# Basic Concepts List

## for All Available Subjects

*Last updated May 2020*

## Math

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<td>Mid-level Math</td>
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## Science & Engineering

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<td>Chemistry</td>
<td>Microbiology</td>
<td>Physics – Calculus Based</td>
<td>Physics – Algebra Based</td>
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<tr>
<td>Earth Science</td>
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## Health & Medical

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<thead>
<tr>
<th>Anatomy &amp; Physiology</th>
<th>Health Administration</th>
<th>Medical Coding</th>
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<td>Nursing RN (Pediatrics)</td>
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## English/Humanities

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<th>Doctoral Writing</th>
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<td>Reading</td>
<td>Primary Reading</td>
<td>English</td>
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<td>Art History &amp; Appreciation</td>
<td>Primary ESL</td>
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## Business

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<td>Govt/Nonprofit Accounting</td>
<td>Managerial Accounting</td>
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<tr>
<td>Advanced Accounting</td>
<td>Intro Economics</td>
<td>Intermediate Macroeconomics</td>
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<td>Intermediate Microeconomics</td>
<td>Intro Finance</td>
<td>Business Law</td>
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<tr>
<td>Principles of Management</td>
<td>Auditing</td>
<td>Marketing</td>
</tr>
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</table>
### Social Sciences
- Intro Criminal Justice
- Intro Ethics
- Intro Philosophy
- Intro Psychology
- Research Methods
- Intro Sociology
- Cultural Anthropology

### Technology
- MS Access
- MS Excel
- MS Word
- MS PowerPoint
- Adobe Illustrator
- Adobe InDesign
- Adobe Photoshop
- Cisco Admin
- Windows Server
- Windows
- Comp Networking
- Linux Admin

### Computer Science
- Principles of CS
- C++
- Python
- Java
- Network Security
- Database Systems
- Cybersecurity
- Cloud Tech
- WebDesign
- A+
- Software Dev & Eng

### Foreign Languages
- French
- German
- Italian
- Spanish

### Teacher Education
- Elem Math Methods
- Elem Reading Methods
- General Education
- Early Childhood Ed

### Communication
- Journalism
- Public Speaking
- Intercultural/Global
- Business/Organizational
- Mass Comm
- Interpersonal/Group

### Other
- Social Studies
- Student Success
- Career Help
Elementary Math (Grades 4-6)

**Algebraic Skills**
- Equations
- Functions
- Patterns

**Geometry**
- Composite and Real World Shapes
- Coordinates
- Lines and Angles
- Perimeter, Area, Volume
- Position and Direction
- Similar, Congruent, Symmetric Shapes
- Sorting and Classifying
- Three Dimensional Shapes
- Transformations
- Two Dimensional Shapes

**Measurement**
- Converting Units and Measurements
- Estimates
- Measuring
- Time
- Units and Tools

**Numbers**
- Coins, Bills, and Collections of Money
- Counting
- Decimals - Read, Write, Place Value, Compare
- Equivalent Numbers - Decimals and Fractions
- Fractions - Compare and Order
- Fractions - Read, Write, Model
- Integers
- Ordinal Numbers
- Whole Number - Place Value
- Whole Numbers - Compare and Order
- Whole Numbers - Read, Write, Characteristics

**Operations and Number Relationships**
- Decimals - Operations
- Estimation
- Fractions - Operations
- Number Properties
- Number Theory: Factors, Multiples, Primes, Divisibility
- Order of Operations
- Ratios, Rates, Proportions, Percents, Squares and Roots
- Solving Real World Problems with Operations
- Understanding Addition, Subtractions, Multiplication, and Division
- Whole Number Addition and Subtraction
- Whole Number Multiplication and Division

**Statistics and Probability**
- Collect and Organize Data
- Measures and Descriptions of Data
- Probability
- Read and Interpret Data
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 plan
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
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
- Rolles 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

Describing Data
- Numerical summary measures
- The effect of changing units on summary measures
- Tabular and graphical methods (dotplots, stemplots, boxplots)
- Comparing distributions (back to back stemplots, parallel boxplots)
- Comparing center and spread: within group, between group variation
- Comparing shapes
- Comparing outliers and other unusual features (clusters, gaps)

Probability
- Interpreting probability, including long run relative frequency interpretation
- "Law of Large Numbers" concept
- Addition rule, multiplication rule, conditional probability and independence
- Discrete random variables and their probability distributions, including binomial and geometric
- Mean (expected value) and standard deviation of a random variable
- Linear transformation of a random variable
- Combining independent random variables
- Notion of independence versus dependence
- Mean and standard deviation for sums and differences of independent random variables
- Simulation of random behavior and probability distributions

The Normal Distribution
- Properties of the normal distribution
- Using tables of the normal distribution
- The normal distribution as a model for measurements

Sampling and Experimentation: Planning and conducting a study
- Methods of data collection (census, sample survey, experiment, observational study)
- Planning and Conducting Surveys
- Characteristics of a well-designed and well-conducted survey
- Populations, samples, and random selection
- Sources of bias in sampling and surveys
- Sampling methods, including simple random sampling, stratified random sampling and cluster sampling
- Planning and Conducting Experiments
- Characteristics of a well-designed experiment
- Treatments, control groups, experimental units, random assignments and replication
- Sources of bias and confounding, including placebo effect and blinding
- Completely randomized design
- Randomized block design, including matched pairs design
- Generalizability of results and types of conclusions that can be drawn from observational studies, experiments and surveys

Sampling distribution
- Sampling distribution of a sample proportion
- Sampling distribution of a sample mean
- Central Limit Theorem
- Sampling distribution of a difference between two independent sample proportions
- Sampling distribution of a difference between two independent sample means
- Simulation of sampling distributions
- t distributions
- Chi-square distributions
- F distributions
Statistical Inference: Estimating population parameters and testing hypotheses

Estimation (point estimators and confidence intervals)
Estimating population parameters and margin of error
Properties of point estimators, including unbiasedness and variability
Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals
Confidence interval for a mean
Confidence interval for a proportion
Confidence interval for a difference between two means (unpaired and paired)
Confidence interval for a difference between two proportions
Confidence interval for a variance
Confidence interval for a ratio of two variances
Test of significance
Logic of significance testing, null and alternative hypotheses; p-values; one and two sided tests; interpret the results; concepts of Type 1 and Types 2 errors; concept of power
Test for a mean
Test for a proportion
Test for a difference between two means (unpaired and paired)
Test for a difference between two proportions
Test for a variance
Test for a ratio of two variances
Effect sizes

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

Exploring Categorical Data
Frequency tables and bar charts
Marginal and joint frequencies for two way tables
Conditional relative frequencies and association
Comparing distributions using bar charts
Chi-square test for goodness of fit, test for homogeneity, and test of independence (one and two-way tables)

Nonparametric tests (sign test, Wilcoxon rank sum test, Wicoxon signed rank test)

Regression and Correlation
Exploring bivariate data - analyzing patterns in scatter plots
Correlation and linearity
Simple linear regression - least-squares regression
Interpreting intercept and slope
Confidence interval for the slope of a least squares regression line
Test for the slope of a least squares regression line
Coefficient of determination
Residual plots, outliers and influential points
Transformations to achieve linearity: logarithmic and power transformations
Multiple regression
Test and confidence interval for parameters in a multiple regression model
Interpreting parameters in a multiple regression model

Determine the type of hypothesis test to use for different types of data
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
  Maxmin 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

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Advanced Statistical Modeling
- Chi Square
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- 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
Data Analytics

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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
- Contributories 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
- Transcription
- 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
Chemistry

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
Models
Pseudo Sciences
Safety
Science and Society
Scientific Method
Scientific Quantities
Scientific Thinking
Scientists and Discoveries
Theories and Laws
Tools and Measurement
Graphical interpretations
Basic laboratory equipment identification

Atoms, Molecules, and Compounds
Matter
Atoms, Molecules, Compounds
Mixture
Homogeneous and Heterogeneous
Chemical and Physical Properties
Symbols
Ions
Polyatomic ions
Isotopes
Elements
Atomic Mass
Atomic Number
Mass Number
Periodic Table
Law of Definite Proportions
Creating compound based on their charges
Mole Concept
Molar Mass
Determining of a formula of a compound ionic
and covalent
Nomenclature for ionic and covalent
 compounds including the rules for transition
metals
Hydrates
Atmospheric Chemistry

Using Chemical Equations in Calculations
Density
Avogadro’s number
Conversions between atoms, molecules,
moles, and masses
Percent composition
Balancing Chemical Equations
Classification of Reactions
Stoichiometry
Empirical formula
Molecular formula
Limiting Reagent

Gas Laws and Kinetic Theory
Kinetic-Molecular Theory
Pressure and equivalent units (ex. atm, psi,
kPa, Pa, etc)
Volume and equivalent units (ex. mmHg, Torr,
etc)
Temperature and equivalent units
STP
Maxwell-Boltzman Distribution
Graham’s Law
Diffusion
Effusion
Boyle’s Law
Charles’ Law
Guy-Lussac’s Law
Combined gas law
Ideal Gas Law
Determine density and molar mass from ideal
gas law
Dalton’s Law
Collecting gas over water and partial pressures
Avogadro’s Principle
Gas Mixtures and Partial Pressure
Kinetic Molecular Theory
Non-ideal Gases

Atomic and Molecular Structure
Atomic Theories and Structure
Octet Rule
Electron Configurations
Lewis Dot Structure
Periodic Trends
Chemical Bonding
Valence electrons
Orbitals
Orbital Geometry
Molecular Geometry
VSEPR theory
Quantum Theory
Atomic and Molecular Structure (cont’d)
- Polarity
- Dipole moment
- Hybridization
- Sigma bond
- Pi Bond
- Resonance structures

Solids
- Crystalline Solids
- Bragg’s Law
- Unit cell

Liquids and Changes of State
- Compressibility
- Surface tension
- Transition states
- States of Matter
- Phase Diagram
- Kinetic Molecular Theory of Liquids

Physical Chemistry
- Colligative Properties of Solutions
- Enthalpy
- Hess’s Law

Aqueous Solutions
- Solution, Solvent, Solute
- Saturated, Unsaturated, Supersaturated
- Dilute
- Molarity, Molality, Normality
- Mole Fraction (X)
- Weight percent (wt%)
- Parts per million (ppm)

Acids, Bases and Salts
- Acid, Base, Salt
- Anion and Cation
- Electrolyte, Non-electrolyte
- Indicators
- Neutralization
- Dissociation
- Conjugate acid, Conjugate base
- Strong and weak acids and bases
- Monoprotic, Polyprotic
- Bronsted-Lowry Acid/Base
- Lewis Acid/Base
- pH and pOH
- Hydrolysis

Kinetics
- Chemical Reaction Rates
- Rate Expressions
- Reaction Mechanisms
- Activation Energy

Chemical Equilibria
- Le Chatelier Principle
- The Equilibrium Constant
- Equilibrium Calculations
- Factors Affecting Equilibria
- ICE Tables

Ionic Equilibrium: Acids and Bases
- Lewis Concept
- Strong and Weak Acids and Bases
- pKa and pKb
- Hydrolysis

Aqueous Equilibria
- Common Ion Effect and Buffer Solutions
- Henderson-Hasselbach Equation
- Titration, End Point, Equivalence point
- Acid-Base Titration Curves
- Acid-Base Indicators
- The Solubility Product Ksp
- Solubility and the Common Ion Effect
- Solubility and Complex Ions

Redox
- Reduction, Oxidation
- Oxidizing agent, Reducing agent
- Oxidation numbers
- Half reactions
- Activity series

Chemical Thermodynamics
- Heat of formation/reactions
- Enthalpy
- Spontaneity, Disorder and Entropy
- Exothermic and Endothermic
- Differentiate between heat and temperature
- Calories vs calories
- Specific heat capacity
- Various temperature scales (Fahrenheit, Celsius, and Kelvin)
- Entropy and the Second Law
- Gibbs Free Energy
- Equilibrium Constants

Electrochemistry
- Electrochemical Cells and Potentials
- Voltaic Cells at Nonstandard Conditions
- Electrolytic Cells
- Faraday’s Law

Nuclear Chemistry
- Types of radiation
- Radioactive Decay
- Fission and Fusion
- Nuclear equations
- Half-life
Nuclear Chemistry (cont’d)
- Isotopes
- Bohr equations
- Rydberg equation
- Energy relationship to wavelength, frequency, and period
- Heisenberg Uncertainty Principle
- Electromagnetic Radiation
- Sources of energy

Basic Organic Chemistry
- Carbon groups
- Polymers
- Names and chemical composition of functional groups
- Basic nomenclature of organic compounds
- Alkanes – Alkenes – Alkynes
- Saturated
- Unsaturated
- Cyclic hydrocarbons
- Aromatic Hydrocarbons

Biochemistry
- Proteins – Carbohydrates – Nucleic acids

Lab techniques
- Synthesis of compounds (solid and gas)
- Separation techniques
- Titration using indicators and meters
- Spectrophotometry/calorimetry
- Gravimetric Analysis
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
- Biot-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 Peyers 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
Microbiology

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

**Genetics**
- Structure
- Replication
- Expression
- Mechanisms of variation
- Mapping of distances in genes
- Lac operon
- Lac repressor
- Trp operon
- Arabinose operon
- Genetic recombination
- Transformation
- Conjugation
- Transduction

**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
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
  - Antidyssrhythmic 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, antihelmintic 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
Nursing RN (Pediatrics)

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
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
## Social Studies

### Elementary (Grades 4-6)
- Africa
- American Historical Figures
- American Revolution
- China
- Citizenship
- Civil Rights
- Civil War
- Colonial Settlements in America
- Communities
- East Asia and Pacific
- Egypt
- Elections
- Europe
- Family and Authority
- French and Indian War
- Geography
- Government
- Greece
- Holidays and Diversity
- India
- Japan
- Latin America
- Louisiana Purchase
- Mesopotamia
- Middle East
- Native American Culture
- Religions of the World
- Rome
- Slavery in America
- South and Southeast Asia
- The Bill of Rights
- The Constitution
- The Declaration of Independence
- The Incas
- The Mayans
- Trade
- War of 1812
- Westward Expansion
- World Cultures

### Middle Grades (Grades 7-8)
- Africa
- American Revolution
- Articles of Confederation
- Byzantine Empire
- Central and South America
- China
- Civil Rights
- Civil War
- Colonial Settlements in America
- Demographic Concepts
- Early American government and political systems
- Economics
- European History
- Exploration
- French and Indian War
- Geography
- India
- Japan
- Louisiana Purchase
- Mapping
- Middle East
- Monroe Doctrine
- Native Americans
- North America
- Religions of the World
- Slavery in America
- The Bill of Rights
- The Constitution
- The Declaration of Independence
- The Physical Environment
- War of 1812
- Westward Expansion

### High School (Grades 9-12)
- Africa
- American Revolution
- Ancient Civilizations
- Articles of Confederation
- Asia
- Civil War
- Cold War
- Colonial Settlements in America
- Contemporary World Events
- Declaration of Independence
- Early American Government and Political Systems
- Economics
- European History
- Geography
- Gulf War
- Industrialism
- Korean War
- Latin America
- Louisiana Purchase
- Middle East
- Native Americans
- Prehistoric America
- Reconstruction
- Slavery in America
- Soviet Union and Eastern Europe
- The Bill of Rights
- The Constitution
- The Monroe Doctrine
- Vietnam War
- War of 1812
- Westward Expansion
- World War 1
- World War 2
Student Success

Academic Strategies
- Note-taking Techniques
- Studying Techniques
- Homework
- Selecting a Major
- Non-traditional Students
- 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
Career Help

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
- Textile arts
- Ceramics
- Printmaking
- Installation
- Video/Film/Digital
- Earthworks

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
- 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-Verb Agreement

Mechanics and Usage
  Punctuation
  Spelling
  Capitalization
  Homophones
  Comma-splines
  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
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
Fiction - mystery/suspense
Poetry
Nonfiction - informational
Nonfiction - persuasive
Biography
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.**
Use of English
- Articles
- Comparisons and Superlatives
- Conditionals
- Countable and non-countable nouns
- Determiners
- Indirect speech
- Irregular verb forms
- Modal verbs
- Participial adjectives
- Parts of a sentence
- Passive and active voice
- Passive causatives
- Phrasal verbs
- Phrase usage: Neither, nor, such, so
- Prepositions
- Pronouns
- Question formation
- Relative clauses
- Subject-verb agreement
- Tag questions
- Time expressions
- Uses of gerunds and infinitives
- Using dictionaries
- Verb tense formation and uses
- Vocabulary: definitions, usage, collocations, word families, and connotations.
- Vocabulary--finding meaning in context
- Word form/Morphology

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

Speaking
- Daily communication--giving directions, giving advice, etc.
- Differences between English pronunciation and spelling
- Presentations
- Pronunciation - Phonics as used in Primary ESL
- Pronunciation: Identification of cause of pronunciation errors
- Pronunciation: Phonetic (International Phonetic Alphabet) transcription
- Pronunciation: Stress and intonation patterns

Listening
- Identifying main ideas vs. details
- Listening comprehension strategies (scaffolding, note taking, predicting, etc)
- Processing contextual audio (lectures, presentations, videos, etc.)
- Visual Organizers (Venn diagrams, concept maps, etc.)

Reading
- Analysis of figurative language
- Identifying main ideas vs. details
- Reading comprehension strategies (note taking, predicting, skimming, etc)
- Visual Organizers (Venn diagrams, picture-walks, concept maps, etc.)

Pedagogy of ESL
- Error correction strategies (response-repetition, prompting, recasting, integration, metalinguistic information, etc).
- Concept of communicative competence
- Differences among languages (phonology, morphology, syntax, and semantics)
- Literacy learning strategies
ESL

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 Superobligatory 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 (Agnostology, 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
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 Harrasment
- 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

Commerical 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
MS Access

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
- SubMacros
- 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
MS Excel

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
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 & WiFi
- 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
**Webdesign**

**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
- Primary Keys and Foreign Keys
- Indexes
- Views
- Creation of ERD
- 1NF, 2NF and 3NF

CRUD Statements
- INSERT Statement
- SELECT Distinct Statement
- SELECT TOP statement
- UPDATE Statement
- DELETE Statement

Advanced Queries
- Designing Advanced queries
- Query optimization
- Common Table Elements
- Joins

Filtering Query Output
- WHERE Statement
- ORDER BY Statement
- Applying logical filters

Hosting Databases
- Connection Strings
- Database IP
- IOPS Limits and Storage limits
- Monitor Database Health

Remote Database Access
- Designing a client application
- Result Sets
- Designing a Report

Database Management Systems
- SQL Server
- Oracle
- MS Access
**Principles of CS**

**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
- Mergesort

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

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

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
Linux System Administration

NOTE: Computer Science tutors wishing to tutor Linux are expected to be familiar with all concepts on this list in addition to the Computer Science Principles list.

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
- Runlevel 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 signalling
- 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

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

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

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

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
  WiFi 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
NOTE: Computer Science tutors wishing to tutor Cybersecurity are expected to be familiar with all concepts on this list in addition to the Computer Science Principles list.

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
  OpenSource, 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
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
- Sports & Recreation
- 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
Early Childhood Education

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
Business and Organizational 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