

Operating Systems  
OS basics  
CLI  
Virtualization  
Mobile  
Troubleshooting OS  
File Systems  
Users and Groups  

Building/Imaging a PC  
Custom components  
Install or upgrade OS  
Patching/SP  
Drivers  
Migrate data  

Peripherals  
USB/Thunderbolt  

Keyboards  
Pointers (Mouse)  
KVM  
Multimedia  
Touch Screens  
Smartcard and Biometric  
Display  

Hard Drives  
RAID  
Types (SATA, SSD, Magnetic)  
Formatting & Partitioning  
Removable Storage  

Multifunction Devices  
Printers  
Copier/Scanners  
Fax  
Installation/Drivers  
Troubleshooting  

Network  
Ethernet  
LAN  
WAN  
Wireless  
Internet  
Mobile  
Network Security
R Programming

Importing and Exporting Data in R
- How to read in different file types
- Entering data in manually
- Using built-in datasets in R
- Exporting Data

Data Structures in R
- Vectors
- Matrices
- Lists and factors
- Data Frames
- Arrays

Basic R Commands
- Inferential statistics commands
- Statistical distribution functions
- If/then statements and conditional processing
- Writing functions
- Other commonly used functions

Data Manipulation
- Renaming row or column variables
- Filtering data
- Removing and adding data to an existing data set
- Looping
- Resampling techniques

Plotting in R
- Different types of plots (histograms, scatterplots, etc.)
- Formatting
- Adding points, lines, etc. to a plot

Statistical Modelling in R
- Linear and multiple regression models
- Logistic regression models
- Generalized linear models

Using R Packages
- How to install and load a package
- How to find help files for functions within a package
NOTE: Computer Science tutors wishing to tutor Java are expected to be familiar with all concepts on this list in addition to the Computer Science Principles list.

- **Primitive Data Types**
  - Integers
  - Floating Point Types
    - Characters
    - Boolean

- **Literals**
  - Variables
    - Variable Scope
    - Initializing Variables

- **Operators**
  - Type Casting and Conversion

- **Control Statements**
  - For loops
  - While Loops
  - If-Else Statements
  - Switch Statements

- **Classes**
  - Constructors
  - Class Definitions
  - Object Instantiation

- **Methods**
  - Using Parameters
  - Method Overloading
  - Returning Values

- **Arrays**
  - Multidimensional Arrays
  - Irregular Arrays

- **Strings**
  - Constructing Strings
  - Operating on Strings

- **Bitwise Operators**

- **Static Keyword**

- **File I/O**

- **Inheritance and Polymorphism**
  - Super classes and Subclasses
  - Abstract Classes
  - Method Overriding

- **Packages and Interfaces**
  - Packages and Member Access
  - Implementing Interfaces

- **Exception Handling**
  - Using Try-Catch-Finally
  - The Exception Hierarchy

- **Enumerations**

- **Generics Fundamentals**
NOTE: Computer Science tutors wishing to tutor Python are expected to be familiar with all concepts on this list in addition to the Computer Science Principles list.

Lists
Control Flow and Looping (while/for, use of the range() function instead of traditional for loop)
Tuples (relation to lists, unpacking)
List/Dictionary/Generator comprehensions
"Dunder" methods (__init__, __plus__, etc)
Variadic arguments (*args)
Keyword arguments (**kwargs)
List slices
Generators (yield)
Lambda functions
Dictionaries
Functions (including map, filter, reduce)
Files
Cisco System Administration

Data Networks
OSI and TCP/IP
Network Devices
Topologies

LAN Switching
Configurations
Troubleshooting
Security

IP Addressing
IPv4
IPv6
Addressing schema

Routing
Configurations
Troubleshooting
Security
Protocols

WAN Technologies
DSL
VPN
Cellular 3G and 4G
ISDN
Cloud Technologies

Cloud Fundamentals
- Cloud Ecosystem
- Motivation for Cloud
- Building blocks of Cloud

Cloud Service Types
- Traditional
  - IaaS (Infrastructure as a service)
  - PaaS (Platform as a service)
  - CaaS (Container as a service)
  - SaaS (Software as a service)
- N/A - Delete

Cloud Application Migration Approach
- Rebuild
- Rehost
- Replace
- Refactor

Cloud Providers
- Microsoft Azure
- Amazon AWS
- Google Cloud Platform (GCP)

Cloud Deployment Models
- Private Cloud
- Public Cloud
- Hybrid

Getting into Cloud
- Deploying into Cloud
- Security on Cloud
- Scalability on Cloud
User and Group Creation and Administration
  Naming
  Concepts
  Roles in Security, Privilege, and Access

Hardware Management
  Mass storage commissioning and configuration
  Peripheral commissioning and configuration
  Device-related tools and utilities
  sysfs, udev
  /sys/, /proc/, /dev/

Booting
  Bootloader and kernel options
  Boot sequence details
  Log file boot events
  System bootup process
  Boot-time events, files, and utilities
  Run level setting
  Boot target establishment
  Safe shutdown and reboot procedures

Installation
  Disk configuration
  Package selection
  Package management utilities: RPM, YUM
  Key filesystems: /var, /home, /boot
  Swap space allocation and sizing

Process Configuration and Management
  Monitoring active processes
  Foreground and background processes
  Process signaling
  Managing shared libraries

Virtualization
  Virtual machines and containers, general concepts
  Deploying virtual machines

Command line and scripting
  Using shell commands
  Understanding and using man pages
  Characteristics of common shells
  Log file and other text file processing
  Creating/editing scripts
  Using streams, pipes, and redirects
  Fundamentals of regular expression coding.
  Using vi; exposure to Emacs, nano, vim
  Job scheduling (cron and at)
  Managing system time

File management
  Files and directories - concepts
  Copying, moving, removing single files
  Recursively handling files and directories
  Using find
  Files permission analysis and management

Filesystem management
  Partition tables
  mkfs command
  Filesystem types
  Filesystem integrity analysis and maintenance

X11 configuration and management
  X11 architecture and concepts
  X windows config file
  Displays and keyboards
  Windows managers
  X windows client/server model
  Graphical desktops

Email management
  Configuration of email aliases
  Configuration of formatting rules
  Overview of email utilities (sendmail, postfix, exim)

Printers and printing
  CUPS configuration
  print queue management

Networking
  Basic TCP/IP (IPv4 & IPv6) architecture
  Role of TCP/IP ports; common ports
  Name resolution; DNS; hosts
  Diagnostic tools and utilities

Security
  Best practice security concepts
  Security auditing
  Encryption concepts
  Understanding the threat landscape
Windows Server

Server Setup and Installation
- Prep for Installation
- New install/Upgrade to Existing
- Selecting Server Hardware

Server Manager
- Accessing and starting server manager
- Create/Edit groups of servers
- View/Change roles, role services, and features
- Access Management Tools
- Managing Services
- Server Status - issues, events, and failures
- Manage Remote Computers

Managing Storage
- Access storage options/Disk Management
- Disk types
- RAID options
- Network Storage (NAS/SAN)
- Disk volumes/partitioning
- Mounting/Unmounting

Windows Services
- File services, NTFS/Sharing Drives
- Installing/Setting up printers
- Naming resolution, DNS, Hosts
- DHCP
- Active Directory
- IIS

Virtualization and Cloud
- Basic Concepts
- Hypervisors
- Install Hyper -V
- Configure VM
- Manage or Modify VM
- Azure

Monitor and Troubleshoot
- Performance and Resource Monitor
- Server Repair and Boot Options
- Fault Tolerance and Clustering
- Power - UPS, Redundancy
- Safe Mode

Windows Server 2019
- Storage Migration Service
- Containers
- Security
Network Security

CIA Principle
- Confidentiality
- Integrity
- Availability

Authentication
- Methods
- Factors
- Types
- Authorities and Digital Certificates

Encryption
- Introduction to Encryption and Cryptography
- Symmetric Key Systems
- Asymmetric Key Systems
- Public Key Systems
- Uses and Implementations
- Limitations, Attacks, Strengths

Vulnerability Assessment
- Types and Risk Factor Models
- Types of Threats
- Exploits, Flaws, and Classifications
- Assessment Types
- Vulnerability Assessment vs. Penetration Testing

Rights and Privileges
- Purpose of Privileges
- Levels of Privilege and Identity Management
- Differences Between Vendors

Physical Vs. Digital Security
- Site Security
- Access Control
- Compliance and Operational Security
- Passwords
- Firewalls
- Application, Data, and Host Security
Computer Networking

Network architecture
  - Network Topologies
  - LAN/ WAN
  - Network Devices and connector

Data communication
  - Data Transmission
  - Data Encoding
  - Error Detection

Protocols and Standards
  - OSI model
  - HTTP/HTTPS
  - FTP
  - SMTP
  - CSMA/CD
  - VOIP
  - Token Ring
  - IPv6
  - IPv4
  - TCP/IP

Network security
  - Risk related concepts
  - Attacks/threats
  - Access control
  - Hardening techniques
  - Authentication and authorization

Configuration
  - Troubleshooting

Command line tools
  - Wi-Fi analyzer

Cloud and virtualization
  - Cloud types
  - Virtual networking components

Wireless and Mobile networking
  - Mobile
  - Ad hoc
  - 802.11 standards

Networking services
  - DHCP
  - DNS
  - Proxy Server
  - VLAN
  - VPN

Ethernet
  - 802.3 Standards
  - Extending Ethernet
  - Frames
  - 100 MB/Gb/10Gb Ethernet

Routing
  - Tables
  - Algorithms
  - Dynamic Routing
  - Configuration of Routers
  - Troubleshooting
Cybersecurity

Security Policies and Procedures
  Threat life cycle
  Advanced Threat Protection
  Training best practices

Networks/Internet
  IP Addressing/CIDR
  Mac Addresses
  Firewalls
  Antivirus
  802.1x Filtering
  OSI model
  Common Network Appliances

Hacker Approaches
  Information gathering/scanning
  SQL injection
  Password Cracking
  WAP/Honeypot

Social Engineering
  Impersonation
  Phishing or Spear Phishing
  Vishing
  CEO Fraud
  Shoulder Surfing
  Attack Concepts(Intimidation/Authority/etc.)

Malware
  Characteristics of malware
  Multifunctional
  Crawlers/Bots
  Targeted Intrusions
  Denial of Service (DDOS)

Encryption
  Certificates
  Key Encryption
  Digital Signatures
  VPN(s)
  Cryptography

System Architecture
  Design Concepts
  Distributed Computing
  Security Models
  Hardware Security Architecture

Access Control
  Least Privilege
  Defense in Depth
  Physical Access Control
  Authentication Methods
Software Development & Engineering

Software Architecture
  Components
  Relationships
  Patterns

Design Principles and Patterns
  Design Pattern Basics
  MVC
  Services
  SOLID Principles
  Testing

Platforms
  Servers
  Distributed Systems
  Cloud
  Configuration Management

Layers
  Multitier Architecture
  Data Model
  Objects (e.g. Entities, DTOs, other Business Objects, etc..)

Tools/Languages
  IDEs
  Open Source, Nuget, and Third Party Software
  Debugging
  Basic Programming Languages for Web Applications like C#/.NET/SQL or PHP/MySQL

Software Maintenance
  Types of maintenance
  Maintenance costs
  Maintenance activities
  Re-engineering and Reverse-engineering
NOTE: Computer Science tutors wishing to tutor C++ are expected to be familiar with all concepts on this list in addition to the Computer Science Principles list.

**Fundamentals**  
Namespaces  
Directives  
LINQ  
.NET Framework

**Syntax and Structures**  
Variables  
Data Types  
Arrays  
Operators  
Lambda Expressions

**Input/Output**  
File Read/Write  
Escape Sequencing  
Convert data

**Control Structures**  
Conditional Statements  
Iterators  
Jump/Break/Continue  
Exception Handling

**OOP Concepts in C#**  
Methods  
Constructors  
Classes  
Inheritance  
Polymorphism  
Interfaces
Network Engineering

**Fundamentals**
- Topology
- Interfaces and cabling
- IPVs, TCP, UDP
- Monitor and Troubleshoot
- VOIP
- Automation

**Switching**
- VLANs
- Discovery Protocols
- Spanning Tree
- Interswitch connectivity
- LACP
- Switching concepts (Frame switching, flooding, etc.)

**Routing**
- Routing Tables
- Forwarding
- Dynamic and Static routing
- FHRP
- Link state protocols
- Distance vector protocols

**Network Services**
- DHCP
- DNS
- QOS
- SSH
- SNMP

**Security**
- Concepts
- VPNs
- Access Control
- AAA
- Layer 2 security features
- Firewalls

**Wireless**
- Principles
- Components
- WLAN
- APs/Channels
**Spanish**

**Basic Sentence Structure**
- Gender & Number of Nouns
- Definite Articles
- Indefinite Articles
- Noun-Adjective Agreement
- Negation (& Double Negatives)
- Contractions Al / Del
- Questions and Exclamations

**Advanced Sentence Structure**
- Direct and Indirect Object Pronouns
- Relative Pronouns & Adjectives
- Possessive Pronouns
- Superlatives
- Demonstratives
- Comparisons of Quantity and Number
- The Personal “a”
- Por vs. Para
- Pero / Sino / Sino Que

**Basic Verb Forms**
- Present Indicative
- Stem Changing Verbs
- Gustar Type Verbs
- Irregular 1st Person Verbs (“go, zco, jo, oy, eo” verbs)
- Present Progressive
- Ser vs. Estar
- Saber vs. Conocer

**Intermediate Verb Forms**
- Preterit (Definite Past)
- Imperfect (Undefined Past)
- Reflexive Verbs
- Conditional Tense
- Future Tense
- Irregular Preterit Verbs

**Advanced Verb Forms**
- Subjunctive Tenses & Conditions
- Perfect Tenses
- Past Participles
- Formal Commands
- Informal (tú) Commands
- Negative Commands

**Idiomatic Expressions**
- Acabar de
- Hay / Hay que
- Hace... (To indicate time that has passed)
- Valer la Pena

**Basic Vocabulary Units**
- Ordinal Numbers
- Telling Time
- Expressions for Weather
- Science & Technology
- Animals
- Home Decor and Furnishings
- Food & Kitchen
- School & Office
- Family Expressions & Relationships
- Clothing
- Medical Care & Human Physiology
- Feelings & Emotions
- Travel (Train & Air)
- Customary Greetings & Protocol
French

Basic Sentence Structure
Gender & Number of Nouns

Vocabulary (including but not limited to...)
Numbers and time
Greetings, letter writing, speaking on the phone
Food and drink
Marketplace
Clothing
Education and careers
Personal relationships, friends, family
Emotions
Hobbies, sports, leisure, travel
Animals, plants, scenery, weather
Body parts, illnesses, basic medical terms
Residences, rooms, furniture
Government, public institutions, infrastructure, news
French/English faux amis
Common French idioms

Grammar and Style
Verb conjugations, tenses, and moods
Pronouns

Literature (including but not limited to...)
Louise Labé
Jean-Jacques Rousseau
Guy de Maupassant
Paul Verlaine
Jules Verne
Victor Hugo
Albert Camus

Pronunciation and Phonetics
Describe how French vowels and certain French consonants differ from their English counterparts
Identify silent consonants and vowels
Identify and pronounce nasalized vowels
Use liaison and enchaînement to enhance euphony
Describe how stress functions in words and sentences
Describe how pronunciation and stress differ in poetry

French History and Culture
Basic history of France, from Roman Gaul to modern times
Basic geography of France, French territories, and other French-speaking nations
French education system
Present-day government of France
French holidays and customs
German

Adjectives
  Adjective Endings
  Comparative & Superlative
  Definite & Indefinite Articles
  Der- & ein-Words
  Extended Adjective Modifiers
  Present & Past Participles

Adverbs
  Expressions of Time
  Negation

Conjunctions
  Coordinating Conjunctions
  Subordinating Conjunctions
  Main and Subordinate Clauses

Nouns
  Appositives
  Case: Nominative, Accusative, Dative, & Genitive
  Gender

Prepositions
  Accusative, Dative, Genitive, & Two-way
  da- & wo-compounds
  Idiomatic Use of Prepositions

Pronouns
  Personal, Interrogative, Demonstrative, Indefinite, Possessive, Relative, & Reflexive

Punctuation
  Comma Rules

Verbs
  Conjugation
  Imperative
  Indirect Discourse & Subjunctive I
  Infinitival Constructions (um…zu, (an)statt…zu, ohne…zu)
  Modal Verbs
  Passive Voice, Statal Passive, Alternatives to Passive
  Regular & Irregular Verbs
  Subjunctive II
  Tense: Present, Present Perfect, Simple Past, Past Perfect, Future & Future Perfect
  Verbs with Separable & Inseparable Prefixes

Word Order
Italian

Basic Sentence Structure
- Italian alphabet, special characteristics
- Regular verbs
- Greetings
- Common salutations
- Expressing opinions
- Masculine versus feminine nouns
- Pronouns

Numbers/currency
- Date
- Time

Weather/seasons
- Action verbs
- Direction, travel

Culinary, food

Advances sentence structure
- Irregular verbs
- Direct pronouns
- Indirect-object pronouns
- Reflexive verbs
- Adjectives
- Using prepositions
- Imperfect subjunctive
- Il congiuntivo trapassato
- Il congiuntivo passato
- Il congiuntivo futuro
- Modal verbs
- Articulated prepositions
- Double object pronouns
- Future perfect
- Words with dual meaning
- Adverb
- Negative statements
- Conosce/Sapere
- Prepositions

Anatomy/Medical/Dental
- Body parts
- Symptoms
- Study of

Italian lifestyle
- Culture
- Politics
- Current affairs
- Business
- Professional writing
- Culinary, food
Elementary Reading Methods

Reading Development
  - Signs student is ready for reading instruction
  - Discourse-Oral Language Development
  - Print/Book Awareness
  - Listening and Retelling
  - Phonemic Awareness
  - Letter Recognition
  - Letter-Sound Correlations/ Language Development

Instructional Strategies for Reading
  - Identifying Student’s Current Reading Level
  - Reading Theories
  - The 5 Components of Reading
  - Balanced Literacy/ Whole Language/ Phonics
  - Developing Curriculum
  - Vocabulary
  - Creating Activities for Instruction
  - Fluency
  - Comprehension strategies
  - Scaffolding Instruction
  - Differentiating Instruction
  - Technology Use

Types of Assessment
  - Affective Reading assessments
  - Summative Assessment for the 5 Components of Reading
  - Formative Assessment for the 5 Components of Reading
  - Analyzing Student Assessment Data
  - Diagnosing Reading Issues
  - Maintaining student records/portfolios
  - Identifying Students Who May Need Additional Intervention
General Education

Active Learning
- Collaborative discussion
- Independent Learning
- Critical Thinking
- Creative thinking
- Brainstorming
- Journaling
- Group Work
- Focused listening
- Formulating Questions
- Note-taking
- Annotating
- Role-playing
- Scaffolding
- Assessment

Hybrid Learning (Blended Learning)
- On-line activities
- Project based learning
- Peer instruction
- Small group discussion
- Just-in-time teaching
- Flipped learning

Critical Thinking
- Deep learning
- Concept mapping (mind-mapping)
- Goal setting
- Considering alternatives
- Utilizing past strategies
- Time Management
- Self-reflection
- Activating prior Knowledge
- Reviewing
- Summarizing
- Study skills

Emotional Intelligence
- Assertive communication
- Conflict resolution
- Active listening skills
- Promoting positive attitude
- Self-awareness
- Student engagement strategies
- Empathy
- Responding to Criticism
- Developing Leadership skills
- Journaling
- Peer Conferences
- Teacher-student Conferencing

Self-regulated learning
- Organizing and transforming information
- Keeping Records
- Rehearsing and memorizing
- Environmental awareness
- Recognizing Individual learning styles
- Goal-setting
- Reflective dialogue
- Constructive feedback
- Abstract Thinking
- Link new learning to prior learning

Professional Learning
- Self-evaluating
- Adapting new strategies to individuals
- Accept leadership opportunities

Growth mindset
- Learning from failure
- Accepting challenge
- Process over result
- Sense of purpose
- Growth over speed
- Effort before talent
- Learning from others' mistakes

Bias
- Test anxiety and performance
- Ignore triggers
- Cross-group interactions
- Positive role models
- Managing stress and threat
- High standards for all
- Personal value affirmation
- Positive role models

Community and service learning
- Volunteer project learning
- Community involvement

Rhetorical communication
- Production of discourse
- Response to discourse
- Effective communication in the classroom
- Problem-solving communication

Curriculum Development
- Identifying overarching objectives
- Lesson plans
- Grading standards
- Common core/benchmarks
- Rubrics
Development Stages (Milestones)
- Birth-18 months
- 18 months-2 Years
- 3 years-5 years
- 6 years-8 years

Theorists
- Urie Bronfenbrenner
- Erik Erikson
- Abraham Maslow
- Maria Montessori
- Jean Piaget
- Lev Vygotsky
- Reggio Emilia
- BF Skinner

Observation and Assessment
- Anecdotal Records
- Work Samples
- Observations
- Why is it important?

Diversity in the Classroom
- How to Promote Diversity

Curriculum Development
- Social/Emotional Development
- Cognitive Development
- Language/Literacy Development
- Math/Scientific Reasoning
- Physical Development
- Differentiation and Accommodations
- Music

Health, Safety and Nutrition
- Mandatory Reporter
- Safe Sleep Practices
- First Aid/CPR
- Abusive Head Trauma
- Importance of Physical Development
- Nutrition
Intercultural and Global Communication

Culture & Cross-Cultural Values
- What is Culture?
- Defining Cross-Cultural
- Stereotypes vs. Cultural Values
- Communication Styles Reflective of Cultural Values
- Hofstede's Cultural Dimensions
- Ethics and Cross-Cultural Communication

Cross-Cultural Communication Comparisons
- Chinese vs. American Technical Communication
- Japanese vs. American Technical Communication
- Korean vs. American Technical Communication

Intercultural Communication
- Defining Intercultural Communication
- Intercultural vs. Cross-Cultural Communication

Challenges in Intercultural and Global Communication
- Intercultural Communication Conflicts
- Cross-Cultural and Global Communication Barriers

Practical Intercultural & Global Comm. Strategies
- Using Interpersonal Skills
- Practicing Relationship vs. Deal Focused Comm.
- Non-Verbal Communication
- Technical Skills
- Simplified and Plain English

Digital Communication
- Defining Digital Communication
- Text Messages
- E-mail
- Social Networks

Health Communication
- Healthcare Professional vs. Patient Understanding
- Plain Language
- Patient Considerations
- Multicultural Communication
Theoretical/Ideological Influences
Survey of Communication Theories
Leadership Communication Theories
Importance of Effective Professional Communication

Practical Application
Effective Written Communication
Effective Oral Communication
Interpersonal Communication
Conflict Management
Non-verbal Communication
Public Speaking

**Essentials of Communication**
- Communication Models
- Public Speaking Apprehension
- Communication Ethics

**Language**
- Language Characteristics
- Language Devices

**Intercultural Communication**
- Culture & Communication
- Cultural Identity & Co-Cultures

**Interpersonal Communication**
- Perception
- Defining Self, Self-Concept, Self-Esteem
- Self-Disclosure
- Conflict Management

**Nonverbal Communication**
- Principles of Nonverbal Communication
- Functions of Nonverbal Communication
- Types of Nonverbal Communication

**Audience Analysis**
- Methods of Audience Analysis
- Gathering Audience Information

**Speech Organization & Topic Selection**
- Brainstorming, Concept Maps
- Introductions, Conclusions, Connectives
- General and Specific Purpose Statements
- Narrowing the Topic

**Research and Support**
- Where to Locate Credible Sources
- How to Identify Credible Sources
- Using Examples, Testimony, and Statistics
- Source Documentation

**Speech Delivery**
- Types of Delivery
- Components of a Quality Delivery
- Delivery & Practice

**Listening**
- Active Listening Practices
- Challenges to Listening

**Informative Speaking**
- Types of Informative Speeches
- Effective Use of Research & Support

**Persuasive Speaking**
- Reasoning
- Types of Persuasive Speaking
- Persuasive Speech Organizational Patterns
- Emotional Appeals
- Rhetorical Appeals
Journalism

**News Writing/Reporting**
- Lead
- Layout/Organization Styles
- Content

**Feature/Magazine Writing**
- Lead
- Layout/Organization Styles
- Content

**Broadcast News Writing**
- Content, Lead, Layout

**Journalism and Theory**
- Society/History
- Feminist Theory
- Ethics
- Policies
- Politics

**Grammar/Copy Editing**
- Basic Grammar concepts
- Copy editing concepts

**Interviewing**
- How to

**Statistics**
- Creating Statistics/Infographics
- Analyzing Statistics

**Using Multimedia**
- Twitter, Podcast, Web, video

**Research, Newsgathering**
- Conducting research
- Newsgathering
Interpersonal and Small Group Communication

**News Writing/Reporting**
- Essential Personal Communication Skills
- Self-Management
- Critical Thinking
- Leadership
- Problem Solving and Decision-Making
- Responsibility and Accountability
- Emotional Integrity

**Principles of Interpersonal & Small Group Communication**
- Culture
- Group Culture
- Hofstede's Cultural Dimensions
- Workplace Culture
- Written Communication
- Professional and Workplace Group Documents
- Verbal Communication
- Tone
- Clear Language
- Persuasion
- Rhetorical Strategies
- Non-Verbal Communication
- Team-Working
- Creating Relationships
- Observation
- Active Listening
- Questioning
- Social Awareness
- Diversity
- Assertiveness
- Conflict Management Skills

**Constraints and Barriers**
- Language Differences
- Cultural Differences
- Personality Differences
- Emotional Barriers
- Generational Differences
- Physical Disabilities
- Psychological Barriers

**Computer-Mediated Group Communication**
- Elements of Computer-Mediated Communication
- Physical Barriers

**Ethics of Small Group Communication**
- Ethical Responsibilities
Mass Communication

Theory & Function
- Mass comm vs interpersonal communications
- Mass communication theories
- Mass media functions
- Audience analysis

Historical and Cultural Context
- Impacts of technological changes
- Ownership and economics of mass media
- Impact on politics & government
- Entertainment & mass culture
- Use in business

Mass Media Practices
- Newspapers
- Magazines
- Broadcast: Radio & TV
- Cable
- Advertising & PR
- Film

The Internet & Social Media
- Disruption of traditional media
- Impacts on audience
- Impacts on ownership
- Impact on content development
- Media representation

Ethics & Laws
- Legal protections: libel, false advertising, FCC role
- Content developer's responsibilities