Kansas Information Technology Career Cluster **Programming & Software Development Pathway** **10157 AP Computer Science A**

Name _____ ID _____

Instructor _____School Year_____

RATING SCALE: 3: Skilled, works independently
2: Competent, may need assistance
1: Received instruction, skill undeveloped
0: No exposure, instruction or training

Measured Competencies listed should be seen as minimums (you can add)

Enrollment Date ____/____/____ Completion Date ____/____/____ Credits Completed _____

I certify that the student received the training in the area indicated.

Student Signature _____ Date _____

Instructor Signature _____ Date _____

Competencies _____/39

I. AP Computer Science A

3 2 1 0 1. Object-Oriented Program Design

- **a. 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.**
- **b. Class design**
  - **Design and implement a class.**
  - **Choose appropriate data representation and algorithms.**
  - **Apply functional decomposition.**
  - **Extend a given class using inheritance.**

3 2 1 0 2. Program Implementation

- **a. Implementation techniques**
  - **Methodology**
    - **Object-oriented development**
    - **Top-down development**
    - **Encapsulation and information hiding**
    - **Procedural abstraction**
- **b. Programming constructs**
  - **Primitive types vs. objects**
  - **Declaration**
    - **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**
- **c. Java library classes (included in the AP Java subset)**

3 2 1 0 3. Program Analysis

- **a. Testing**
  - **Test classes and libraries in isolation.**
  - **Identify boundary cases and generate appropriate test data.**
  - **Perform integration testing.**
- **b. Debugging**
  - **Categorize errors: compile-time, run-time, logic.**
  - **Identify and correct errors.**
  - **Employ techniques such as using a debugger, adding extra output statements, or hand-tracing code.**
- **c. Understand and modify existing code**
- **d. Extend existing code using inheritance**
- **e. Understand error handling**
  - **Understand runtime exceptions.**
- **f. Reason about programs**
  - **Pre- and post-conditions**
  - **Assertions**
- **g. Analysis of algorithms**
  - **Informal comparisons of running times**
  - **Exact calculation of statement execution counts**
- **h. 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)**

3 2 1 0 4. Standard Data Structures

- **a. Simple data types (int, boolean, double)**
- **b. Classes**
- **c. Lists**
- **d. Arrays**

3 2 1 0 5. Standard Algorithms

- **a. Operations on data structures previously listed**
  - **Traversals**
  - **Insertions**
  - **Deletions**
- **b. Searching**
  - **Sequential**
  - **Binary**
- **c. Sorting**
  - **Selection**
  - **Insertion**
  - **Mergesort**

3 2 1 0 6. . Computing in Context

- **a. System reliability**
- **b. Privacy**
- **c. Legal issues and intellectual property**
- **d. Social and ethical ramifications of computer use**

Foundation & 21st Century Competencies

(lowercase letters are indicators to be considered)

II. Pathway Foundation
Problem Solving and Critical Thinking

3 2 1 0 1. Demonstrate knowledge of the process required to evaluate and verify the nature of a problem.

a. Demonstrate knowledge of the underlying concepts of the information systems discipline.
b. Demonstrate knowledge of methods for achieving productivity in knowledge work.
c. Apply general systems theory to the analysis and development of an information system.
d. Identify procedures for formal problem- solving.
e. Demonstrate knowledge of the fundamental concept of information theory and organizational system processes.
f. Identify the essential properties of information systems.

3 2 1 0 2. Demonstrate knowledge of the process required to solve a problem.

a. Demonstrate knowledge of problem-solving steps and techniques.
b. Summarize application planning, development, and risk management for information system.
c. Identify potential problems in system implementation.
d. Demonstrate knowledge of the information analysis process.
e. Demonstrate knowledge of information technology solutions.

III. Cluster Foundation
Employability and Career Development

3 2 1 0 1. Demonstrate ability to evaluate and compare employment opportunities and accept employment.

a. Identify job advantages and disadvantages.
b. Compare job benefits to individual needs.
c. Compare job opportunities and responsibilities to career plan.
d. Make decision to accept or reject employment.
e. Write acceptance or rejection letter without error.
f. Complete employment forms upon acceptance.

3 2 1 0 2. Demonstrate ability to seek and apply for employment.

a. Identify resources for finding employment.
b. Analyze resources to determine those that are most appropriate for desired career.
c. Compare job requirements with personal qualifications, interests, and aptitudes.
d. Select job that matches personal qualifications, interests, and aptitudes.
e. Identify prospective employer's submission requirements.
f. Gather information and prepare rough draft of resume.
g. Put resume in proper format.
h. Write letter of application for specific job opening in correct format, without error.
i. Gather information for application.
j. Complete all questions on application with appropriate and honest answers.
k. Sign and date application.
l. Attach any supporting material required or requested.
m. Submit full application package to employers.
n. Dress appropriately for interview.
o. Exhibit professional conduct before, during and after interview.
p. Explain your qualifications and interests clearly and concisely.
q. Answer all questions honestly and concisely.
r. Write follow-up letter after the interview.

3 2 1 0 3. Demonstrate knowledge of career development/progression patterns in the IT industry.

a. Identify education and training requirements for IT career pathways.
b. Identify professional organizations in the area of information technology.
c. Identify benefits derived from membership in specific professional organizations.

3 2 1 0 4. Demonstrate knowledge of the relationship between lifelong learning and IT career development.

a. Identify present and future IT employment opportunities.
b. Demonstrate knowledge of the potential impact of IT on future society.
c. Identify the importance of lifelong learning in the IT field.
d. Identify certification and/or degree requirements.
e. Identify required knowledge and skills for career ladder.
f. Research educational and training opportunities.
g. Identify present and future IT education and training opportunities.
h. Design a lifelong learning plan that ties in with career advancement plan.

3 2 1 0 5. Develop a personal career plan to meet career goals and objectives.

a. Identify career that matches individual interests and aptitudes.
b. Develop career goal with time frame.
c. Identify goals and objectives for reaching and advancing in career.
d. Write a list of strategies for achieving educational requirements.
e. Identify strategies for obtaining employment experiences.
f. Write a time line for achieving career goals and objectives.
g. List alternatives and potential changes.

3 2 1 0 6. Explain written organizational policies, rules and procedures to help employees perform their jobs.

a. Identify the contents of various organizational publications.
b. Determine the appropriate document(s) for specific job responsibilities and work assignments.
c. Locate and identify specific organizational policy, rule or procedure to assist with a given situation.
d. Articulate how a specific organizational policy, rule or procedure will improve a given situation.

3 2 1 0 7. Identify and demonstrate positive work behaviors and personal qualities.

a. Demonstrate regular attendance.
b. Follow company dress and appearance standards.
c. Exhibit pride in work.
d. Demonstrate leadership and teamwork.
e. Exhibit ability to handle stress.
f. Display initiative and open-mindedness.
g. Participate in company orientation and training programs with enthusiasm.
h. Identify progressive strategies that will impact efficiency of job.
i. Follow established rules, regulations and policies.
j. Explain employer/management responsibilities.
k. Demonstrate cost effectiveness.
l. Demonstrate time management.
m. Complete all tasks thoroughly.

3 2 1 0 8. Identify and explore career opportunities in one or more career pathways.

a. Locate and interpret career information for at least one career cluster.
b. Identify job requirements for three career pathways.
c. Identify educational and credentialing requirements for three careers.
d. Identify personal interests and aptitudes.
e. Identify job requirements and characteristics of selected careers.
f. Compare personal interests and aptitudes with job requirements and characteristics.
g. Modify career goals based on results of personal interests and aptitudes with career requirements and characteristics.

3 2 1 0 9. Provide examples of how IT is transforming business in various industries.

a. Demonstrate knowledge of how both PCs and larger computer systems impact people and are used in business/industry/government and other institutions.
b. Demonstrate knowledge of the impact of computers on

career pathways in business/industry (e.g., how computers have eliminated and created jobs).

c. Demonstrate knowledge of the impact of computers on access to information and information exchange worldwide.
d. Demonstrate knowledge of ethical issues that have surfaced in the information age.

Ethics and Legal Responsibilities

3 2 1 0 1. Demonstrate appropriate knowledge and behaviors of legal responsibilities and of positive cyber-citizenry.

a. Demonstrate knowledge of the legal issues that face information technology professionals.
b. Identify issues and trends affecting computers and information privacy.

3 2 1 0 2. Demonstrate knowledge of social, ethical, and legal issues in the information technology field.

a. Analyze the social implications of decisions made and actions taken as an information technology professional.
b. Demonstrate knowledge of the ethical issues that face information technology professionals.
c. Determine the practical implications of lawsuits in terms of good will, client relations, the bottom line, diversion of company resources, cash flow and accounts receivable.
d. Demonstrate knowledge of basic business law concepts.

3 2 1 0 3. Demonstrate knowledge of the rights and responsibilities of IT workers.

a. Identify generally accepted business ethics.
b. Demonstrate knowledge of federal laws governing discrimination and harassment.
c. Demonstrate knowledge of key concepts related to employment discrimination.
d. Demonstrate sensitivity to diversity, including differences in gender, culture, race, language, physical and mental challenges, and family structures.
e. Establish procedures for maintaining the confidentiality of client information.

Leadership and Teamwork

3 2 1 0 1. Build interpersonal skills with individuals and other team members.

a. Analyze the interdependence of empathetic listening, synergy, and consensus building.
b. Define roles within the group decision-making process.
c. Demonstrate knowledge of how to apply team methods to empower coworkers.
d. Apply knowledge of group dynamics.
e. Promote teamwork, leadership, and empowerment.
f. Identify strategies for fostering creativity.

3 2 1 0 2. Demonstrate knowledge of the skills needed for leadership in the IT environment.

a. Demonstrate knowledge of how to apply team methods to empower coworkers.
b. Establish goals and objectives for IS.
c. Define mission and critical success factors.
d. Identify desired group and team behavior in an IS context.

Safety, Health, and Environmental

3 2 1 0 1. Maintain a safe working environment.

a. Demonstrate knowledge of the relationship between health, safety, and productivity.
b. Identify health and safety standards established by government agencies.
c. Access needed safety information using company and manufacturers' references (e.g., procedural manuals, documentation, standards,
d. and flowcharts).
e. Ensure maintenance of a clean work area.
f. Solve safety problems using problem-solving, decision-making, and critical thinking strategies.
g. Demonstrate knowledge of ergonomics and repetitive strain injury.

Systems

3 2 1 0 1. Demonstrate knowledge of the nature of IT in business.

a. Determine how business activities interface with data processing functions.
b. Differentiate between the role of information systems within a company and their role in a global environment.
c. Measure increases in productivity realized by the implementation of information systems.

3 2 1 0 2. Demonstrate knowledge of the operation of cross-functional teams in achieving project goals.

a. Consider the benefits of using a cross-functional team in policy and procedure development.
b. Identify desired group and team behavior in an IS context.

3 2 1 0 3. Explain/discuss general strategies for maximizing organizational learning and productivity in a high tech environment.

a. Assess the importance of new technologies to future developments and to the future knowledge worker productivity.
b. Demonstrate knowledge of methods for achieving productivity in knowledge work.
c. Create/maintain an environment supportive of productivity.

IV. Academic Foundations

Language Arts Courses

3 2 1 0 1. Demonstrate language arts knowledge and skills required to pursue the full-range of career and post-secondary education opportunities within the IT career cluster.

a. Listen actively.
b. Adapt language (diction/structure, style) for audience, purpose, situation.
c. Collect/organize oral and written information.
d. Compose/edit (agenda, audio-visuals, bibliographies, drafts, forms/documents, notes, oral presentations, reports, technical terminology).
e. Comprehend oral and written information (cause/effect, comparisons/contrasts, conclusions, context, purpose, charts/tables/graphs, evaluation/critiques, mood, persuasive text, sequence, summaries, technical matter).
f. Evaluate oral and written information (accuracy, adequacy/sufficiency, appropriateness, clarity, conclusions/solutions, fact/opinion, propaganda, relevancy, validity, relationship of ideas).
g. Identify oral and written assumptions, purpose, outcomes/solutions, and propaganda techniques.
h. Predict outcomes/solutions from oral and written information trends.
i. Present formal and informal speech for the purposes of discussion, supplying/requesting information, interpretation, and persuasion.
j. Use library, text and Internet resources.

Communications Courses

3 2 1 0 2. Apply active listening skills to obtain and clarify information.

a. Determine familiarity of discussion.
b. Respond accordingly using appropriate verbal and nonverbal language.
c. Explain the message given in your own words.
d. Ask questions to seek or confirm understanding.
e. Paraphrase and/or repeat information.
f. Record and summarize information in written notes.
g. Follow directions and/or respond in a positive way with clear, concise comments.

3 2 1 0 2. Build customer relations.

a. Identify organizations' products and services (including own strengths as a sales agent).
b. Recognize the importance of all customers to the business.
c. Determine customers' individual needs.
d. Project a professional business image (e.g., appearance, voice, grammar, word usage, enunciation, nonverbal communication).
e. Interact with customers and colleagues in a professional (e.g., prompt, friendly, courteous, respectful, helpful, knowledgeable, and understandable) manner.
f. Comply with established business protocols and company policies.
g. Communicate company policies to customers.
h. Handle merchandise returns in accordance with customer service policy.
i. Handle customer complaints in accordance with customer

service policy.
j. Facilitate customer service through the maintenance of key information systems.
k. Follow through on commitments made to customers (e.g., special orders, delivery specifications, new items).

3 2 1 0 3. Comprehend and use reading strategies to learn meaning, technical concepts, vocabulary, and follow instructions.
a. Use reading strategy to achieve intended purpose.
b. Identify purpose of text.
c. Identify complexity of text.
d. Explain purpose of text.
e. Determine relevance, accuracy and appropriateness to purpose.
f. Identify complexities and discrepancies in information.
g. Analyze information presented in a variety of formats, such as tables, lists, figures.
h. Identify key technical concepts and vocabulary.
i. Follow all instructions as specifically given.
j. Explain meaning of new terms, vocabulary and concepts.
k. Interpret technical materials used.
l. Summarize overall meaning of text.
m. Write specific steps for applying information to task or new situation.
n. Write set of directions for others sharing information learned and applying that to task or new situation.

3 2 1 0 4. Conduct meetings.
a. Plan meeting.
b. Set agenda.
c. Schedule meeting.
d. Reserve meeting room.
e. Invite appropriate personnel.
f. Identify need for outside speakers.
g. Assign someone to take minutes.
h. Make introductions.
i. Invite questions, comments, and group participation.
j. Determine appropriate action, time frame, and person accountable for identified tasks.
k. Monitor time.
l. Publish minutes in timely manner.

3 2 1 0 5. Demonstrate sensitivity in communicating with a diverse workforce.
a. Identify factors (e.g., culture, ethnicity, equity, special/exceptional needs) that impact communication.
b. Identify strategies for successful communication with a diverse workforce.
c. Determine communication style appropriate for listener(s).
d. Bridge communication styles.
e. Establish guidelines for dealing with conflict.

3 2 1 0 6. Develop and deliver formal and informal presentations using appropriate media to engage and inform audiences.
a. Know subject matter well enough to be independent of written aids.
b. Identify characteristics of the audience and adjust to their ability to understand.
c. Use technical terms and concepts correctly.
d. Use proper organization and structure to achieve coherence of major points.
e. Identify media and visual aids appropriate to understanding of topic.
f. Prepare visual aids and support materials for easy viewing and without error.
g. Smoothly and efficiently operate any equipment used with support.
h. Deliver presentation without grammatical error.
i. Speak clearly with appropriate volume, rate and gestures while making and maintaining appropriate eye contact.
j. Use support materials in the presentation that enhance the understanding of the topic and the interest level of the audience.
k. Stay within presentation time parameters.
l. Evaluate listeners' interest and receptiveness.
m. Use verbal and nonverbal feedback strategies to engage discussion and adjust message and delivery.
n. Respond to questions and comments.

3 2 1 0 7. Interpret and use tables, charts, and figures to support written and oral communications.
a. Compile facts and arrange in an organized manner for a table, chart or figure.
b. Document sources of data.
c. Determine most appropriate way to display data for effective coherence.
d. Prepare table, chart, graph or figure for inclusion in publication or presentation.
e. Evaluate reference or source of data for authenticity and reliability.
f. Explain information presented in tables, charts and figures.
g. Prepare written summary of findings expressed in tables, charts and figures.

3 2 1 0 8. Interpret verbal and nonverbal behaviors to enhance communication with co-workers and clients/participants.
a. Identify verbal cues.
b. Observe voice speed, voice quality and tone.
c. Explain message conveyed by verbal behaviors.
d. Identify nonverbal cues.
e. Observe eye contact, facial expressions, posture, gestures and other body language.
f. Explain message conveyed by nonverbal behaviors.

3 2 1 0 9. Locate, organize and reference written information from various sources to communicate with co- workers and clients/participants.
a. Identify topic.
b. Conduct search of information using card catalog, keywords, and/or search engines.
c. Locate variety of resources such as books, journals, and magazines.
d. Locate information from electronic forms including the Internet.
e. Organize resources to use key information.
f. Read and take notes from selected resources.
g. Prepare outline that emphasizes major points with supporting data.
h. Present information in organized, easy-to-follow manner.
i. Prepare working bibliography according to MLA, APA, CBE, or Chicago, depending on the warranted language style.
j. Prepare a bibliography according to MLA, APA, CBE, or Chicago, depending on the warranted language style.
k. Use parenthetical, footnotes and endnotes text citations accurately.
l. Follow plagiarism and copyright rules and regulations.

3 2 1 0 10. Use correct grammar, punctuation and terminology to write and edit documents.
a. Organize and arrange information for effective coherence.
b. Report relevant information in order of occurrence.
c. Interpret information, data, and observations correctly.
d. Present main ideas and supporting facts.
e. Use technical terms and concepts.
f. Incorporate and use references effectively and accurately.
g. Report objective and/or subjective information.
h. Use correct grammar and sentence structure.
i. Use correct spelling.
j. Use correct punctuation and capitalization.
k. Use word processing software to develop text, charts, graphs or figures correctly.
l. Use presentation software to prepare visual support materials.
m. Format written documents with correct font and layout for easy reading.

Mathematics Courses

3 2 1 0 1. Demonstrate mathematics knowledge and skills required to pursue the full range of career and post-secondary education opportunities within the IT career cluster.
a. Identify whole numbers, decimals, fractions, complex numbers, polynomials, and geometrical figures.
b. Apply basic arithmetic (addition, subtraction, multiplication, and division) operations.
c. Apply relational (equal, not equal, greater than, less than, etc.) and logical operators in a logical expression.
d. Understand the relationship of data and measurements to the problem.
e. Produce mathematical formulae, expressions, and/or sequence of solution steps from problem statements.
f. Analyze problem statements for missing/irrelevant data,

estimate/exact values, inconsistent parameters.

g. Construct charts/tables/graphs from functions and data.

h. Describe problem-solving techniques (e.g., successive approximation, trial and error).

Science Courses

3 2 1 0 1. Demonstrate science knowledge and skills required to pursue the full range of career and post-secondary education opportunities within the IT career cluster.

a. Analyze/evaluate conclusions, conflicting data, controls, data, inferences, limitations, questions, sources of errors, and variables.

b. Use computers for information processing, mathematical applications and problem-solving.

c. Apply/use scientific methods in qualitative and quantitative analysis, data gathering, direct and indirect observation, predictions, and problem identification.