COURSE TITLE: **Intermediate Programming (11.4210000)**
Teacher: Mr. Gary Liu
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Description: This course introduces students to design, development, support and management of hardware, and software.

Materials: Learn Key and other appropriate software and supplementary materials will be used.

Objectives

The Advanced Programming pathway is one of six pathways in the Information Technology Cluster. This cluster builds linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support and management of hardware, software, and multimedia and systems integration services. Careers in Programming and Software Development involve the design, development, implementation and maintenance of computer systems and software, requiring knowledge of computer operating systems, programming languages and software development. People with expertise in programming and software development work with cutting-edge technologies to develop tomorrow's products for use by businesses and consumers. While many of the career opportunities in this area are in software companies, large organizations of other types, such as financial services and business, also offer many opportunities. People with expertise in programming and software development are in high demand, doing work such as creating the software that launches and runs NASA space shuttles. Students will qualify to sit for the AP Computer Science exam to earn college credit after successful completion of this pathway. This pathway culminates with an opportunity for students to take the Sun Certified Java Associate or Microsoft Certified Professional Developer as the end of pathway assessment. **See Appendix for detailed standards.**

Homework Late Work: Homework will be assigned, collected, and graded throughout the duration of the course. Late work will be accepted with a 10 - POINT DEDUCTION per day up to 3 days**. A grade of 50 will be given after three days up to the last day grades are entered for the corresponding progress report** (exception Semester Report - Final Grade). Thereafter, a grade of zero will be given unless special arrangements have been made with me before the deadline**.** Some credit is better than no credit!

Missed Work Due to Absences: Students are expected to be present. However, when applicable, it is the responsibility of the student to complete missed assignments, projects, quizzes, tests etc. within 1 week **A grade of zero will be given after 1 week unless special arrangements have been made with me before the deadline.** Students who have an **EXCUSED ABSENCE** will be allowed to turn in their missing work with no deductions. Students with an **UNEXCUSED ABSENCE** will be allowed to turn in their work with a **10 - POINT DEDUCTION**. Please fill out an absentee sheet and attach it to your missed work before turning it in.

Make-up work can be completed on Thursday's beginning at 4:00pm. If the student misses his/her appointment; he or she can reschedule once, thereafter, the grade becomes a zero.

Recovery: The intent of the recovery policy is to assist students by providing adequate opportunities to master course objectives in order to eliminate preventable failures.

Opportunities designed to allow students to recover from a low or failing **cumulative** grade will be allowed when **all work required to date has been completed** and **the student has demonstrated a legitimate effort to meet all course requirements including attendance**. Students must complete the work before they can recover it. Clearly there is a difference between recovery and make-up work. The recovery policy for this course is as follows:

- ❑ Recovery is for students who are failing, or close to failing (low cumulative grade).
- ❑ Recovery is for a cumulative grade, not for one test, project, etc.
- ❑ Students may recover up to a maximum grade of 70 on recovery work.
- ❑ Recovery must be student initiated.
- ❑ Recovery work will not be granted to change a grade after a semester is over.
- ❑ All recovery work must be completed within ten school days prior to the end of the semester.
- ❑ The recovery assignment is at my discretion.
- ❑ I will establish a reasonable time period for recovery work to be completed during the semester.

Instructional Methodologies: Class lecture/discussion/demonstration, audio-visual aids, individualized instruction, guest speakers, field trips by grade level (if applicable).

Discipline: All student handbook rules apply. In addition students are expected to take care of equipment, textbooks, and supplies, as well as, exhibit respect for fellow students and faculty members. Please see guidelines posted in class.

Parent/Teacher Communication: Communication with parents about academic progress, behavior and attendance will be handled via progress reports, e-mail, phone contact, conference, or a combination of these methods.

Career Opportunities: Software Engineer, Technology Specialist, Software developer, game developer

Test/Quizzes: Tests will be based on information in the text that will be covered in class and any other supplementary information given in notes. Students Academic Portfolio will count as one major test grade. Information on the procedures and format of your student portfolio will follow.

Class Works: Class works includes students' participation, assignments and quizzes. There will be several assignments and small presentations. Each person is expected to do their part.

Work Ethics: Each student must demonstrate good work ethics in class (i.e. punctuality, not interfering with the learn process of another student, compliance to classroom rules, etc.). Failure to do so will cause your work ethic grades to suffer.

Grading Evaluation:

Daily Work	45%
Final Exam	15%
Project	10%
Quizzes/Tests	20%
Work Ethics	10%

Grading Scale:

100-90	A
89-80	B
79-70	C
Below 70	F

Tutorial: Tutorial time is 8:00am on Monday through Thursday. After school by appointment only.

All Tri Cities students are required to have an Academic Portfolio for each of their classes. Academic Portfolios must be maintained in electronic format by following the template provided.

Each student will be expected to bring to class daily his/her notebook, workbook, paper, pencil and any other needed classroom supplies and materials.

The Georgia Department of Education has made available two assessments to ascertain the competence of our career technology students. The assessments are Work-Ready and End-of-Pathway. The Work-Ready assessment measures the skills of Georgia's workers, determines valuable job training opportunities, and assures companies that the state can provide a long-term, qualified labor supply, and is a requirement for some Georgia jobs. The End-of-Pathway assessment measures the level of technical skill attainment of each career pathway completer. The Work-Ready assessment will be administered to all work-based learning students and all seniors currently enrolled in a CTE course. The End-of-Pathway assessments will be administered to all CTE students who have finished or are finishing a pathway. Tests will be administered in October and April.

Student Name _____

I have read this course syllabus and I understand all information presented. In the event that I have questions, I will contact the teacher.

_____
Parent/Guardian Signature

I have read this course syllabus and I understand all information presented. I understand that I must use the Internet for educational purposes only. In the event that I have questions, I will ask my teacher.

_____
Student Signature

HARDWARE AND SOFTWARE COMPONENTS

Students will apply knowledge of hardware and software components. Students will apply knowledge of high-level program execution.

BCS-IP-1. Students will apply knowledge of hardware and software components.

a. Explain how Boolean logic is related to computer hardware.
b. Explain how a computer monitor displays text and images.
c. Explain how a graphical button is displayed and how it knows when it has been pushed.

Academic Standards:

ELA12W2 The student demonstrates competence in a variety of genres.
ELA12LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

BCS-IP-2. Students will apply knowledge of high-level program execution.

a. Build an interpreter that executes a simple language.
b. Build a compiler that translates one simple language to another.

Academic Standard:

ELA12W2 The student demonstrates competence in a variety of genres.

Sample Tasks:

Read about Boolean logic at http://computer.howstuffworks.com/boolean.htm. Simulate a logic gate.

Write a program that interprets simple graphic commands: draw a line, draw an ellipse, draw a rectangle, and draw the resulting picture.

Write a compiler which creates a class that draws a picture based on a set of simple graphic commands.

SOFTWARE ENGINEERING

Students will demonstrate knowledge of key concepts in software engineering.

BCS-IP-3. Students will demonstrate knowledge of key concepts in software engineering.

a. Define software engineering.
b. Compare and contrast software engineering and programming.
c. List the phases in the software life cycle.
d. Perform software requirements analysis.
e. Discuss Extreme Programming and pair programming.
f. Discuss societal and ethical issues in software engineering.

Academic Standards:

ELA12W3 The student uses research and technology to support writing.
ELA12LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

USER INTERFACE DESIGN

Students will demonstrate knowledge of the important principles in user interface design.

BCS-IP-4. Students will demonstrate knowledge of the important principles in user interface design.

a. List the criteria used to determine the effectiveness of an interface.
b. Apply user interface design criteria to critique common user interfaces (car door handle, steering wheels, light switches, cell phones, and VCRs).
c. Perform a user-centered task analysis. Identify sub-groups of users and their characteristics.
d. List examples of good and bad user interface designs. Discuss the impact of bad user interface designs.

Academic Standards:

ELA12W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals a satisfying closure.
ELA12W2 The student demonstrates competence in a variety of genres.
ELA12W3 The student uses research and technology to support writing.
*ELA12LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.*Implementation

Sample Tasks:

Compare cell phone user interfaces for various tasks such as changing a ring tone, adding a new contact, or creating a memo.

Evaluate web sites based on user interface criteria.

Compile a list of accidents due to poor user interface design.

Interview people of different ages and occupations about their cell phone use and what problems they experience. Identify some cell phone user groups.

PROBLEM SOLVING

Students will apply problem-solving strategies to more advanced problems.

BCS-IP-5. The student will collaboratively develop solutions for specific problems.

a. Collaboratively determine a course of action for problem resolution.
b. Design algorithms for problem resolution.
c. Break a task into subtasks required for problem resolution.
d. Select appropriate tools and technology resources to accomplish a variety of tasks.
e. Collaboratively design, combine, test, analyze, and adjust coding solutions based on problem-solving algorithms.
f. Review and discuss coding solutions for elements of thoroughness and correctness.

Academic Standards:
SCSh3 Students will identify and investigate problems scientifically.
ELA12W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals a satisfying closure.
ELA12W2 The student demonstrates competence in a variety of genres.
ELA12W3 The student uses research and technology to support writing.
ELA12LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

PROGRAMMING

Students will use basic and advanced programming techniques to design, implement, and solve complex problems using an object-oriented programming language.

BCS-IP-6. Students will design solutions for complex programs using advanced programming techniques and constructs.

a. Implement techniques such as conditional statements, iterative statements, and variables to solve complex problems.
b. Utilize basic and advanced mathematical expressions to solve complex problems.
c. Create appropriate arrays and lists.
d. Utilize various testing and debugging techniques to test classes.
e. Design classes that can be used in other programs.
f. Analyze and explain simple programs involving advanced programming constructs.

Academic Standards:
ELA12W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals a satisfying closure.
ELA12W2 The student demonstrates competence in a variety of genres.
ELA12LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

BCS-IP-7. Students will use and develop algorithms to solve complex problems.

a. Develop algorithms to solve complex problems using pseudocode.
b. Interpret algorithms written in pseudocode to code solutions to complex problems.
c. Identify properties of well-written algorithms in solving complex problems.
d. Use an Action, Components, and Events (ACE) chart to design your GUI components.

Academic Standards:
ELA12W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals a satisfying closure.
ELA12LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

BCS-IP-8. Students will demonstrate knowledge of advanced object-oriented concepts.

a. Define polymorphism, interface, inheritance, encapsulation, and abstract class.
b. Develop programs that use inheritance and interfaces in the development of GUI applications.

Academic Standards:
ELA12W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals a satisfying closure.
ELA12W2 The student demonstrates competence in a variety of genres.
ELA12W3 The student uses research and technology to support writing.

ELA12LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

DATA STRUCTURES

Students will apply their knowledge of arrays and lists. Students will demonstrate an understanding of stacks and queues.

BCS-IP-9. Students will apply their knowledge of arrays and lists.

a. Choose between an array and a list for representing data in a variety of contexts.
b. Create one- and two-dimensional arrays of the correct size for a variety of problems.
c. Describe how elements are removed and added to a list.
d. Implement common searching and sorting algorithms for arrays.

Academic Standards:

ELA12W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals a satisfying closure.
ELA12W2 The student demonstrates competence in a variety of genres.
ELA12W3 The student uses research and technology to support writing.

BCS-IP-10. Students will demonstrate an understanding of stacks and queues.

a. Use stacks and queues to solve a variety of problems.
b. List common uses of stacks and queues.
c. Explain the function of an event queue.

Academic Standards:

ELA12W1 The student produces writing that establishes an appropriate organizational structure, sets a context and engages the reader, maintains a coherent focus throughout, and signals a satisfying closure.
ELA12W2 The student demonstrates competence in a variety of genres.
ELA12W3 The student uses research and technology to support writing.
ELA12LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

Sample Tasks:

- Use a 2D array to hold disks in the game Connect Four.
- Use a 2D array to represent a checkerboard.
- Use a list to hold slides for a slide show.
- Use a stack to solve simple postfix equations such as 3 4 + 2 * 5 -.
- Use a queue to create a simulation of a printer queue.
- Search a list of students for a specific name.
- Sort a list of students based on the student name.

LIMITS OF COMPUTING

Students will investigate the various limits to computing, identify key limiting factors and how they affect computing, and discuss possible technological advances to overcome some of these limits in the future.

BCS-IP-11. Students will identify the physical constraints on computing.

a. Investigate miniaturization and its relationship to sub-atomic concerns.
b. Identify the thermodynamic limits on energy dissipation.
c. Identify the speed-of-light limitations on computing and discuss its implications.
d. Explain and give examples of parallel processing.

Academic Standards:

*ELA12W3 The student uses research and technology to support writing.*Implementation date Fall 2007 7

ELA12LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

BCS-IP-12. Students will examine the limits to computing based on complexity and computability.

a. Define complexity theory.
b. Compare polynomial time versus exponential time.
c. Define non-deterministic and intractable.
d. Discuss the importance of computational time in relationship to solvable problems.
e. Explain the Turing Machine and its relationship to the halting problem.

Academic Standard:

ELA12LSV1 The student participates in student-to-teacher, student-to-student, and group verbal interactions.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to work ethics, behavior, and legal responsibilities in the workplace.

CTAE-FS-10 Career Development: Learners plan and manage academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of concepts, processes, and behaviors associated with successful entrepreneurial performance.

Intermediate Programming Pacing Guide

Weeks	Standards	Assessment
2 Weeks	**BCS-IP-1. Students will apply knowledge of hardware and software components.** a. Explain how Boolean logic is related to computer hardware. b. Explain how a computer monitor displays text and images. c. Explain how a graphical button is displayed and how it knows when it has been pushed.	Academic Portfolio Section 1
2 weeks	**BCS-IP-2. Students will apply knowledge of high-level program execution.** a. Build an interpreter that executes a simple language. b. Build a compiler that translates one simple language to another.	Academic Portfolio Section 2
2 Week	**BCS-IP-3. Students will demonstrate knowledge of key concepts in software engineering.** a. Define software engineering. b. Compare and contrast software engineering and programming. c. List the phases in the software life cycle. d. Perform software requirements analysis. e. Discuss Extreme Programming and pair programming. f. Discuss societal and ethical issues in software engineering.	Academic Portfolio Section 3
3 Weeks	**BCS-IP-4. Students will demonstrate knowledge of the important principles in user interface design.** a. List the criteria used to determine the effectiveness of an interface. b. Apply user interface design criteria to critique common user interfaces (car door handle, steering wheels, light switches, cell phones, and VCRs). c. Perform a user-centered task analysis. Identify sub-groups of users and their characteristics. d. List examples of good and bad user interface designs. Discuss the impact of bad user interface designs.	Academic Portfolio Section 4
4 Weeks	**BCS-IP-5. The student will collaboratively develop solutions for specific problems.** a. Collaboratively determine a course of action for problem resolution. b. Design algorithms for problem resolution. c. Break a task into subtasks required for problem resolution. d. Select appropriate tools and technology resources to accomplish a variety of tasks. e. Collaboratively design, combine, test, analyze, and adjust coding solutions based on problem-solving	Group Project: A Complicated Simulation Case

	algorithms. f. Review and discuss coding solutions for elements of thoroughness and correctness.	
1 Week	**BCS-IP-6. Students will design solutions for complex programs using advanced programming techniques and constructs.** a. Implement techniques such as conditional statements, iterative statements, and variables to solve complex problems. b. Utilize basic and advanced mathematical expressions to solve complex problems. c. Create appropriate arrays and lists. d. Utilize various testing and debugging techniques to test classes. e. Design classes that can be used in other programs. f. Analyze and explain simple programs involving advanced programming constructs.	Academic Portfolio Section 5
4 Weeks	**BCS-IP-7. Students will use and develop algorithms to solve complex problems**. a. Develop algorithms to solve complex problems using pseudocode. b. Interpret algorithms written in pseudocode to code solutions to complex problems. c. Identify properties of well-written algorithms in solving complex problems. d. Use an Action, Components, and Events (ACE) chart to design your GUI components. **BCS-IP-8. Students will demonstrate knowledge of advanced object-oriented concepts.** a. Define polymorphism, interface, inheritance, encapsulation, and abstract class. b. Develop programs that use inheritance and interfaces in the development of GUI applications.	Final Project: A Game Design Project of Value-Added CS Model
2 weeks	**BCS-IP-9. Students will apply their knowledge of arrays and lists.** a. Choose between an array and a list for representing data in a variety of contexts. b. Create one- and two-dimensional arrays of the correct size for a variety of problems. c. Describe how elements are removed and added to a list. d. Implement common searching and sorting algorithms for arrays.	Academic Portfolio section 6
2 weeks	**BCS-IP-10. Students will demonstrate an understanding of stacks and queues.** a. Use stacks and queues to solve a variety of problems. b. List common uses of stacks and queues. c. Explain the function of an event queue.	Academic Portfolio Section 7

3 weeks	**BCS-IP-11. Students will identify the physical constraints on computing.** a. Investigate miniaturization and its relationship to sub-atomic concerns. b. Identify the thermodynamic limits on energy dissipation. c. Identify the speed-of-light limitations on computing and discuss its implications. d. Explain and give examples of parallel processing. **BCS-IP-12. Students will examine the limits to computing based on complexity and computability.** a. Define complexity theory. b. Compare polynomial time versus exponential time. c. Define non-deterministic and intractable. d. Discuss the importance of computational time in relationship to solvable problems. e. Explain the Turing Machine and its relationship to the halting problem.	Academic Portfolio Section 8
11 Weeks	**BCS-IP-7. Students will use and develop algorithms to solve complex problems**. a. Develop algorithms to solve complex problems using pseudocode. b. Interpret algorithms written in pseudocode to code solutions to complex problems. c. Identify properties of well-written algorithms in solving complex problems. d. Use an Action, Components, and Events (ACE) chart to design your GUI components. **BCS-IP-8. Students will demonstrate knowledge of advanced object-oriented concepts.** a. Define polymorphism, interface, inheritance, encapsulation, and abstract class. b. Develop programs that use inheritance and interfaces in the development of GUI applications. **BCS-IP-9. Students will apply their knowledge of arrays and lists.** a. Choose between an array and a list for representing data in a variety of contexts. b. Create one- and two-dimensional arrays of the correct size for a variety of problems. c. Describe how elements are removed and added to a list.	Academic Portfolio Section 5 and 6 Revise of code Project: Project management and object orientation Project: Project management and algorithm flow Final Project: A software development project