

**INDIANA AREA SCHOOL DISTRICT
INDIANA, PA
Secondary**

Course Title: Computer Programming and Coding II

Grade Level: Grades 9-12

Course Number:

Core or Elective: Elective

Periods Per Week: Five

Length of Time: 39-Minutes Per Class Period

Length of Course: One semester

Units of Credit: One-half Credit

Created on: October 24, 2018

Revised: _____

Revised: _____

Revised: _____

NCAA Core Course Approved

IDEAL Course

Board Approval Date: _____

Course Description

This course is a continuation of Computer Programming and Coding I. Students must have completed the Computer Programming and Coding I course. Students will continue to learn the basics of computer programming along with the basics of computer science. The material emphasizes more advanced computational thinking and helps develop the ability to solve problems. This course continues to cover the building blocks of programming along with other central elements of computer science. The concepts covered in the course include: “for” loops, text and string processing, functions, arrays, 2D arrays, and web development. The primary language for the course is Python. The course prepares students for further study in computer science, including the AP Computer Science course.

Expected Level of Achievements (District Grading Scale)

A (4):	93% - 100%
B (3):	85% - 92%
C (2):	77% - 84%
D (1):	69% - 76%
F (0):	68% and below

Academic/Content Standards/ Benchmarks

(Standards met in this course – standards specific to each unit are listed with each unit)

PDE BCIT & Mathematics Standards:

- 15.4.12.A: Apply the creative and productive use of emerging technologies for educational and personal success.
- 15.4.12.H: Use programming languages to develop logical thinking and problem solving skills.
- 15.4.12.I: Compare and contrast programming languages; select most appropriate one to complete a specific task.
- 15.4.12.J: Create a complex computer program to solve a problem.
- 02.5.11.A: Develop a plan to analyze a problem, identify the information needed to solve the problem, carry out the plan, check whether an answer makes sense, and explain how the problem was solved in grade appropriate contexts.

PDE Computer Science Standards:

- 3A-CS-02: Compare levels of abstraction and interactions between application software, system software, and hardware layers.
- 3A-NI-06 Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts.
- 3A-NI-08 Explain tradeoffs when selecting and implementing cybersecurity recommendations.
- 3A-AP-13: Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.
- 3A-AP-14: Use lists to simplify solutions, generalizing computational problems instead of repeatedly using simple variables.
- 3A-AP-15: Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance, and explain the benefits and drawbacks of choices made.
- 3A-AP-17: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
- 3A-AP-18: Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
- 3A-AP-19: Systematically design and develop programs for broad audiences by incorporating feedback from users.
- 3A-AP-21: Evaluate and refine computational artifacts to make them more usable and accessible.
- 3A-AP-22: Design and develop computational artifacts working in team roles using collaborative tools.
- 3A-AP-23: Document design decisions using text, graphics, presentations, and/or demonstrations in the development of complex programs.
- 3B-NI-04 Compare ways software developers protect devices and information from unauthorized access.
- 3B-AP-10: Use and adapt classic algorithms to solve computational problems.
- 3B-AP-11: Evaluate algorithms in terms of their efficiency, correctness, and clarity.
- 3B-AP-12: Compare and contrast fundamental data structures and their uses.

National Business Education Association Standards:

NBEA Computation Standards:

- I. Mathematical Foundations: Apply basic mathematical operations to solve problems.
- II. Number Relationships and Operations: Solve problems involving whole numbers, decimals, fractions, percents, ratios, averages, and proportions.
- III. Patterns, Functions, and Algebra: Use algebraic operations to solve problems.
- IV. Measurements: Use common international standards of measurement when solving problems.
- V. Statistics and Probability: Analyze and interpret data using common statistical procedures.
- VI. Problem-Solving Applications: Use mathematical procedures to analyze and solve business problems.

NBEA Information Technology Standards:

- XI. Programming and Application Development: Design, develop, test, and implement programs.
- XII. Telecommunications and Networking Infrastructures: Develop the skills to design, deploy, and administer networks and telecommunications systems.

Subject Area: Computer Science

Course Title: Computer Programming and Coding II

Grade: 9-12

Strand: For Loops

Time: 3 Weeks

Academic/Content Standards/ Benchmarks	Objectives	Instructional Strategies	Assessment Strategies
PDE BCIT & Mathematics Standards: 15.4.12.A 15.4.12.H 15.4.12.I 15.4.12.J 2.5.11.A PDE Computer Science Standards: 3A-AP-13 3A-AP-14 3A-AP-15 3A-AP-17 3A-AP-18 3A-AP-19 3A-AP-21 3A-AP-23 3B-AP-10 3B-AP-11 3B-AP-12 National Business Education Association Standards: NBEA Computation Standards: I, II, III, IV, V, and VI NBEA Information Technology Standards: XI and XII	Topic include: <ul style="list-style-type: none">▪ For loops▪ User-controlled loops▪ Count loops▪ Range function▪ Counting and counter variables▪ Summing and accumulation variables▪ Algorithms and tracing code▪ Modeling and simulation	<ul style="list-style-type: none">▪ Audio-visual Presentation▪ Board Work▪ Brainstorming▪ Class Discussion▪ Computer-based instruction▪ Cooperative Learning▪ Demonstrations▪ Differentiated Instruction▪ Graphic Organizer▪ Hands-on Computer Activities▪ Independent Reading/Study▪ Lecture▪ Peer Collaboration▪ Peer Tutoring▪ Performance-based Learning▪ Question and Answer▪ Role Playing▪ Teacher Modeling▪ Web-based/Online Learning	<ul style="list-style-type: none">▪ Active Daily Participation▪ Formative Assessments▪ Homework Assignments▪ Independent Study▪ Performance-based Assessments▪ Portfolio▪ Projects▪ Real world projects▪ Rubrics▪ Student Self-reflection▪ Teacher Observations▪ Teacher-made Assessments▪ Tests/Quizzes▪ Web-based Projects/Assignments

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Materials/Resources	Reteaching Strategies include:	Enrichment Enrichment options include:
<ul style="list-style-type: none"> ▪ Bulletin Boards ▪ Computers ▪ Course Resources: starter files ▪ Edhesive Introduction to CS course ▪ Python Integrated Development Environment (i.e. CodeSkulptor) ▪ Google Classroom ▪ Google Suite ▪ Internet ▪ Lab facilities ▪ Promethean Board ▪ Student and Teacher Forums (Piazza; online) ▪ Supplemental textbooks ▪ Teacher-made Materials ▪ White Boards and Markers 	<ul style="list-style-type: none"> ▪ Additional Time ▪ Alternate activity/instruction ▪ Cooperative learning activity/Peer Tutoring ▪ Graphic organizer ▪ Modified assignment ▪ Modified environment ▪ Modified expectations ▪ Note-taking practice ▪ One-on-one Instruction ▪ Online Videos/Tutorials ▪ Positive reinforcement ▪ Practice assignment ▪ Preferential Seating ▪ Study skills tutorial ▪ Supplemental reading assignment ▪ Testing modifications ▪ Verbal cue ▪ Visual cue 	<ul style="list-style-type: none"> ▪ Accelerated assignment schedule ▪ Alternate activity/instruction ▪ Computer/online software-based activity ▪ Cooperative learning activity ▪ Enrichment Assignments ▪ High Expectations ▪ Modified assignment ▪ Participation in software design competition(s) ▪ Positive reinforcement ▪ Project ▪ Seminar discussion ▪ Supplemental reading assignment

Subject Area: Computer Science

Course Title: Computer Programming and Coding II

Grade: 9-12

Strand: Text and String Processing

Time: 3 Weeks

Academic/Content Standards/ Benchmarks	Objectives	Instructional Strategies	Assessment Strategies
<p>PDE BCIT & Mathematics Standards: 15.4.12.A 15.4.12.H 15.4.12.I 15.4.12.J 2.5.11.A</p> <p>PDE Computer Science Standards: 3A-CS-02 3A-AP-13 3A-AP-14 3A-AP-15 3A-AP-17 3A-AP-18 3A-AP-21 3B-AP-10 3B-AP-12</p> <p>National Business Education Association Standards:</p> <p>NBEA Computation Standards: I, II, III, IV, V, and VI</p> <p>NBEA Information Technology Standards: XI and XII</p>	<p>Topics include:</p> <ul style="list-style-type: none">▪ ASCII (American Standard Code for Information Interchange) table▪ Character functions▪ Processing strings▪ Inputting text files▪ Outputting text files to store data from programs▪ Processing strings in files▪ Text compression – compressing text for use in improving transmission efficiency over the internet	<ul style="list-style-type: none">▪ Audio-visual Presentation▪ Board Work▪ Brainstorming▪ Class Discussion▪ Computer-based instruction▪ Cooperative Learning▪ Demonstrations▪ Differentiated Instruction▪ Graphic Organizer▪ Hands-on Computer Activities▪ Independent Reading/Study▪ Lecture▪ Peer Collaboration▪ Peer Tutoring▪ Performance-based Learning▪ Question and Answer▪ Role Playing▪ Teacher Modeling▪ Web-based/Online Learning	<ul style="list-style-type: none">▪ Active Daily Participation▪ Formative Assessments▪ Homework Assignments▪ Independent Study▪ Performance-based Assessments▪ Portfolio▪ Projects▪ Real world projects▪ Rubrics▪ Student Self-reflection▪ Teacher Observations▪ Teacher-made Assessments▪ Tests/Quizzes▪ Web-based Projects/Assignments

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Subject Area: Computer Science

Course Title: Computer Programming and Coding II

Grade: 9-12

Strand: Functions

Time: 3 Weeks

Academic/Content Standards/ Benchmarks	Objectives	Instructional Strategies	Assessment Strategies
<p>PDE BCIT & Mathematics Standards: 15.4.12.A 15.4.12.H 15.4.12.I 15.4.12.J 2.5.11.A</p> <p>PDE Computer Science Standards: 3A-AP-13 3A-AP-14 3A-AP-15 3A-AP-17 3A-AP-18 3A-AP-19 3A-AP-21 3A-AP-23 3B-AP-10 3B-AP-11 3B-AP-12</p> <p>National Business Education Association Standards:</p> <p>NBEA Computation Standards: I, II, III, IV, V, and VI</p> <p>NBEA Information Technology Standards: XI and XII</p>	<p>Topics include:</p> <ul style="list-style-type: none">▪ Introduction to functions▪ Creating functions▪ Parameters▪ Returning values through functions▪ Tracing code using functions▪ Programming (code writing) using functions	<ul style="list-style-type: none">▪ Audio-visual Presentation▪ Board Work▪ Brainstorming▪ Class Discussion▪ Computer-based instruction▪ Cooperative Learning▪ Demonstrations▪ Differentiated Instruction▪ Graphic Organizer▪ Hands-on Computer Activities▪ Independent Reading/Study▪ Lecture▪ Peer Collaboration▪ Peer Tutoring▪ Performance-based Learning▪ Question and Answer▪ Role Playing▪ Teacher Modeling▪ Web-based/Online Learning	<ul style="list-style-type: none">▪ Active Daily Participation▪ Formative Assessments▪ Homework Assignments▪ Independent Study▪ Performance-based Assessments▪ Portfolio▪ Projects▪ Real world projects▪ Rubrics▪ Student Self-reflection▪ Teacher Observations▪ Teacher-made Assessments▪ Tests/Quizzes▪ Web-based Projects/Assignments

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<ul style="list-style-type: none"> ▪ Bulletin Boards ▪ Computers ▪ Course Resources: starter files ▪ Edhesive Introduction to CS course ▪ Python Integrated Development Environment (i.e. CodeSkulptor) ▪ Google Classroom ▪ Google Suite ▪ Internet ▪ Lab facilities ▪ Promethean Board ▪ Student and Teacher Forums (Piazza; online) ▪ Supplemental textbooks ▪ Teacher-made Materials ▪ White Boards and Markers 	<ul style="list-style-type: none"> ▪ Additional Time ▪ Alternate activity/instruction ▪ Cooperative learning activity/Peer Tutoring ▪ Graphic organizer ▪ Modified assignment ▪ Modified environment ▪ Modified expectations ▪ Note-taking practice ▪ One-on-one Instruction ▪ Online Videos/Tutorials ▪ Positive reinforcement ▪ Practice assignment ▪ Preferential Seating ▪ Study skills tutorial ▪ Supplemental reading assignment ▪ Testing modifications ▪ Verbal cue ▪ Visual cue 	<ul style="list-style-type: none"> ▪ Accelerated assignment schedule ▪ Alternate activity/instruction ▪ Computer/online software-based activity ▪ Cooperative learning activity ▪ Enrichment Assignments ▪ High Expectations ▪ Modified assignment ▪ Participation in software design competition(s) ▪ Positive reinforcement ▪ Project ▪ Seminar discussion ▪ Supplemental reading assignment

Subject Area: Computer Science

Course Title: Computer Programming and Coding II

Grade: 9-12

Strand: Arrays

Time: 3 Weeks

Academic/Content Standards/ Benchmarks	Objectives	Instructional Strategies	Assessment Strategies
<p>PDE BCIT & Mathematics Standards: 15.4.12.A 15.4.12.H 15.4.12.I 15.4.12.J 2.5.11.A</p> <p>PDE Computer Science Standards: 3A-AP-13 3A-AP-14 3A-AP-15 3A-AP-17 3A-AP-18 3A-AP-19 3A-AP-21 3A-AP-22 3A-AP-23 3B-AP-10 3B-AP-11 3B-AP-12</p> <p>National Business Education Association Standards:</p> <p>NBEA Computation Standards: I, II, III, IV, V, and VI</p> <p>NBEA Information Technology Standards: XI and XII</p>	<p>Topics include:</p> <ul style="list-style-type: none">▪ Introduction to arrays▪ Declaring arrays▪ Element vs. index▪ Using for loops with arrays▪ Array functions▪ Arrays as parameters▪ Arrays and data▪ Sorting and searching arrays▪ Writing a simple search▪ Writing a simple sort▪ Programming (writing code) using arrays	<ul style="list-style-type: none">▪ Audio-visual Presentation▪ Board Work▪ Brainstorming▪ Class Discussion▪ Computer-based instruction▪ Cooperative Learning▪ Demonstrations▪ Differentiated Instruction▪ Graphic Organizer▪ Hands-on Computer Activities▪ Independent Reading/Study▪ Lecture▪ Peer Collaboration▪ Peer Tutoring▪ Performance-based Learning▪ Question and Answer▪ Role Playing▪ Teacher Modeling▪ Web-based/Online Learning	<ul style="list-style-type: none">▪ Active Daily Participation▪ Formative Assessments▪ Homework Assignments▪ Independent Study▪ Performance-based Assessments▪ Portfolio▪ Projects▪ Real world projects▪ Rubrics▪ Student Self-reflection▪ Teacher Observations▪ Teacher-made Assessments▪ Tests/Quizzes▪ Web-based Projects/Assignments

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Subject Area: Computer Science

Course Title: Computer Programming and Coding II

Grade: 9-12

Strand: 2D Arrays

Time: 3 Weeks

Academic/Content Standards/ Benchmarks	Objectives	Instructional Strategies	Assessment Strategies
<p>PDE BCIT & Mathematics Standards: 15.4.12.A 15.4.12.H 15.4.12.I 15.4.12.J 2.5.11.A</p> <p>PDE Computer Science Standards: 3A-AP-13 3A-AP-14 3A-AP-15 3A-AP-17 3A-AP-18 3A-AP-19 3A-AP-21 3A-AP-22 3A-AP-23 3B-AP-10 3B-AP-11 3B-AP-12</p> <p>National Business Education Association Standards:</p> <p>NBEA Computation Standards: I, II, III, IV, V, and VI</p> <p>NBEA Information Technology Standards: XI and XII</p>	<p>Topics include:</p> <ul style="list-style-type: none">▪ Introduction to 2D arrays▪ Declaring 2D arrays▪ Using loops with 2d arrays▪ Introductory algorithms with 2D arrays▪ Intermediate algorithms with 2D arrays▪ Tracing code with 2D arrays▪ Programming (writing code) using 2d Arrays	<ul style="list-style-type: none">▪ Audio-visual Presentation▪ Board Work▪ Brainstorming▪ Class Discussion▪ Computer-based instruction▪ Cooperative Learning▪ Demonstrations▪ Differentiated Instruction▪ Graphic Organizer▪ Hands-on Computer Activities▪ Independent Reading/Study▪ Lecture▪ Peer Collaboration▪ Peer Tutoring▪ Performance-based Learning▪ Question and Answer▪ Role Playing▪ Teacher Modeling▪ Web-based/Online Learning	<ul style="list-style-type: none">▪ Active Daily Participation▪ Formative Assessments▪ Homework Assignments▪ Independent Study▪ Performance-based Assessments▪ Portfolio▪ Projects▪ Real world projects▪ Rubrics▪ Student Self-reflection▪ Teacher Observations▪ Teacher-made Assessments▪ Tests/Quizzes▪ Web-based Projects/Assignments

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Subject Area: Computer Science

Course Title: Computer Programming and Coding II

Grade: 9-12

Strand: Internet

Time: 3 Weeks

Academic/Content Standards/ Benchmarks	Objectives	Instructional Strategies	Assessment Strategies
<p>PDE BCIT & Mathematics Standards: 15.4.12.A 15.4.12.H 15.4.12.I 15.4.12.J 2.5.11.A</p> <p>PDE Computer Science Standards: 3A-NI-06 3A-NI-08 3A-AP-13 3A-AP-14 3A-AP-15 3A-AP-17 3A-AP-18 3A-AP-19 3A-AP-21 3A-AP-22 3A-AP-23 3B-NI-04 3B-AP-10 3B-AP-11 3B-AP-12</p> <p>National Business Education Association Standards:</p> <p>NBEA Computation Standards: I, II, III, IV, V, and VI</p> <p>NBEA Information Technology Standards: XI and XII</p>	<p>Topics include:</p> <ul style="list-style-type: none">▪ What is the Internet?▪ IP addressing and DNS (Domain Name Servers)▪ Packets and routers▪ Making web pages using HTML▪ Cybersecurity▪ Net neutrality▪ Building web pages	<ul style="list-style-type: none">▪ Audio-visual Presentation▪ Board Work▪ Brainstorming▪ Class Discussion▪ Computer-based instruction▪ Cooperative Learning▪ Demonstrations▪ Differentiated Instruction▪ Graphic Organizer▪ Hands-on Computer Activities▪ Independent Reading/Study▪ Lecture▪ Peer Collaboration▪ Peer Tutoring▪ Performance-based Learning▪ Question and Answer▪ Role Playing▪ Teacher Modeling▪ Web-based/Online Learning	<ul style="list-style-type: none">▪ Active Daily Participation▪ Formative Assessments▪ Homework Assignments▪ Independent Study▪ Performance-based Assessments▪ Portfolio▪ Projects▪ Real world projects▪ Rubrics▪ Student Self-reflection▪ Teacher Observations▪ Teacher-made Assessments▪ Tests/Quizzes▪ Web-based Projects/Assignments

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