Approved Pathway:
1) Includes minimum of three secondary-level credits.
2) Includes a work-based element.
4) Supporting documentation include Articulation Agreement(s) and a Program of Study.
5) Technical-level and Application-level courses receive .5 state-weighted funding in an approved CTE pathway.

Concentrator Requirement
For a student to be a concentrator, at least 2 of 3 required secondary level credits taken must be a combination of technical and application levels.

SCIENCE, TECHNOLOGY, ENGINEERING & MATH (STEM) CAREER CLUSTER DESIGN

BioMedical Pathway – CIP Code 14.0501

INTRODUCTORY LEVEL

<table>
<thead>
<tr>
<th>Course</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>Biology</td>
<td>03051/53051</td>
<td>1 credit</td>
</tr>
<tr>
<td>Engineering Tech (8-9)</td>
<td>21003/71003</td>
<td>1 credit</td>
</tr>
<tr>
<td>Computing Systems (8-9)</td>
<td>10002/60002</td>
<td>1 credit</td>
</tr>
<tr>
<td>Engineering Appl. (8-9)</td>
<td>21002/71002</td>
<td>1 credit</td>
</tr>
<tr>
<td>Computer Appl. (8-9)</td>
<td>10004/60004</td>
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TECHNICAL LEVEL

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<tbody>
<tr>
<td>Prin. Of Biomedical Science</td>
<td>14251</td>
<td>1 credit</td>
</tr>
<tr>
<td>Medical Interventions</td>
<td>14105</td>
<td>1 credit</td>
</tr>
<tr>
<td>Ag. Food Science Food</td>
<td>18305</td>
<td>1 credit</td>
</tr>
<tr>
<td>Science</td>
<td>22203</td>
<td>1 credit</td>
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<tr>
<td>AP Biology</td>
<td>03056</td>
<td>1 credit</td>
</tr>
<tr>
<td>Human Body Systems</td>
<td>14102</td>
<td>1 credit</td>
</tr>
<tr>
<td>Anatomy &amp; Physiology</td>
<td>03053</td>
<td>1 credit</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>14253</td>
<td>1 credit</td>
</tr>
<tr>
<td>Nutrition &amp; Health Science</td>
<td>22213</td>
<td>1 credit</td>
</tr>
<tr>
<td>Robotics</td>
<td>21009</td>
<td>1 credit</td>
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APPLICATION LEVEL

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<tr>
<td>Emerging Technologies</td>
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<tr>
<td>Biotechnical Engineering</td>
<td>21014</td>
<td>1 credit</td>
</tr>
<tr>
<td>Biomedical Innovation</td>
<td>14255</td>
<td>1 credit</td>
</tr>
<tr>
<td>Project Mgmt. &amp; Res. Scheduling</td>
<td>21205</td>
<td>1 credit</td>
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</tbody>
</table>

Course appropriate for Project Lead the Way Programs; competencies may be utilized by any/all schools

Course is eligible for Regents Qualified Admissions – Natural Science.

ALL ONE CREDIT COURSES MAY BE TAUGHT AS TWO .5 CREDIT COURSES.
03051 Biology

Structure and Function of Cells

1. Analyze the characteristics that are essential to life.
2. Apply the scientific method to answer a question/solve a problem.
3. Explain how cell functions involve specific chemical reactions.
4. Identify the structures, functions, and importance of organic and inorganic compounds in cells.
5. Describe how enzymes regulate the rate of chemical reactions.
6. Compare and contrast prokaryotic and eukaryotic cells.
7. Discuss the function and structure of cell membranes.
8. Describe the process of photosynthesis.
9. Identify the relationship between photosynthesis and cellular respiration.

Heredity and Evolution

10. Evaluate the relationships between structure and function in nucleic acids.
11. Distinguish between the functions of DNA and RNA.
12. Compare and contrast mitosis and meiosis.
13. Identify Mendelian laws of inheritance, their relationship to chromosomes and related terminology.
14. Analyze applications of probability and statistical analysis in genetics.
15. Analyze various patterns of inheritance.
16. Identify the causes of genetic disorders.
17. Identify the effect of a mutation in a DNA sequence on the products of protein synthesis.
18. Explain how evolution is change over time.
19. Describe changes on early earth that challenged first life forms.
20. Cite evidence for evolution.

Ecology

21. Distinguish between individuals, populations, communities, ecosystems, biomes, and the biosphere.
22. Analyze the relationship between organisms and their trophic levels.
23. Identify processes, components, and roles of organisms in the hydrologic, carbon, nitrogen, and phosphorous cycles.
25. Classify examples of species interactions and succession in biotic communities.
26. Evaluate the effects of human population size, resource use, and technology on environmental quality.

Organisms Behavior and Diversity

27. Explain how changes in the environment create selective pressures that challenge the survival of an organism.
28. Apply a taxonomic key to a set of objects.
29. Explain how animals have behavioral responses to internal changes and to external stimuli.
30. Evaluate the nervous system and its effects on behavior.
31. Identify homeostasis as the dynamic regulation and balance of an organism's internal environment.
32. Models the complexity of the division of labor into specific body systems.
All Engineering and Technology Pathways

A. FOUNDATIONAL ACADEMIC EXPECTATIONS

B. ESSENTIAL KNOWLEDGE AND SKILLS

ACADEMIC FOUNDATIONS: Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.

3 2 1 0 1. Complete required training, education, and certification to prepare for employment in a particular career field.
   a. Identify training, education and certification requirements for occupational choice.
   b. Participate in career-related training and/or degree programs.
   c. Pass certification tests to qualify for licensure and/or certification in chosen occupational area.

3 2 1 0 2. Demonstrate language arts knowledge and skills required to pursue the full range of post-secondary education and career opportunities.
   a. Model behaviors that demonstrate active listening.
   b. Adapt language for audience, purpose, situation. (i.e. diction/structure, style).
   c. Organize oral and written information.
   d. Compose focused copy for a variety of written documents such as agendas, audio-visuals, bibliographies, drafts, forms/documents, notes, oral presentations, reports, and technical terminology.
   e. Edit copy to create focused written documents such as agendas, audio-visuals, bibliographies, drafts, forms/documents, notes, oral presentations, reports, and technical terminology.
   f. Comprehend key elements of oral and written information such as cause/effect, comparisons/contrasts, conclusions, context, purpose, charts/tables/graphs, evaluation/critiques, mood, persuasive text, sequence, summaries, and technical subject matter.
   g. Evaluate oral and written information for accuracy, adequacy/sufficiency, appropriateness, clarity, conclusions/solutions, fact/opinion, propaganda, relevancy, validity, and relationship of ideas.
   h. Identify assumptions, purpose, outcomes/solutions, and propaganda techniques.
   i. Predict potential outcomes and/or solutions based on oral and written information regarding trends.
   j. Present formal and informal speeches including discussion, information requests, interpretation, and persuasive arguments.

3 2 1 0 3. Demonstrate mathematics knowledge and skills required to pursue the full range of post-secondary education and career opportunities.
   a. Identify whole numbers, decimals, and fractions.
   b. Demonstrate knowledge of basic arithmetic operations such as addition, subtraction, multiplication, and division.
   c. Demonstrate use of relational expressions such as equal to, not equal, greater than, less than, etc.
   d. Apply data and measurements to solve a problem.
   e. Analyze mathematical problem statements for missing and/or irrelevant data.
   f. Construct charts/tables/graphs from functions and data.
   g. Analyze data when interpreting operational documents.

3 2 1 0 4. Demonstrate science knowledge and skills required to pursue the full range of post-secondary and career education opportunities.
   a. Evaluate scientific constructs including conclusions, conflicting data, controls, data, inferences, limitations, questions, sources of errors, and variables.
   b. Apply scientific methods in qualitative and quantitative analysis, data gathering, direct and indirect observation, predictions, and problem identification.

COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.
1. Select and employ appropriate reading and communication strategies to learn and use technical concepts and vocabulary in practice.
   a. Determine the most appropriate reading strategy for identifying the overarching purpose of a text (i.e. skimming, reading for detail, reading for meaning or critical analysis).
   b. Demonstrate use of content, technical concepts and vocabulary when analyzing information and following directions.
   c. Select the reading strategy or strategies needed to fully comprehend the content within a written document (i.e., skimming, reading for detail, reading for meaning or critical analysis).
   d. Interpret information, data, and observations to apply information learned from reading to actual practice.
   e. Transcribe information, data, and observations to apply information learned from reading to actual practice.
   f. Communicate information, data, and observations to apply information learned from reading to actual practice.

2. Demonstrate use of the concepts, strategies, and systems for obtaining and conveying ideas and information to enhance communication in the workplace.
   a. Employ verbal skills when obtaining and conveying information.
   b. Record information needed to present a report on a given topic or problem.
   c. Write internal and external business correspondence that conveys and/or obtains information effectively.
   d. Communicate with other employees to clarify workplace objectives.
   e. Communicate effectively with customers and employees to foster positive relationships.

3. Locate, organize and reference written information from various sources to communicate with co-workers and clients/participants.
   a. Locate written information used to communicate with co-workers and customers.
   b. Organize information to use in written and oral communications.
   c. Reference the sources of information.

4. Evaluate and use information resources to accomplish specific occupational tasks.
   a. Use informational texts, Internet web sites, and/or technical materials to review and apply information sources for occupational tasks.
   b. Evaluate the reliability of information from informational texts, Internet Web sites, and/or technical materials and resources.

5. Use correct grammar, punctuation and terminology to write and edit documents.
   a. Compose multi-paragraph documents clearly, succinctly, and accurately.
   b. Use descriptions of audience and purpose when preparing and editing written documents.
   c. Use correct grammar, spelling, punctuation, and capitalization when preparing written documents.

6. Develop and deliver formal and informal presentations using appropriate media to engage and inform audiences.
   a. Prepare oral presentations to provide information for specific purposes and audiences.
   b. Identify support materials that will enhance an oral presentation.
   c. Prepare support materials that will enhance an oral presentation.
   d. Deliver an oral presentation that sustains listeners' attention and interest.
   e. Align presentation strategies to the intended audience.
   f. Implement multi-media strategies for presentations.

7. Interpret verbal and nonverbal cues/behaviors to enhance communication with co-workers and clients/participants.
   a. Interpret verbal behaviors when communicating with clients and co-workers.
   b. Interpret nonverbal behaviors when communicating with clients and co-workers.

8. Apply active listening skills to obtain and clarify information.
   a. Interpret a given verbal message/information.
   b. Respond with restatement and clarification techniques to clarify information.

9. Develop and interpret tables, charts, and figures to support written and oral communications.
   a. Create tables, charts, and figures to support written and oral communications.
   b. Interpret tables, charts, and figures used to support written and oral communication.

10. Listen to and speak with diverse individuals to enhance communication skills.
a. Apply factors and strategies for communicating with a diverse workforce.
b. Demonstrate ability to communicate and resolve conflicts within a diverse workforce.

3210 11. Exhibit public relations skills to increase internal and external customer/client satisfaction.
a. Communicate effectively when developing positive customer/client relationships.

PROBLEM-SOLVING AND CRITICAL THINKING: Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams. Solve problems using creativity and innovation.

3210 1. Employ critical thinking skills independently and in teams to solve problems and make decisions (e.g., analyze, synthesize and evaluate).
a. Identify common tasks that require employees to use problem-solving skills.
b. Analyze elements of a problem to develop creative solutions.
c. Describe the value of using problem-solving and critical thinking skills to improve a situation or process.
d. Create ideas, proposals, and solutions to problems.
e. Evaluate ideas, proposals, and solutions to problems.
f. Use structured problem-solving methods when developing proposals and solutions.
g. Generate new and creative ideas to solve problems by brainstorming possible solutions.
h. Critically analyze information to determine value to the problem-solving task.
i. Guide individuals through the process of recognizing concerns and making informed decisions.
j. Identify alternatives using a variety of problem-solving and critical thinking skills.
k. Evaluate alternatives using a variety of problem-solving and critical thinking skills.

3210 2. Employ critical thinking and interpersonal skills to resolve conflicts with staff and/or customers.
a. Analyze situations and behaviors that affect conflict management.
b. Determine best options/outcomes for conflict resolution using critical thinking skills.
c. Identify with others’ feelings, needs, and concerns.
d. Implement stress management techniques.
e. Resolve conflicts with/for customers using conflict resolution skills.
f. Implement conflict resolution skills to address staff issues/problems.

3210 3. Identify, write and monitor workplace performance goals to guide progress in assigned areas of responsibility and accountability.
a. Write realistic performance goals, objectives and action plans.
b. Monitor performance goals and adjust as necessary.
c. Recognize goal achievement using appropriate rewards in the workplace.
d. Communicate goal achievement with managers and co-workers.

3210 4. Conduct technical research to gather information necessary for decision-making.
a. Align the information gathered to the needs of the audience.
b. Gather technical information and data using a variety of resources.
c. Analyze information and data for value to the research objectives.
d. Evaluate information and data to determine value to research objectives.

INFORMATION TECHNOLOGY APPLICATIONS: Use information technology tools specific to the career cluster to access, manage, integrate, and create information.

3210 1. Use Personal Information Management (PIM) applications to increase workplace efficiency.
a. Manage personal schedules and contact information.
b. Create memos and notes.

3210 2. Employ technological tools to expedite workflow.
a. Use information technology tools to manage and perform work responsibilities.

3210 3. Operate communications applications within a workplace.
a. Share files and documents.
b. Identify the functions and purpose of communications systems.
c. Use communications tools within and across organizations.

4. Operate Internet applications to perform workplace tasks.
   a. Access and navigate Internet (e.g., use a web browser).
   b. Search for information and resources.
   c. Evaluate Internet resources for reliability and validity.

5. Operate writing and publishing applications to prepare business communications.
   a. Prepare simple documents and other business communications.
   b. Prepare reports and other business communications by integrating graphics and other non-text elements.
   c. Prepare complex multi-media publications.

6. Operate presentation applications to prepare presentations.
   a. Prepare presentations for training, sales and information sharing.
   b. Deliver presentations with supporting materials.

7. Employ spreadsheet applications to organize and manipulate data.
   a. Create a spreadsheet.
   b. Perform calculations and analyses on data using a spreadsheet.

8. Employ database applications to manage data.
   a. Manipulate data elements.
   b. Manage interrelated data elements.
   c. Analyze interrelated data elements.
   d. Generate reports showing interrelated data elements.

9. Employ collaborative/groupware applications to facilitate group work.
   a. Facilitate group work through management of shared schedule and contact information.
   b. Facilitate group work through management of shared files and online information.
   c. Facilitate group work through instant messaging or virtual meetings.

10. Employ computer operations applications to manage work tasks.
    a. Manage computer operations.
    b. Manage file storage.
    c. Compress or alter files.

11. Use computer-based equipment (containing embedded computers or processors) to control devices.
    a. Operate computer driven equipment and machines.
    b. Use installation and operation manuals.
    c. Troubleshoot computer driven equipment and machines.
    d. Access support as needed to maintain operation of computer driven equipment and machines.

SYSTEMS: Understand roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. Identify how key organizational systems affect organizational performance and the quality of products and services. Understand global context of industries and careers.

12. Describe the nature and types of business organizations to build an understanding of the scope of organizations.
    a. List the types and functions of businesses.
    b. Describe the types and functions of businesses.
    c. Explain the functions and interactions of common departments within a business.

13. Implement quality control systems and practices to ensure quality products and services.
    a. Describe quality control standards and practices common to the workplace.
SAFETY, HEALTH AND ENVIRONMENTAL: Understand the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. Follow organizational policies and procedures and contribute to continuous improvement in performance and compliance.

3 2 1 0 14. Implement personal and jobsite safety rules and regulations to maintain safe and healthful working conditions and environments.
   a. Assess workplace conditions with regard to safety and health.
   b. Align safety issues with appropriate safety standards to ensure a safe workplace/jobsite.
   c. Identify safety hazards common to workplaces.
   d. Identify safety precautions to maintain a safe worksite.
   e. Select appropriate personal protective equipment as needed for a safe workplace/jobsite.
   f. Inspect personal protective equipment commonly used for selected career pathway.
   g. Use personal protective equipment according to manufacturer rules and regulations.
   h. Employ a safety hierarchy and communication system within the workplace/jobsite.
   i. Implement safety precautions to maintain a safe worksite.

3 2 1 0 15. Complete work tasks in accordance with employee rights and responsibilities and employers obligations to maintain workplace safety and health.
   a. Identify rules and laws designed to promote safety and health in the workplace.
   b. State the rationale of rules and laws designed to promote safety and health.

3 2 1 0 16. Employ emergency procedures as necessary to provide aid in workplace accidents.
   a. Demonstrate knowledge of First Aid procedures.
   b. Demonstrate knowledge of CPR procedures.
   c. Use safety equipment as necessary.

3 2 1 0 17. Employ knowledge of response techniques to create a disaster and/or emergency response plan.
   a. Complete an assessment of an emergency and/or disaster situation.
   b. Create an emergency and/or disaster plan.

LEADERSHIP AND TEAMWORK: Use leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

3 2 1 0 18. Employ leadership skills to accomplish organizational goals and objectives.
   a. Analyze the various roles of leaders within organizations (e.g. contribute ideas; share in building an organization; act as role models to employees by adhering to company policies, procedures, and standards; promote the organization’s vision; and mentor others).
   b. Exhibit traits such as empowerment, risk, communication, focusing on results, decision-making, problem solution, and investment in individuals when leading a group in solving a problem.
   c. Exhibit traits such as compassion, service, listening, coaching, developing others, team development, and understanding and appreciating others when acting as a manager of others in the workplace.
   d. Exhibit traits such as enthusiasm, creativity, conviction, mission, courage, concept, focus, principle-centered living, and change when interacting with others in general.
   e. Consider issues related to self, team, community, diversity, environment, and global awareness when leading others.
   f. Exhibit traits such as innovation, intuition, adaptation, life-long learning and coachability to develop leadership potential over time.
   g. Analyze leadership in relation to trust, positive attitude, integrity, and willingness to accept key responsibilities in a work situation.
   h. Describe observations of outstanding leaders using effective management styles.
   i. Participate in civic and community leadership and teamwork opportunities to enhance skills.
19. Employ organizational and staff development skills to foster positive working relationships and accomplish organizational goals.
   a. Implement organizational skills when facilitating others’ work efforts.
   b. Explain how to manage a staff that satisfies work demands while adhering to budget constraints.
   c. Describe how staff growth and development to increase productivity and employee satisfaction.
   d. Organize team involvement within a group environment.
   e. Work with others to develop and gain commitment to team goals.
   f. Distribute responsibility and work load fairly.
   g. Model leadership and teamwork qualities to aid in employee morale.
   h. Identify best practices for successful team functioning.
   i. Explain best practices for successful team functioning.

20. Employ teamwork skills to achieve collective goals and use team members' talents effectively.
   a. Work with others to achieve objectives in a timely manner.
   b. Promote the full involvement and use of team members' individual talents and skills.
   c. Employ conflict-management skills to facilitate solutions.
   d. Demonstrate teamwork skills through working cooperatively with co-workers, supervisory staff, and others, both in and out of the organization, to achieve particular tasks.
   e. Demonstrate teamwork processes that provide team building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution.
   f. Develop plans to improve team performance.
   g. Demonstrate commitment to and a positive attitude toward team goals.
   h. Take responsibility for shared group and individual work tasks.
   i. Assist team members in completing their work.
   j. Adapt effectively to changes in projects and work activities.
   k. Negotiate effectively to arrive at decisions.

21. Establish and maintain effective working relationships with all levels of personnel and other departments in order to accomplish objectives and tasks.
   a. Build effective working relationships using interpersonal skills.
   b. Use positive interpersonal skills to work cooperatively with co-workers representing different cultures, genders and backgrounds.
   c. Manage personal skills to accomplish assignments.
   d. Treat people with respect.
   e. Provide constructive praise and criticism.
   f. Demonstrate sensitivity to and value for diversity.
   g. Manage stress and control emotions.

22. Conduct and participate in meetings to accomplish work tasks.
   a. Develop meeting goals, objectives and agenda.
   b. Assign responsibilities for preparing materials and leading discussions.
   c. Prepare materials for leading discussion.
   d. Assemble and distribute meeting materials.
   e. Conduct meeting to achieve objectives within scheduled time.
   f. Demonstrate effective communication skills in meetings.
   g. Produce meeting minutes including decisions and next steps.
   h. Use parliamentary procedure, as needed, to conduct meetings.

23. Employ mentoring skills to inspire and teach others.
   a. Use motivational techniques to enhance performance in others.
   b. Provide guidance to enhance performance in others.
ETHICS AND LEGAL RESPONSIBILITIES: Know and understand the importance of professional ethics and legal responsibilities.

3210 24. Apply ethical reasoning to a variety of workplace situations in order to make ethical decisions.
   a. Evaluate alternative responses to workplace situations based on legal responsibilities and employer policies.
   b. Evaluate alternative responses to workplace situations based on personal or professional ethical responsibilities.
   c. Identify personal and long-term workplace consequences of unethical or illegal behaviors.
   d. Explain personal and long-term workplace consequences of unethical or illegal behaviors.
   e. Determine the most appropriate response to workplace situations based on legal and ethical considerations.
   f. Explain the most appropriate response to workplace situations based on legal and ethical considerations.

3210 25. Interpret and explain written organizational policies and procedures to help employees perform their jobs according to employer rules and expectations.
   a. Locate information on organizational policies in handbooks and manuals.
   b. Discuss how specific organizational policies and procedures influence a specific work situation.

EMPLOYABILITY AND CAREER DEVELOPMENT: Know and understand the importance of employability skills. Explore, plan, and effectively manage careers. Know and understand the importance of entrepreneurship skills.

3210 26. Identify and demonstrate positive work behaviors and personal qualities needed to be employable.
   a. Demonstrate self-discipline, self-worth, positive attitude, and integrity in a work situation.
   b. Demonstrate flexibility and willingness to learn new knowledge and skills.
   c. Exhibit commitment to the organization.
   d. Identify how work varies with regard to site, from indoor confined spaces to outdoor areas, including aerial space and a variety of climatic and physical conditions.
   e. Apply communication strategies when adapting to a culturally diverse environment.
   f. Manage resources in relation to the position (i.e. budget, supplies, computer, etc).
   g. Identify positive work-qualities typically desired in each of the career cluster's pathways.
   h. Manage work roles and responsibilities to balance them with other life roles and responsibilities.

3210 27. Develop a personal career plan to meet career goals and objectives.
   a. Develop career goals and objectives as part of a plan for future career direction.
   b. Develop strategies to reach career objectives.

3210 28. Demonstrate skills related to seeking and applying for employment to find and obtain a desired job.
   a. Use multiple resources to locate job opportunities.
   b. Prepare a résumé.
   c. Prepare a letter of application.
   d. Complete an employment application.
   e. Interview for employment.
   f. List the standards and qualifications that must be met in order to enter a given industry.
   g. Employ critical thinking and decision-making skills to exhibit qualifications to a potential employer.

3210 29. Maintain a career portfolio to document knowledge, skills and experience in a career field.
   a. Select educational and work history highlights to include in a career portfolio.
   b. Produce a record of work experiences, licenses, certifications and products.
   c. Organize electronic or physical portfolio for use in demonstrating knowledge, skills and experiences.

3210 30. Demonstrate skills in evaluating and comparing employment opportunities in order to accept employment positions that match career goals.
   a. Compare employment opportunities to individual needs and career plan objectives.
   b. Evaluate employment opportunities based upon individual needs and career plan objectives.
   c. Demonstrate appropriate methods for accepting or rejecting employment offers.

3210 31. Identify and exhibit traits for retaining employment to maintain employment once secured.
   a. Model behaviors that demonstrate reliability and dependability.
b. Maintain appropriate dress and behavior for the job to contribute to a safe and effective workplace/jobsite.
c. Complete required employment forms and documentation such as I-9 form, work visa, W-4 and licensures to meet employment requirements.
d. Summarize key activities necessary to retain a job in the industry.
e. Identify positive work behaviors and personal qualities necessary to retain employment.

3210 32. Identify and explore career opportunities in one or more career pathways to build an understanding of the opportunities available in the cluster.
   a. Locate and identify career opportunities that appeal to personal career goals.
   b. Match personal interest and aptitudes to selected careers.

3210 33. Recognize and act upon requirements for career advancement to plan for continuing education and training.
   a. Identify opportunities for career advancement.
   b. Pursue education and training opportunities to acquire skills necessary for career advancement.
   c. Examine the organization and structure of various segments of the industry to prepare for career advancement.
   d. Research local and regional labor (workforce) market and job growth information to project potential for advancement.
   e. Manage employment relations to make career advancements.

3210 34. Continue professional development to keep current on relevant trends and information within the industry.
   a. Use self-assessment, organizational priorities, journals, Internet sites, professional associations, peers and other resources to develop goals that address training, education and self-improvement issues.
   b. Read trade magazines and journals, manufacturers’ catalogues, industry publications and Internet sites to keep current on industry trends.
   c. Participate in relevant conferences, workshops, mentoring activities and in-service training to stay current with recent changes in the field.

3210 35. Examine licensing, certification and credentialing requirements at the national, state and local levels to maintain compliance with industry requirements.
   a. Examine continuing education requirements related to licensing, certification, and credentialing requirements at the local, state and national levels for chosen occupation.
   b. Examine the procedures and paperwork involved in maintaining and updating licensure, certification and credentials for chosen occupation.
   c. Align ongoing licensing, certification and credentialing requirements to career plans and goals.

3210 36. Examine employment opportunities in entrepreneurship to consider entrepreneurship as an option for career planning.
   a. Describe the opportunities for entrepreneurship in a given industry.

TECHNICAL SKILLS: Use of technical knowledge and skills required to pursue careers in all career cluster, including knowledge of design, operation, and maintenance of technological systems critical to the career cluster.

3210 37. Employ information management techniques and strategies in the workplace to assist in decision-making.
   a. Use information literacy skills when accessing, evaluating and disseminating information.
   b. Describe the nature and scope of information management.
   c. Maintain records to facilitate ongoing business operations.

3210 38. Employ planning and time management skills and tools to enhance results and complete work tasks.
   a. Develop goals and objectives.
   b. Prioritize tasks to be completed.
   c. Develop timelines using time management knowledge and skills.
   d. Use project-management skills to improve workflow and minimize costs.

C. CLUSTER (FOUNDATION) KNOWLEDGE AND SKILLS

ACADEMIC FOUNDATIONS: Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.
COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.

Prepare STEM material in oral, written, or visual formats that provide information to an intended audience to fulfill specific communication need of an audience.

3 2 1 0  1. Use effective methods to communicate concepts of STEM to a broadly represented audience.
   a. Report subjective and objective information.
   b. Report information with the intent of being persuasive.
   c. Report information with the intent of being informational.
   d. Report information with the intent of being instructional.
   e. Analyze the audience and presentation environment.
   f. Explain technical concepts to non-technical audiences
   g. Use professional terminology.
   h. Identify, select, use appropriate multimedia resources.
   i. Discern between various communication techniques and their ability to convey various types of information.
   j. Explain various methods of obtaining information.

3 2 1 0  2. Effectively communicate STEM information to a select audience.
   a. Explain the various methods of presenting information.
   b. Use oral presentation skills to present scientific, technological, engineering, or mathematical reports.
   c. Use written presentation skills to present scientific, technological, engineering, or mathematical reports.
   d. Use visual presentation skills to present scientific, technological, engineering, or mathematical reports.
   e. Use multimedia presentation skills to present scientific, technological, engineering, or mathematical reports.

3 2 1 0  3. Apply the ability to read, interpret, and analyze STEM materials discerning the information and concepts.
   a. Use appropriate note-taking methods.
   b. Write a report on technical literature; use graphical tools as appropriate.
   c. Present a report on technical literature; use graphical tools as appropriate.
   d. Discriminate between fact and opinion.

Apply active listening skills to obtain or clarify information pertaining to plans, processes, projects, or designs.

3 2 1 0  4. Interpret messages or information provided that clarifies issues, ideas, plans, projects, or processes.
   a. Indicate familiarity of topic being presented.
   b. Respond accordingly using appropriate verbal and nonverbal language.
   c. Answer questions correctly and be able to provide feedback in own words.

3 2 1 0  5. Respond and/or restate information that will clarify STEM techniques to be used and/or information to be applied to projects, plans, or processes.
   a. Ask questions to seek or confirm understanding.
   b. Paraphrase and/or repeat information.
   c. Record notes and summarize information from written notes.

PROBLEM-SOLVING AND CRITICAL THINKING: Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams. Solve problems using creativity and innovation.

Effectively develop and apply the skills inherent in systems engineering where requirements, configuration, integration, project management, quality assurance, and process applications are necessary.

3 2 1 0  1. Apply the skills and abilities in requirements analysis and configuration control while working plans, processes, and projects as assigned.
3 2 1 0  2. Use the skills required in project management to track and assess the progress of a plan, process, or project as assigned.

3 2 1 0  3. Apply the skills in quality assurance as well as those in process management and development for appropriate applications of systems integration techniques to an assigned project.

INFORMATION TECHNOLOGY APPLICATIONS: Use information technology tools specific to the career cluster to access, manage, integrate, and create information.

Effectively use information technology to gather, store, and communicate data in appropriate formats.

3 2 1 0  1. Use IT in support of gathering, storage, and transfer of data or results in appropriate formats to support assigned projects.
   a. Apply different techniques for gathering storing and transferring data.

3 2 1 0  2. Select and use assorted forms of IT to meet the requirements of a plan, process, project, report, issue, or problem.
   a. Write a report based on Internet research, using calculations, graphs, and/or spreadsheets.
   b. Create, organize, manage, and distribute information in electronic format.

Evaluate and use skills relating to the differing technological tools used to manipulate, report, or operate with data acquisition.

3 2 1 0  3. Use IT tools to manipulate data creating reports, plans, processes, or projects from data provided.
   a. Use statistical tools to analyze data.
   b. Query and extract information from data.
   c. Create knowledge from data.

3 2 1 0  4. Use modeling, simulation, or visual reproduction to effectively analyze, create, and/or communicate to others regarding plans, projects, problems, issues or processes.
   a. Apply techniques for modeling systems or problems.
   b. Apply techniques for scientific visualization and animation of complex physical systems or problems.
   c. Test different scenarios to multiple variables.

3 2 1 0  5. Apply a currently applicable computer programming language to a process, project, plan, or issue as assigned.
   a. Write a computer program, e.g., Java, C++.
   b. Execute a computer program, e.g., Java, C++.

3 2 1 0  6. Apply statistical tools that verify the reliability or validity of the data used or collected in the plan, project, process, or problem.
   a. Using a selected statistical tool, compute data reliability.
   b. Select and use the tools to analyze and synthesize data.
   c. Describe the meaning of probability and how it applies to a set of data.

3 2 1 0  7. Apply a technological, scientific, or mathematical concept (use of algorithms) when communicating with others on issues, plans, processes, problems, or concepts.
   a. Select the proper visualization tools.
   b. Use simulation, modeling, prototype techniques to solve problems.
   c. Communicate data visually.

SYSTEMS: Understand roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. Identify how key organizational systems affect organizational performance and the quality of products and services. Understand global context of industries and careers.

SAFETY, HEALTH AND ENVIRONMENTAL: Understand the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. Follow organizational policies and procedures and contribute to continuous improvement in performance and compliance.
Apply safety practices in the environment where science, technology, engineering, and/or mathematical principles are appropriate to ensure a safe workplace.

3 2 1 0 1. Apply appropriate safety and health practices when developing plans, projects, processes, or solving complex problems.
   a. Exercise good safety practices.
   b. Follow various regulatory codes, such as EPA, FEMA, UL, OSHA, CSA.
   c. Reference and use material safety data sheets (MSDS).
   d. Encourage others to employ safe practices.

3 2 1 0 2. Use appropriate safety techniques, equipment, and processes in planning and/or project applications.
   a. Demonstrate safe use of tools and equipment.
   b. Develop and implement emergency plans.
   c. Develop and implement workplace lab safety plan.
   d. Follow workplace regulations and record-keeping requirements.
   e. Demonstrate the use of safety equipment in the workplace.
   f. Demonstrate the use of eyewash and safety showers.
   g. Accurately interpret safety signs, symbols, and labels.
   h. Demonstrate basic first aid techniques.

Develop an awareness of safety, health, and environmental hazards inherent in the STEM arenas when solving problems, developing plans, processes, or completing projects to be proactive in promoting safety.

3 2 1 0 3. Identify existing or potential hazards to existing or assigned plans, projects, or processes where safety, health, or environment might be in play.
   a. Describe potential safety, health and environmental hazards in various situations.
   b. Identify physical, chemical, toxicological, biological, and radioactive hazards.
   c. Analyze environmental impacts.
   d. Conduct a safety audit.

LEADERSHIP AND TEAMWORK: Use leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

ETHICS AND LEGAL RESPONSIBILITIES: Know and understand the importance of professional ethics and legal responsibilities.

Develop the knowledge and abilities to comprehend ethical and legal standards as they apply to STEM where plans, processes, and projects will be dependent upon them.

3 2 1 0 1. Demonstrate the skill of application to ethical and legal standards as they apply to the plans, processes, and projects as assigned in simulated environments.
   a. Evaluate the pros and cons of current ethical questions and scenarios, for example, environmental stewardship, genetic research, and living subjects in research.
   b. Comply with ethical standards and professional code of ethics.
   c. Follow legal requirements for the treatment of people in the workplace (ADA, EEO).
   d. Follow requirements of regulatory agencies in the scientific, and mathematics, engineering, or technology field (e.g., NFPA, OSHA, EPA, ADA, EOE, FCC).
   e. Develop personal ethics for real-life situations and experiences.
   f. Evaluate personal, professional, and organizational ethics.
   g. Explain fundamentals of patents, trademarks, copyrights, and proprietary information.
   h. Recognize and refute misleading information.
   i. Evaluate methods for protecting and conserving resources.
EMPLOYABILITY AND CAREER DEVELOPMENT: Know and understand the importance of employability skills. Explore, plan, and effectively manage careers. Know and understand the importance of entrepreneurship skills.

Develop the skills and abilities to research career pathways in STEM.

3 2 1 0  1. Engage experiences in STEM where an individual can identify personal interests and expectations for career and personal development.
   a. List resources for researching funding sources for scientific projects and technology.
   b. List careers that you have investigated, internships that you could apply for, and job shadowing opportunities that you have identified.
   c. Construct and maintain a portfolio of experiences and accomplishments.

TECHNICAL SKILLS: Use the technical knowledge and skills required to pursue the targeted careers for all pathways in the career cluster, including knowledge of design, operation, and maintenance of technological systems critical to the career cluster.

D. PATHWAY KNOWLEDGE AND SKILLS

ACADEMIC FOUNDATIONS

Apply the concepts and processes using the guiding principles and standards of school mathematics to solve STEM problems.

3 2 1 0  1. Apply and create appropriate models, concepts, and processes for an assigned situation, and apply them in solving the problem.
3 2 1 0  2. Explain the impact of assumptions, initial conditions, boundary conditions, and other constraints on problem solutions.

Apply and use algebraic, geometric and trigonometric relationships, characteristics, and properties to solve problems.

3 2 1 0  3. Evaluate mathematical solutions for reasonableness.
3 2 1 0  4. Apply appropriate data collection, statistical analysis methods, and the means of displaying data to make decisions.
3 2 1 0  5. Apply the processes and concepts for science literacy relative to engineering and technology.

Demonstrate the ability to select, apply, and convert systems of measurement to solve problems.

3 2 1 0  6. Apply scalar and vector quantities as applied to physical systems, such as the relationship between position, velocity, and acceleration.
3 2 1 0  7. Apply fundamental laws and principles relevant to engineering and technology.

Demonstrate the ability to use Newton’s Laws of Motion to analyze static and dynamic systems with and without the presence of external forces.

3 2 1 0  8. Use the laws of conservation of energy, charge, and momentum, to solve a variety of problems involving mechanical, fluid, chemical, biological, electrical, and thermal systems.
3 2 1 0  9. Use the relationships between energy, work, and power to solve a variety of problems involving mechanical, fluid, electrical, and thermal systems.

Explain relevant physical properties of materials used in engineering and technology.

3 2 1 0  10. Use the principles of ray optics to describe reflection and refraction of light.
3 2 1 0  11. Explain the relationships between amplitude, wavelength, frequency, period, and speed of a wave.

Explain the relationships between scientific theory, scientific principles and laws, in technology, and engineering.

3 2 1 0  12. Develop concepts and processes for the application of technology standards.
COMMUNICATIONS

PROBLEM-SOLVING AND CRITICAL THINKING

Use mathematics, science, and technology concepts and processes to solve problems in projects involving design and/or production (e.g. medical, agricultural, biotechnological, energy and power, information and communication, transportation, manufacturing, and construction).

3 2 1 0 13. Apply the core concepts of technology and recognize the relationships with STEM systems (e.g. systems, resources, criteria and constraints, optimization and trade-off, and controls).
3 2 1 0 14. Develop the active use of information technology applications.
3 2 1 0 15. Use computer applications to solve problems by creating and using algorithms, and through simulation and modeling techniques.

INFORMATION TECHNOLOGY APPLICATIONS

Select and use different forms of communications technology including word processing, spreadsheets, database, presentation software, email to communicate, and use of the internet to search for and display information.

3 2 1 0 16. Select and use information technology tools to collect, analyze, synthesize, and display data to solve problems.
3 2 1 0 17. Read and create basic computer aided engineering drawings.

TECHNICAL SKILLS

Apply concepts and processes for the application of technology to engineering.

3 2 1 0 18. Use knowledge, techniques, skills, and modern tools necessary for engineering practice.
3 2 1 0 19. Describe the elements of good engineering practice (e.g. understanding customer needs, planning requirements analysis, using appropriate engineering tools, prototyping, test, evaluation, and verification).
3 2 1 0 20. Demonstrate the ability to characterize a plan and identify the necessary engineering tools that will produce a technical solution when given a problem statement.
3 2 1 0 21. Effectively use project management techniques (e.g. working in teams, appropriate time management practices, effective organizational skills, conduct analysis of cost, resources, and production capacity, and quality practices with continuous improvement).

Develop processes and concepts for the use of technology which model technical competence.

3 2 1 0 22. Use and calibrate probes, sensors, measuring systems, and devices to collect data using traceable standards.
3 2 1 0 23. Explain the impact of error in measurement, predict the effect of error propagation in calculations, and record data with the correct number of significant digits.
3 2 1 0 24. Safely operate a variety of tools, machines, and equipment (e.g. milling machines, rapid prototyping machines, drill press, band saw, CNC machines, and hand tools).
3 2 1 0 25. Use, handle, and store tools and materials correctly, perform preventative maintenance, understanding the results of negligence and improper maintenance or improper calibration.

DESIGN

Know the elements of the processes and concepts for understanding the design process.

3 2 1 0 26. Explain why and how the contributions of great innovators are important to society.
3 2 1 0 27. Explain the elements and steps of the design process and tools or techniques that can be used for each step.
3 2 1 0 28. Describe design constraints, criteria, and trade-offs in regard to variety of conditions (e.g. technology, cost, safety, society, the environment, time, human resources, manufacturability).
Develop processes and concepts to apply the design process.

3 2 1 0  29. Apply the design process, including understanding customer needs, interpreting and producing design constraints and criteria, planning and requirements analysis, brainstorming and idea generation, using appropriate modeling and prototyping, testing, verification, and implementation.

3 2 1 0  30. Demonstrate the ability to evaluate a design or product and improve the design using testing, modeling, and research.

3 2 1 0  31. Demonstrate the ability to record and organize information and test data during design evaluation.
I. 21003 Engineering Technology

Flight and Space

Performance Objectives – It is expected that students will:

1. Apply their knowledge of research techniques to investigate the history of an aerospace vehicle.

2. Experience the flight characteristics of kites, whirly gigs, model airplanes, hot air balloons, and model rockets.

3. Utilize language arts skills to write a script and create a storyboard for an infomercial promotion of an aerospace vehicle.

4. Distinguish between the forces of lift, drag, weight, and thrust that affect an object moving through a fluid. Understand the importance of each force.

5. Examine how center of gravity affects an aerospace vehicle in distributing weight.

6. Discover how Newton’s laws apply to flight and space.

7. Discover Bernoulli’s principle through exploration.

8. Recognize the tools and purpose of aeronautic design and testing.

9. Identify the characteristics of an airfoil and how they compare and contrast with the characteristics of wings.

10. Analyze the features and benefits of different types of wings.

11. Describe the major parts (fuselage, empennage, high lift devices, wings, undercarriage, propulsion, instruments, and controls) of aircraft and how they can affect the overall balance of an airplane during flight.

12. Research and design an airfoil and empennage for use in the prototyping of a Styrofoam glider.

13. Explore the history and development of rocketry, space flight, and living in space.

14. Discover the basic principles of flight and rocketry.

15. Investigate how changes in various design characteristics of a rocket will affect the rocket’s performance.

16. Know that a rocket must overcome the forces of gravity and drag in order to get out of the atmosphere.
17. Understand that an orbit is the balance of gravity and an object’s tendency to follow a straight path.

18. Use an immersive learning simulation to select optimal components for a lunar robot’s engine, power source, tires, body type and sensor system to save stranded astronauts on the moon.

19. Understand the challenges that engineers face to provide safe travel and optimum living conditions in space.

Science of Technology

20. Describe the difference between a chemist and a chemical engineer.

21. Apply science and engineering skills to make ice cream.

22. Follow the design process to create an adhesive.

23. Work with a team to solve an oil spill engineering simulation problem.

24. Demonstrate an understanding of how small a nanometer is.

25. Explore how nano-products are used in society today.

26. Identify tools and processes used to see and manipulate matter at the nanoscale.

27. Discuss the impact that nanotechnology has on their lives today and will have in the future.

28. Correctly identify the six simple machines and explain their applications.

29. Distinguish between the three classes of levers.

30. Identify a machine as something that helps use energy more efficiently.

31. Determine mechanical advantage from assembled simple machines.

32. Be able to compare and contrast kinetic and potential energy.

33. Predict the relative kinetic energy based on the mass and speed of the object.

34. Recognize and follow safety rules for using lab tools and machines.

35. Build, test, and evaluate a model of a design problem.

36. Analyze a product through testing methods and make modifications to the product.
Magic of Electrons

3210 37. Identify the roles of protons, neutrons, and electrons in an atom.
3210 38. Identify an element based on the atomic number.
3210 39. Identify metals, metalloids, and non-metals on the periodic table.
3210 40. Judge whether a material is a conductor, insulator, or semiconductor based upon its number of valance electrons and its position on the periodic table.
3210 41. Explain how the Law of Charges holds an atom together.
3210 42. Explain how electrons transfer from one atom to another to create electron flow.
3210 43. Define current, voltage, and resistance.
3210 44. Measure voltage and current using a multimeter.
3210 45. Understand the properties of a magnet.
3210 46. Build an electromagnet to demonstrate its characteristics and functions.
3210 47. Build a DC motor to identify the primary parts and demonstrate how it functions.
3210 48. Build a generator to identify the primary parts and demonstrate how it functions.
3210 49. Understand the role of an electromagnet in the function of a DC motor and generator.
3210 50. Compare the characteristics of a basic motor and generator.
3210 51. Build series, parallel, and combination electrical circuits.
3210 52. Create circuit diagrams using standardized schematic symbols.
3210 53. Build and test physical electrical circuits based upon circuit diagrams.
3210 54. Integrate DC sources, lamps, switches, diodes, light emitting diodes, resistors, and capacitors into electrical circuits to achieve specific functions.
3210 55. Distinguish between the functions and operations of fixed resistors, variable resistors, and photo resistors.
3210 56. Determine the value of a fixed resistor based upon the color codes on those resistors.
3210 57. Measure voltage, current, and resistance using a multimeter.
3210 58. Mathematically calculate voltage, current, and resistance using Ohm’s law.
3210 59. Create a circuit that uses a transistor as a switch.
60. Interpret logic scenarios to determine outputs based upon possible conditions within those scenarios.

61. Distinguish between the functions of NOT, AND, OR, NAND, NOR, and XOR gates.

62. Create truth tables for logic scenarios and match those gates to truth tables.

63. Convert binary numbers to Base-10.

64. Convert ASCII characters to binary.

65. Create a digital wave form and graph it for a binary sequence.


67. Use transistors as switches to create circuits that function as AND and OR gates.

68. Determine the logic, sensors, gates, outputs, and other components needed to emulate existing electronic devices that utilize logic.

69. Design, construct, and test device solutions for emulating common electronic devices that utilize logic.
### I. Computing Systems

**3 2 1 0** 1. Apply knowledge of operating systems principles to ensure optimal functioning of system.
   a. Interact with/respond to system messages using console device.
   b. Apply basic commands of operating system software.
   c. Apply appropriate file and disk management techniques.
   d. Employ desktop operating skills.
   e. Follow power-up and log-on procedures.
   f. Run applications/jobs in accordance with processing procedures.
   g. Follow log-off and power-down procedure(s).
   h. Handle materials and equipment in a responsible manner.

**3 2 1 0** 2. Clearly document procedures for future use.

**3 2 1 0** 3. Communicate and recognize goal achievement.
   a. Communicate goal achievement.
   b. Provide recognition for goal achievement.

**3 2 1 0** 4. Configure systems to provide optimal system interfaces.
   a. Apply concepts of privileged instructions and protected mode programming.
   b. Configure peripheral device drivers (e.g., disk, display, printer, modem, keyboard, mouse, network).
   c. Allocate disk space, non-sharable resources, and I/O devices.
   d. Interface peripheral devices/controllers in the computer system (e.g., software and hardware interrupts, exceptions, Direct Memory Addressing [DMA], bus structures).
   e. Identify standards and issues related to I/O programming and design of I/O interfaces.
   f. Define hardware-software interface issues for a computer system.
   g. Apply advanced I/O concepts (e.g., disk caching, data compression, extended memory, magnetic disk/CD-ROM storage and formats).

**3 2 1 0** 5. Configure/modify system as needed.
   a. Build system software command structures using operating system macro facilities for computer systems.
   b. Identify scheduling priority in programming.
   c. Identify data requirements.
   d. Review automated scheduling software.
   e. Secure needed supplies and resources.

**3 2 1 0** 6. Determine audience and information needs.
   a. Define research questions.
   b. Identify target audience.

**3 2 1 0** 7. Document procedures and actions.
   a. Develop audit trails.

**3 2 1 0** 8. Ensure that hardware and software system components are compatible prior to performing installation.
   a. Identify hardware requirements (e.g., processor, memory, disk space, communications, printers, monitors).
   b. Determine compatibility of hardware and software.

**3 2 1 0** 9. Ensure that software to be installed is licensed prior to performing installation.
   a. Verify conformance to licensing agreement.

**3 2 1 0** 10. Evaluate information systems problem-solving techniques and approaches.
   a. Evaluate systems engineering considerations.
   b. Identify potential problems in system implementation.
   c. Summarize application planning, development, and risk management for information system.
   d. Demonstrate knowledge of critical thinking skills and techniques.
   e. Demonstrate knowledge of decision-making skills and techniques.
   f. Develop a plan using data-oriented techniques.
   g. Determine whether prototyping system is feasible.
   h. Determine software design process, from specification to implementation.

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

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

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

Student Signature __________________________ Date ________________
Instructor Signature __________________________ Date ________________

Competencies ________/78
19. Explain the key functions and applications of K systems.
   a. Demonstrate knowledge of the function and operation of compilers and interpreters.
   b. Demonstrate knowledge of widely used software applications (e.g., word processing, database management, spreadsheet development).
   c. Demonstrate knowledge of the key functions of systems software.

20. Explain the role of number systems in information systems.
   a. Identify the role the binary system in information systems.
   b. Demonstrate knowledge of number systems and for a new installation.

   a. Identify potential sources of information.
   b. Gather information from selected print and electronic sources.
   c. Conduct interviews with selected human information sources.
   d. Evaluate potential sources of information based on established criteria (e.g., affordability, relevance).
   e. Target audience/user group as a key information source.
   f. Determine priorities for the information that should be gathered.
   g. Identify subject-matter experts.

22. Identify computer classifications and hardware.
   a. Identify types of computer storage devices.
   b. Identify the hardware associated with telecommunications functions.
   c. Identify major hardware components and their functions.
   d. Identify the three main classifications of computers (i.e., micro-, mid-range, and mainframes).

23. Identify new IT technologies and assess their potential importance and impact in the future.
   a. Identify new technologies relevant to information technology.
   b. Assess the importance of new technologies to future developments and to future knowledge worker productivity.
   c. Identify new and emerging drivers and inhibitors of information technology change.

24. Monitor and adjust goals.
   a. Obtain support for goals.
   b. Provide support for goals.
   c. Monitor goal achievement.
Kansas STEM Career Cluster

Identify major operating system fundamentals and components.

Understand the range of languages used in software development.

Demonstrate knowledge of the range of languages used in software development.

42. Understand types and functions of businesses.

Define stakeholder relationships (e.g., customers, employees, shareholders, and suppliers).

Identify business reporting and information flow.

Identify types of business organizations and functions.

43. Use available reference tools as appropriate.

Access needed information using appropriate reference materials.

Access needed information using company and manufacturers' references (e.g., procedural manuals, documentation, standards, work flowcharts).

44. Use installation and operation manuals.

Access needed information using appropriate reference materials.

45. Use reliability factors effectively to plan for and create products/services.

Consider reliability factors (e.g., cost, human, producibility).

Achieve reliability through maintainability, good design, design simplification, and design redundancy.

Recognize the relationship of maintainability and reliability.

Align cost components with quality objectives.

Classify quality costs (e.g., preventive, evaluation, pre-delivery failures, post-delivery failures).
Design and Modeling

Performance Objectives - It is expected that students will:

1. Explain the relationship between science, technology, engineering and math.
2. Describe engineering and explain how engineers participate in or contribute to the invention and innovation of products.
3. Describe impacts that technology has had on society.
4. Distinguish between invention and innovation.
5. Assemble an engineering notebook and a portfolio.
6. Describe the design process and how it is used to aid in problem solving.
7. Use the design process to solve a technical problem.
8. Recognize design criteria and constraints.
9. Describe the purpose and importance of working in a team.
10. Explain a design brief and apply the concept when using the design process.
11. Describe the elements of design and apply this concept to the design process.
12. Use a decision matrix to select the best solution to a design problem.
13. Demonstrate the ability to measure accurately with different devices and scales.
14. Explain how to measure in different contexts.
15. Measure using both the English and Metric systems.
16. Summarize the reasoning for using sketching as a communication tool.
17. Use visualization, spatial reasoning, and geometric shapes to sketch two and three dimensional shapes.
18. Recognize and create thumbnail, perspective, isometric, and orthographic sketches.
19. Recognize and accurately interpret one and two point perspective drawings.
20. Communicate ideas for a design using various sketching methods, notes, and drafting views.
21. Dimension an orthographic sketch following the guidelines of dimensioning.
22. Create a three-dimensional (3D) model of an object.
Kansas STEM Career Cluster

21002 Engineering Applications

3 2 1 0 23. Apply geometric and dimension constraints to design CAD-modeled parts.
3 2 1 0 24. Assemble the product using the CAD modeling program.
3 2 1 0 25. Demonstrate the ability to produce various annotated working drawings of a 3D model.
3 2 1 0 26. Identify the difference between a prototype, a model and a mock-up and analyze what circumstances call for the use of each.
3 2 1 0 27. Explain why teams of people are used to solve problems.
3 2 1 0 28. Brainstorm and sketch possible solutions to an existing design problem.
3 2 1 0 29. Create a decision-making matrix.
3 2 1 0 30. Select an approach that meets or satisfies the constraints given in a design brief.

Automation and Robotics

Performance Objectives - It is expected that students will:

3 2 1 0 31. Describe the purpose of automation and robotics and its effect on society.
3 2 1 0 32. Summarize ways that robots are used in today’s world and the impact of their use on society.
3 2 1 0 33. Describe positive and negative effects of automation and robotics on humans in terms of safety and economics.
3 2 1 0 34. Investigate a career related to automation and robotics and determine the requirements for entering the field.
3 2 1 0 35. Investigate and understand various mechanisms to determine their purpose and applications.
3 2 1 0 36. Be able to apply their knowledge of mechanisms to solve a unique problem.
3 2 1 0 37. Design, build, wire, and program both open and closed loop systems.
3 2 1 0 38. Troubleshoot a malfunctioning system using a methodical approach.
3 2 1 0 39. Experience fluid power by creating and troubleshooting a pneumatic device.
3 2 1 0 40. Design, build, wire and program a system operated by alternative energy.

Energy and the Environment (optional/extension)

Performance Objectives - It is expected that students will:

3 2 1 0 41. Differentiate between potential and kinetic energy.
3 2 1 0 42. Explain the differences, advantages, and disadvantages between exhaustible, inexhaustible, renewable, and non-renewable energy sources.
Specific curriculum will differ from program to program. Additional topics of study can include:

- Efficiency vs. Conservation and measures to address each
- Water Conservation and Management
- Energy Budget and Fiscal Impact
- Geographic Barriers and Availability Considerations of Resources
- Power, Work, and Measure of Energy
- Trends of Consumption of Various Energy Sources
- Environmental Impact of Energy Usage and Disposal
Kansas Information Technology Career Cluster  

All Information Technology Pathways  

10004-Computer Applications  

Name __________________________ ID __________________________  

Instructor __________________________ School Year ____________  

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

Student Signature __________________________ Date _________  

Instructor Signature __________________________ Date _________  

Competencies _______/40  

I. Computer Applications  
(lowcase letters are indicators to be considered)  

3 2 1 0  1. Personal Information Management  

a. Create calendars/schedules.  
b. Document results.  
c. Create tasks (to-do) list.  
d. Identify PIM applications (MS Outlook, Lotus Notes, and others).  
e. Manage daily/weekly/monthly schedule using applications such as Notes, MS Outlook, etc.  
f. Create and send notes, informal memos, reminder using PIM applications.  
g. Create reminder for oneself.  
h. Access email messages received.  
i. Access email system using login and password functions.  
j. Create e-mail messages in accordance with established business standards (e.g., grammar, word usage, spelling, sentence structure, clarity, email).  
k. Demonstrate knowledge of email etiquette.  
l. Send email messages.  
m. Access email attachments.  
n. Attach documents to messages.  
o. Demonstrate knowledge of contamination protection strategies for email.  
p. Save email messages/attachments.  

3 2 1 0  2. Research and Internet  

a. Locate information using search engine(s) and Boolean logic.  
b. Navigate web sites using software functions.  
c. Select appropriate search procedures and approaches.  
d. Select search engine(s) to use.  
e. Access business and technical information using the Internet.  
f. Access commercial, government, and education resources.  
g. Evaluate Internet resources (e.g., accuracy of information).  
h. Explore browser features.  
i. Test Internet connection.  
j. Unpack files using compression software.  
k. Bookmark web addresses (URLs).  
l. Navigate web sites using software functions (e.g., Forward, Back, Go To, Bookmarks).  
m. Access library catalogs on the Internet.  
n. Compile a collection of business sites (e.g., finance and investment).  
o. Add plug-ins and helpers to the web browser.  
p. Archive files.  
q. Explore the multimedia capabilities of the World Wide Web.  
r. Utilize online tools.  
s. Communicate via email using the Internet.  
t. Explore collaboration tools.  
u. Explore electronic commerce.  
w. Explore newsgroups.  
x. Compile a collection of business sites (e.g., finance and investment).  

3 2 1 0  3. Word Processing and Presentations  

a. Create documents (e.g., letters, memos, reports) using existing forms and templates.  
b. Employ word processing utility tools (e.g., spell checker, grammar checker, thesaurus).  
c. Format text using basic formatting functions.  
d. Retrieve existing documents.  
e. Safeguard documents using name and save functions.  
f. Create new word processing forms, style sheets, and templates.  
g. Enhance publications using different fonts, styles, attributes, justification, etc.  
h. Enhance publications using paint/draw functions.  
i. Format new desktop publishing files.  
j. Output desktop publishing files.  
k. Place graphics in document.  
l. Prepare publications using desktop publishing software.  
m. Use advanced formatting features (e.g., headers/footers/dropped caps, and indexing).  
n. Create computer presentation and handouts in accordance with basic principles of graphics design and visual communication.  
o. Edit presentations.  
p. Insert graphic elements (e.g., graph, clip art, table) in a slide.  
q. Identify hardware items that support presentation software (e.g., scanners, digital cameras, printers, and projection systems).  
r. Print a single slide, an entire presentation, an outline, and notes.  
s. Run slide shows manually and automatically.  

3 2 1 0  4. Spreadsheets  

a. Create spreadsheets.  
b. Edit spreadsheets.  
c. Print spreadsheets.  
d. Retrieve existing spreadsheets.  
e. Save spreadsheets.  
f. Create charts and graphs from spreadsheets.  
g. Group worksheets.  
h. Input/process data using spreadsheet functions.  
i. Perform calculations using simple formulas.  

3 2 1 0  5. Data  

a. Enter data using a form.  
b. Locate/replace data using search and replace functions.  
c. Process data using database functions (e.g., structure, format, attributes, relationships, keys).  
d. Perform single- and multiple-table queries (e.g., create, run, save).  
e. Print forms, reports, and results of queries.  
f. Search a database table to locate records.  
g. Sort data using single- and multiple-field sorts.  
h. Verify accuracy of output.  
i. Maintain shared database of contact information.  
j. Manage daily/weekly/monthly schedule using applications.  
k. Participate in virtual group discussions and meetings.  
l. Apply basic commands of operating system software.  
m. Employ desktop operating skills.  
n. Apply appropriate file and disk management techniques.  
o. Recognize the need for regular backup procedures.  
p. Demonstrate knowledge of central processing unit (CPU) control and architecture.  
q. Identify CPU modes of operations.  
r. Define the role of memory management in an
3 2 1 0 6. Ethics and Security
a. Demonstrate knowledge of potential internal and external threats to security.
b. Assess exposure to security issues.
c. Demonstrate knowledge of virus protection strategy.
d. Ensure compliance with security rules, regulations, and codes.
e. Explore ways to implement countermeasures.
f. Implement security procedures in accordance with business ethics.
g. Maximize threat reduction.
h. Document security procedures.
i. Understand how to follow a disaster plan.
j. Identify sources of virus infections.
k. Understand how to utilize backup and recovery procedures.
l. Understand how to load virus detection and protection software.
m. Maintain confidentiality.
n. Understand how to provide for user authentication (e.g., assign passwords, access level).
o. Understand how to remove viruses.
q. Identify the features and benefits of quality planning.
r. Identify the role of quality within the organization.

3 2 1 0 7. History / Quality Assurance
a. Demonstrate knowledge of changes brought about by quality industry leaders in the world.
b. Demonstrate knowledge of successful efforts by industry to improve quality and/or reduce costs.
c. Demonstrate knowledge of the historical evolution of quality assurance/total quality management (e.g., Deming, ISO 9000).
d. Demonstrate knowledge of the standards/requirements for the Baldrige award.
e. Demonstrate knowledge of quality management terminology.

Foundation & 21st Century Competencies

All Information Technology Pathways

(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.
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.
3210 1. Explain the functions of different human body systems, and list the major organs within each system.
3210 2. Describe how multiple body systems are interconnected and how those interconnections are necessary for life.
3210 3. Describe how an autopsy is performed and the types of information it provides to officials.

Heart
3210 4. Explain what a pump is.
3210 5. List two factors that affect the amount of work necessary to move a liquid from one flask to another.
3210 6. Illustrate the human heart and label all the important structures.
3210 7. Compare and contrast the characteristics of the different cardiac tissue types.
3210 8. Explain how the design of the heart allows it to pump both oxygenated and un-oxygenated blood without mixing.
3210 9. Summarize the use of technology as an important tool in the Biomedical Sciences.
3210 10. Explain why heart rate, EKG, and blood pressure are important indicators of cardiovascular health.
3210 11. Identify, sketch red and white blood cells viewed under a microscope.
3210 12. Describe the functions of the major components of human blood.
3210 13. Summarize the differences between cells, tissues, and organs.

Diabetes
3210 14. Analyze food labels for nutritional content.
3210 15. Build and analyze molecular models and diagrams of atoms, molecules and simple compounds.
3210 16. Explain the process of calorimetry and how it is used to measure the amount of energy in a food.
3210 17. Explain why water is an essential component of human bodies.
3210 18. Describe how carbohydrates, proteins and lipids differ in function and structure.
3210 19. Discuss the structure and functions of enzymes.
3210 20. Explain the importance of enzymes on maintaining homeostasis in the human body.
3210 21. Describe the function of co-enzymes and give examples of co-enzymes found in food.
3210 22. Illustrate how insulin transfers glucose from blood into cells.
3210 23. Explain the causes, symptoms, effects, and treatments of both Type I and Type II diabetes.
3210 24. Summarize the dietary requirements and restrictions of people who have diabetes.
3210 25. Describe the nutritional requirements of diabetic teens as compared to their non-diabetic peers.
3210 26. Plan a a healthy one-day menu appropriate for a diabetic teen.

Sickle Cell
3210 27. Describe the differences in the appearance of normal and sickle red blood cells.
3210 28. List the symptoms and complications of sickle cell disease.
3210 29. Explain how sickle cell disease is transferred genetically.
3210 30. Define chromosome.
3210 31. Describe the structure of a chromosome.
3210 32. Explain the relationship between chromosomes, DNA, and genes.
3210 33. Outline the DNA code.
3210 34. Explain how karyotypes are used to diagnose medical conditions.

Cholesterol
3210 35. Explain the differences between saturated and unsaturated fatty acid molecules.
3210 36. Define stearic acid, oleic acid, linoleic acid, stearidonic acid, and cholesterol.
3210 37. Describe how the polymerase chain reaction amplifies DNA.
Infectious Diseases

3210 38. Explain what bacteria are.
3210 39. Describes bacterial reproduction.
3210 40. Summarizes antibiotic resistance, and explains why it is a major health problem today.
3210 41. Describes the general structure of viruses.
3210 42. Explain the structural and functional differences between bacterial cells and virus particles.

Medical Interventions

3210 43. Describe the different types or categories of medical intervention.
3210 44. Explain how biomedical engineers apply engineering principles to design and produce medical devices.

210 31. Demonstrate the ability to record and organize information and test data during design evaluation.
I. 14105 Medical Interventions

**Infections**

1. List medical interventions to create a classroom display.
2. Illustrates connections between individuals in a disease outbreak.
3. Calculate serial dilutions and calculate resultant concentrations.
4. Describe the applications of bioinformatics in health and wellness.
5. Explain how bacteria can be identified using their DNA sequences.
6. Propose a plan to treat patients in an outbreak as well as prevent future spread.
7. Draw and label a diagram of a bacteria cell.
8. Explain the importance of taking antibiotics as described.
9. Infer the results of not taking antibiotics as prescribed.
10. Create a model of the structure of the ear.
11. Explain what causes hearing loss.
12. Recommend appropriate interventions for particular types of hearing loss.
13. Explain how sound waves are produced, travel and are interpreted by the ear.
14. Summarize how vaccines work.
15. Explain what recombinant DNA is and why it is important to vaccine creation.

**Genes**

16. Show how the process of PCR amplifies a specific gene.
17. Interpret gel electrophoresis results to determine genotype.
18. Predict how restriction enzymes will cut DNA based on single nucleotide polymorphisms (SNPs) at restriction sequences.
19. Compare amniocentesis and chorionic villus sampling.
20. Explain how gene therapy can treat a genetic disorder.
22. Describe medical interventions available to parents who wish to choose the gender of their next child.
Outline the process of reproductive cloning.

**Cancer**

- Describe the differences in the appearance of normal cells and cancer cells.
- Describe the different uses for X-rays, CT scans, and MRIs.
- Describe the potential risk factors for different types of cancer as well as the ways to reduce the risks.
- Outline the various cancer screenings they should have performed throughout their lives.
- Consider the implications of genetic tests that detect hereditary breast cancer.
- Describe the differences between chemotherapy and radiation.
- Describe how specific chemotherapy drugs interact with and destroy cancer cells.
- Explain how SNP (Single-nucleotide polymorphism) profiles may factor in to the decision to prescribe a specific medication.
- Describe how cases of human abuse have led to strict regulations of human participation in clinical trials.
- Describe an application of nanotechnology in medicine.

**Organ Failure**

- Outline the evolution of the methods used to diagnose and treat diabetes from the 1800s to today.
- Predict results of a bacterial transformation.
- Outline the steps required to produce a protein in the laboratory.
- Summarize the options available to patients with ESRD (End Stage Renal Disease).
- Explain how dialysis machines work to remove wastes from the blood and adjust fluid and electrolyte imbalances.
- Describe the procedures involved in a live donor laparoscopic nephrectomy.
- Compare and contrast heart and kidney transplants.
- Summarizes what factors need to be taken into account when deciding which patient should receive an organ donation.
- Describe how xenotransplantation or tissue engineering work, as well as their potential risks, benefits, challenges, and ethical or moral concerns.
- Evaluate current methods of disease prevention.
I. 18305 Food Science - Course

Determining the Meaning and Importance of Food Science:

3 2 1 0 1. Explain the concept of food science (LA))
3 2 1 0 2. Explain the importance of food science (LA)
3 2 1 0 3. Identify the segments of the food Industry (CD) (LK HS 66, 126)
3 2 1 0 4. Identify careers related to food science (CD) (LK MS29, AHS 40)
3 2 1 0 5. Describe the education and skills needed for a career in food science (CD, LA)
3 2 1 0 6. Identify the two main occupations involved in food science and the food science industry (CD)

Examining the Food Service Industry:

3 2 1 0 7. Describe the food service industry (CD) (LK HS 18, HS 111)
3 2 1 0 8. Explain how food science and the food service industry are related CD
3 2 1 0 9. Identify trends to the food service industry (CD)

Explaining Human Digestion:

3 2 1 0 10. Explain the digestive process (S, LA)
3 2 1 0 11. Identify the parts of the digestive system (S) (LK HS 31)
3 2 1 0 12. Identify secretions and enzymes that aid in the digestive process (S)
3 2 1 0 13. Identify types of digestive system disorders (S)

Describing the Major Food Nutrients:

3 2 1 0 14. Explain the importance of nutrition (LA) (LK MS 30, HS 42)
3 2 1 0 15. Identify and describe the six major nutrients needed for good nutrition (S)

Determining the Impact of Diet on Health

3 2 1 0 16. Explain how calories relate to nutrition MS (S, LA)
3 2 1 0 17. Explain claims made on food labels related to diet and health (LA)
3 2 1 0 18. Describe the Recommended Dietary Allowance (RDA) (LA)

Determining the Chemistry of Water in Foods

3 2 1 0 19. Identify effects of hydrogen bonding in water (S)
3 2 1 0 20. Demonstrate the chemical function of water as a dispersing medium (S, E)
3 2 1 0 21. Indicate differences between water activity and moisture of food (S)
3 2 1 0 22. Show characteristics of water that affect its use (S)B1-2

Examining the Chemistry of Lipids (Fats)

3 2 1 0 23. Identify the chemical composition of lipids (S)
3 2 1 0 24. Recognize the differences between saturated and unsaturated fats (S)
3 2 1 0 25. Examine the chemical changes that fats undergo (S)
3 2 1 0 26. Identify the functions of lipids in foods (S)

Examining the Chemistry of Proteins

3 2 1 0 27. Identify chemical parts of proteins molecule (S)
3 2 1 0 28. Distinguish between conjugated proteins and nonconjugated proteins (S)
3 2 1 0 29. Recognize the different types of reactions of food proteins (S)
3 2 1 0 30. Identify the different properties of food proteins (S)B1-4

Describing the Chemistry of Carbohydrates

3 2 1 0 31. Identify carbohydrates and their chemical composition (S)
3 2 1 0 32. Identify simple carbohydrates (S)
3 2 1 0 33. Identify functional properties of monosaccharides (S)
3 2 1 0 34. Identify large complex carbohydrates (S)
Discussing the Chemistry of Flavor Enhancing Substances

1. Identify basic tastes (S)
2. Investigating Water in Food Physics
3. Identify the importance of hydrogen bonding in water molecular structure (S)
4. Identify basic tastes (S)

Investigating Water in Food Physics

5. Identify the importance of hydrogen bonding in water molecular structure (S).
6. Differentiate between adsorbed water and bound water (S)
7. Identify the relationship between bound water and water activity (S)
8. Identify the function of water in heat transfer in foods (S)

Examining Lipids (Fats) in Food Physics

9. Examine the structure of lipids (S)
10. Investigate controlled crystallization or tempering of lipids (S)
11. Recognize the effect of visible light upon the decomposition of fats (S)
12. Observe differences in melting points of fats that reflect strength of bonds (S)
13. Demonstrate liquid fate as a food conductor of heat (S)

Explaining Proteins in Food Physics

14. Identify the structure of proteins (S)
15. Recognize physical properties of proteins (S)
16. Investigate the development of synergism (S)
17. Explain the structure of collagen and factors affecting it (S, LA)
18. Identify factors that affect the functional properties of protein (S)

Explaining Carbohydrates in Foods Physics

19. Identify functional properties of carbohydrates (S)
20. Recognize the structural differences and similarities in carbohydrates (S)
21. Recognize that the structure of the carbohydrate molecule affects the reaction and properties of compound (S)
22. Recognize that molecular size and weight affect the affinity of water by a sugar molecule (S)
23. Identify the effect of heat upon the starch molecule without water and with water (S)

Classifying Chemical Food Additives

24. Define chemical food additive (S)
25. Explain the functions of food additives (S)
26. Identify the classifications for food additives (S)

Explaining Chemical Preservatives:

27. Describe the mechanisms of chemical food preservatives (S) (LK HS 61, HS 111, AHS 46)
28. Identify common types of chemical food preservatives (S)

Discussing Laws Related To Food Additives and Food Safety

29. Identify the agencies that oversee food additive and food safety regulations (SS)
30. Identify the primary laws/regulations related to food additives and food safety (SS)
31. Describe the process for approving a food additive (SS)
32. Describe recent controversies over food additives (LA, SS)

Explaining Microbes and Food Spoilage Caused by Microbial Growth:

33. Describe food microbiology (S, LA) (LK HS 42)
34. Describe different types of microbes (S, LA) (LK HS 51)
35. Describe how microbes cause food spoilage (S, LA) (LK HS 127)
Describing the Prevention of Food Spoilage

3 2 1 0 70. Describe causes of food spoilage (S, LA)
3 2 1 0 71. Describe methods of preventing food spoilage (S, LA)

Identifying Food-Borne Illnesses and Their Prevention

3 2 1 0 72. Describe the symptoms of food-borne illnesses (LA, S)
3 2 1 0 73. Describe the causes of food-borne illnesses (S, LA)
3 2 1 0 74. Describe prevention of food-borne illnesses (LA, S)

Using Heat in Food Preservation

3 2 1 0 75. Describe methods of using heat to preserve food (S)
3 2 1 0 76. Describe the role of time and temperature in heat preservation (S)
3 2 1 0 77. Describe the process of canning (LA)

Using Cold in Food Preservation

3 2 1 0 78. Describe methods of using cold to preserve food (S, LA)
3 2 1 0 79. Describe the important variables in refrigerated cold preservation (S, LA)

Using Drying, Chemical Additives and Irradiation in Food Preservation

3 2 1 0 80. Describe the use of dehydration as a food preservation method (S, LA)
3 2 1 0 81. Describe the use of irradiation as a food preservation method (S, LA)
3 2 1 0 82. Describe the use of chemical additives as a food preservation method (S, LA)

Using Fermentation

3 2 1 0 83. Describe the fermentation process (S, LA)
3 2 1 0 84. Describe the benefits of fermenting food (S, LA)
3 2 1 0 85. Identifying common foods that are preserved by fermentation (S)

Explaining the Importance of Sanitation:

3 2 1 0 86. Describe the importance of sanitation. (LK HS 12)
3 2 1 0 87. Identify sources of contamination. (LK HS 14)
3 2 1 0 88. Differentiate between cleaning and sanitizing.

Practicing Personal Hygiene in Food Processing

3 2 1 0 89. Describe the importance of personal hygiene in food processing. (CD, LA)
3 2 1 0 90. Describe methods of demonstrating good personal hygiene habits. (CD, LA)

Describing the Cleanliness of Processing Equipment

3 2 1 0 91. Describe the importance of the cleanliness of food processing equipment. (CD, LA)
3 2 1 0 92. Identify factors that affect the cleanliness of food processing equipment. (CD)

Maintaining a Clean Processing Plant:

3 2 1 0 93. Identify factors that affect cleanliness in a food processing plant (CD)
3 2 1 0 94. Describe the importance of cleanliness in a food processing plant (CD, LA)

Using Approved Practices in Handling and Processing Dairy Products

3 2 1 0 95. Explain milk handling from the cow to the processing plant (LA)
3 2 1 0 96. Describe the processing of fluid milk (LA)
3 2 1 0 97. Describe the processing of milk products and by-products (E, LA)

Identifying Dairy Products

3 2 1 0 98. Identify fluid milk products
3 2 1 0 99. Identify processed milk products
3 2 1 0 100. Distinguish milk products from non-dairy products (CD)

Describing Proper Handling of Red Meat

3 2 1 0 101. Describe proper handling of red meat prior to cooking (CD, LA)
3 2 1 0 102. Explain recommended red meat cooking procedures (LA)
3 2 1 0 103. Identify recommended storage of cooked meats

Identifying Cuts of Meat

3 2 1 0 104. Explain the difference between primal and retail cuts (CD, LA)
3 2 1 0 105. Explain the process of determining whether meat is beef, veal, pork or lamb (CD, LA)
3 2 1 0 106. Identify beef and veal cuts (CD)
3 2 1 0 107. Identify pork cuts (CD)
3 2 1 0 108. Identify lamb cuts (CD)

Quality and Yield Meat Grading

3 2 1 0 109. Explain how the quality grade influences the taste of meat (CD, M)
3 2 1 0 110. Explain the factors that influence yield grade of meat (CD, M)
3 2 1 0 111. Calculate Yield Grade (E, M)

Discussing the Processing of Meat:

3 2 1 0 112. Explain slaughtering/harvesting (CD, LA) (LK HS 96)
3 2 1 0 113. Describe cutting, grinding, and blending meat (E, CD)
3 2 1 0 114. Explain tenderizing processes (aging, cubing, chemical/electrical treatment, and marinating) (LA)
3 2 1 0 115. Describe preservation methods (dehydrating, curing, smoking, canning, freezing, freeze drying and irradiating) (LA)

Handling and Processing Poultry and Eggs: LK HS 83, HS 96

3 2 1 0 116. Describe the steps in processing poultry (LA)
3 2 1 0 117. Describe the grading process for poultry and eggs (LA)
3 2 1 0 118. Identify the parts of egg
3 2 1 0 119. Describe the steps in egg processing (LA)

Handling and Processing Fish and Shellfish:

3 2 1 0 120. Identify types of fish and shellfish used for food
3 2 1 0 121. Define aquaculture (S)
3 2 1 0 122. Identify spoilage issues related to seafood
3 2 1 0 123. Identify methods of preserving fish
3 2 1 0 124. Describe the commercial processing of fish CD
3 2 1 0 125. List the general structure and composition of a grain seed S
3 2 1 0 126. Describe the grain milling process CD
3 2 1 0 127. List the types of flour and explain their uses
3 2 1 0 128. Describe the processing of breakfast cereals (LA)
3 2 1 0 129. Explain the concept of “value-added” agriculture in terms of cereal grains

Identifying Cereal Products

3 2 1 0 130. Identify the role of further processors
3 2 1 0 131. Identify common food products made from cereal grains
3 2 1 0 132. Identify industrial products made from cereal grains
3 2 1 0 133. Explain the importance of industrial products in increasing the demand for cereal grains (LA)
3 2 1 0 134. Identify the environmental benefits of using renewable resources for industrial products (SS, LA)

Handling and Processing Fruits and Vegetables:

3 2 1 0 135. Identify general properties and characteristics of produce (fruits and vegetables)
3 2 1 0  136. Identify harvesting methods for produce
3 2 1 0  137. Describe proper handling and storing of produce (LA)
3 2 1 0  138. Identify enzyme activity detrimental to fruit and vegetable storage (S)
3 2 1 0  139. Identify alternative methods for preserving produce

Producing Beverages
3 2 1 0  140. Identify the types of beverages produced in the food industry
3 2 1 0  141. Identify sweeteners used in beverages
3 2 1 0  142. Describe characteristics of soft drinks (LA)
3 2 1 0  143. Describe characteristics of non-carbonated and “healthy beverages)(LA)
3 2 1 0  144. Describe the process for making beer and wine (LA)

Producing Candies and Sweets
3 2 1 0  145. Explain how sugar is produced
3 2 1 0  146. Define and classify confectioneries
3 2 1 0  147. Explain the process of sugar reduction and why it is important S
3 2 1 0  148. Explain how chocolate is produced
3 2 1 0  149. Describe the confectionary manufacturing process CD

Processing of Fats and Oils
3 2 1 0  150. Identify the sources of fats and oils used in food processing
3 2 1 0  151. List the different properties of fats and oils( S)
3 2 1 0  152. Describe the production and processing methods of fats and oils (LA)
3 2 1 0  153. List the essential fatty acids and explain why they are important (S)
3 2 1 0  154. Identify key health issues related to fats and oils

Using Safe Methods in Storing Foods in the Home:
3 2 1 0  155. Describe methods of safely storing foods in the home (LK HS 41)
3 2 1 0  156. Identify potential food storage problems in homes (LK AHS 32)

Following Safe Methods in Handling and Preparing Foods in the Home
3 2 1 0  157. Describe methods of safely handling and preparing foods in the home (LA)
3 2 1 0  158. Describe the importance of cooking meats to the proper temperatures (LA)
3 2 1 0  159. Observe a meal being prepared in the home and identify potential safety issues (E, LA)

Food Packaging and Labeling
3 2 1 0  160. Explain the importance of food packaging (LA)
3 2 1 0  161. Identify the characteristics of a food packaging material
3 2 1 0  162. Identify the different materials and forms of food packages
3 2 1 0  163. Explain the three different types of food packaging containers
3 2 1 0  164. Explain the importance of food labels
3 2 1 0  165. Identify foods affected by food labeling
3 2 1 0  166. Identify the parts of a food label
3 2 1 0  167. Explain the format of a nutrition panel
3 2 1 0  168. Define terms that may be found on a food label (LA)

Determining Risks Associated with Food
3 2 1 0  169. Explain the difference between true and perceived risks (L, LA)
3 2 1 0  170. Identify risks that can be caused by food
3 2 1 0  171. Identify ways that risk can be eliminated

Explain Potential Carcinogenic Hazards Associated with Food
3 2 1 0  172. Define carcinogens (S, LA)
3 2 1 0  173. Identify carcinogenic hazards associated with foods (S)

Explaining Potential Pesticide Hazards Associated with Food
3 2 1 0  174. Identify the benefits of using pesticides
3 2 1 0  175. Explain how pesticide levels can be reduced (LA)

Identifying Government Agencies That Regulate Food:
3 2 1 0  176. Discuss the Food and Drug Administration (SS, LA, CD)
3 2 1 0  177. Discuss the Food Safety and Inspection Service (SS, LA, CD)
3 2 1 0  178. Discuss the Environmental Protection Agency (SS, LA, CD)
3 2 1 0  179. Discuss the United States Department of Agriculture (SS, LA, CD)

Complying With GMP and HACCP
3 2 1 0  180. Define and explain the importance of GMP (LA)
3 2 1 0  181. Define and explain the HACCP system in food safety (LA)

Explaining the Development Process of New Food Products:
3 2 1 0  182. Understand the importance of supermarket inventory management (CD)
3 2 1 0  183. Outline the product life cycle (CD)
3 2 1 0  184. Describe the research and development process (CD)
3 2 1 0  185. Explain the importance of packaging for new food products

Describing the Marketing of Foods
3 2 1 0  186. Define the utilities provided by the food marketing system (LA)
3 2 1 0  187. Describe the functions provided by the food marketing system (LA)
3 2 1 0  188. List and define the 4 Ps of marketing (CD)
3 2 1 0  189. Describe the type of markets for food products (SS, LA)
3 2 1 0  190. Explain the role of public food programs (SS, LA)

Assessing The Role of Governments in Food Economics
3 2 1 0  191. Explain concentration ration
3 2 1 0  192. Identify the government’s role in ensuring competition in the food markets (SS, LA)
3 2 1 0  193. Define workable competition
3 2 1 0  194. Define the government’s role in promoting food safety (LA, CD)
3 2 1 0  195. Explain the government’s role in ensuring food security (SS, LA)

Associating Food Economics with Economic Development: LK MS59, HS102
3 2 1 0  196. List and define the most common challenges facing developing countries (LA, SS)
3 2 1 0  197. Explain why nations specialize and trade (SS, LA)
3 2 1 0  198. Explain the role of Public Law 480 in promoting economic development. (SS, LA)
3 2 1 0  199. Understand the role of trade agreements (SS, LA)

Using Genetic Engineering with Food
3 2 1 0  200. Explain the terms “genetic engineering,” “GMO,” and “transgenic.” (S, LA)
3 2 1 0  201. Learn how GMOs are created in the laboratory (S)
3 2 1 0  202. Describe the uses of GMOs (S, LA)
3 2 1 0  203. Explain the regulation of GMOs

Debating the Pros and Cons of Genetically Modified Foods
3 2 1 0  204. Acquire a basic understanding of how GMOs are formed (S)
3 2 1 0  205. Describe the positive aspects of GMOs in food (S, LA)
3 2 1 0  206. Describe the negative aspects of GMOs in foods (S, LA)
3 2 1 0  207. Debate issues for future leadership roles (LA, L)
Analyzing the Supply of Food For An Increasing World Population

3 2 1 0   208. Describe the roles of governments in the food supply LA, SS)
3 2 1 0   209. Describe the relationship between technology and food (LA)
3 2 1 0   210. Describe how food production affects economic development (SS, LA)

Exploring Future Food Products

3 2 1 0   211. Describe the role of biotechnology in food science (S, LA)
3 2 1 0   212. Describe future food products from improved crops (S, LA)
3 2 1 0   213. Describe the future of food producing animals (S, LA)

Addressing Environmental Concerns Related to Food Production and Processing

3 2 1 0   214. Describe the methods of disposing of food processing solid wastes (LA)
3 2 1 0   215. Discuss wastewater issues related to food processing (LA)
3 2 1 0   216. Describe the wastewater treatment process (LA, S)
I. 2203 Food Science - Course

Determining the Meaning and Importance of Food Science:

3 2 1 0  1. Explain the concept of food science (LA))
3 2 1 0  2. Explain the importance of food science (LA)
3 2 1 0  3. Identify the segments of the food Industry (CD) (LK HS 66, 126)
3 2 1 0  4. Identify careers related to food science (CD) (LK MS29, AHS 40)
3 2 1 0  5. Describe the education and skills needed for a career in food science (CD, LA)
3 2 1 0  6. Identify the two main occupations involved in food science and the food science industry (CD)

Examining the Food Service Industry:

3 2 1 0  7. Describe the food service industry (CD) (LK HS 18, HS 111)
3 2 1 0  8. Explain how food science and the food service industry are related CD
3 2 1 0  9. Identify trends to the food service industry (CD)

Explaining Human Digestion:

3 2 1 0  10. Explain the digestive process (S, LA)
3 2 1 0  11. Identify the parts of the digestive system (S) (LK HS 31)
3 2 1 0  12. Identify secretions and enzymes that aid in the digestive process (S)
3 2 1 0  13. Identify types of digestive system disorders (S)

Describing the Major Food Nutrients:

3 2 1 0  14. Explain the importance of nutrition (LA) (LK MS 30, HS 42)
3 2 1 0  15. Identify and describe the six major nutrients needed for good nutrition (S)

Determining the Impact of Diet on Health

3 2 1 0  16. Explain how calories relate to nutrition MS (S, LA)
3 2 1 0  17. Explain claims made on food labels related to diet and health (LA)
3 2 1 0  18. Describe the Recommended Dietary Allowance (RDA) (LA)

Determining the Chemistry of Water in Foods

3 2 1 0  19. Identify effects of hydrogen bonding in water (S)
3 2 1 0  20. Demonstrate the chemical function of water as a dispersing medium (S, E)
3 2 1 0  21. Indicate differences between water activity and moisture of food (S)
3 2 1 0  22. Show characteristics of water that affect its use (S)

Examining the Chemistry of Lipids (Fats)

3 2 1 0  23. Identify the chemical composition of lipids (S)
3 2 1 0  24. Recognize the differences between saturated and unsaturated fats (S)
3 2 1 0  25. Examine the chemical changes that fats undergo S
3 2 1 0  26. Identify the functions of lipids in foods (S)

Examining the Chemistry of Proteins

3 2 1 0  27. Identify chemical parts of proteins molecule (S)
3 2 1 0  28. Distinguish between conjugated proteins and nonconjugated proteins (S)
3 2 1 0  29. Recognize the different types of reactions of food proteins (S)
3 2 1 0  30. Identify the different properties of food proteins (S)

Describing the Chemistry of Carbohydrates

3 2 1 0  31. Identify carbohydrates and their chemical composition (S)
3 2 1 0  32. Identify simple carbohydrates (S)
3 2 1 0  33. Identify functional properties of monosaccharides (S)
3 2 1 0  34. Identify large complex carbohydrates (S)
Discussing the Chemistry of Flavor Enhancing Substances

Identify basic tastes (S)
Investigating Water in Food Physics
Identify the importance of hydrogen bonding in water molecular structure (S)
Identify basic tastes (S)

Investigating Water in Food Physics
Identify the importance of hydrogen bonding in water molecular structure (S).
Differentiate between adsorbed water and bound water (S)
Identify the relationship between bound water and water activity (S)
Identify the function of water in heat transfer in foods (S)

Examining Lipids (Fats) in Food Physics
Examine the structure of lipids (S)
Investigate controlled crystallization or tempering of lipids (S)
Recognize the effect of visible light upon the decomposition of fats (S)
Observe differences in melting points of fats that reflect strength of bonds (S)
Demonstrate liquid fate as a food conductor of heat (S)

Explaining Proteins in Food Physics
Identify the structure of proteins (S)
Recognize physical properties of proteins (S)
Investigate the development of synergism (S)
Explain the structure of collagen and factors affecting it (S, LA)
Identify factors that affect the functional properties of protein (S)

Explaining Carbohydrates in Food Physics
Identify functional properties of carbohydrates (S)
Recognize the structural differences and similarities in carbohydrates (S)
Recognize that the structure of the carbohydrate molecule affects the reaction and properties of compound (S)
Recognize that molecular size and weight affect the affinity of water by a sugar molecule (S)
Identify the effect of heat upon the starch molecule without water and with water (S)

Classifying Chemical Food Additives
Define chemical food additive (S)
Explain the functions of food additives (S)
Identify the classifications for food additives (S)

Explaining Chemical Preservatives
Describe the mechanisms of chemical food preservatives (S) (LK HS 61, HS 111, AHS 46)
Identify common types of chemical food preservatives (S)

Discussing Laws Related To Food Additives and Food Safety
Identify the agencies that oversee food additive and food safety regulations (SS)
Identify the primary laws/regulations related to food additives and food safety (SS)
Describe the process for approving a food additive (SS)
Describe recent controversies over food additives (LA, SS)

Explaining Microbes and Food Spoilage Caused by Microbial Growth:
Describe food microbiology (S, LA) (LK HS 42)
Describe different types of microbes (S, LA) (LK HS 51)
Describe how microbes cause food spoilage (S, LA) (LK HS 127)
Describing the Prevention of Food Spoilage

3 2 1 0 70. Describe causes of food spoilage (S, LA)
3 2 1 0 71. Describe methods of preventing food spoilage (S, LA)

Identifying Food-Borne Illnesses and Their Prevention

3 2 1 0 72. Describe the symptoms of food-borne illnesses (LA, S)
3 2 1 0 73. Describe the causes of food-borne illnesses (S, LA)
3 2 1 0 74. Describe prevention of food-borne illnesses (LA, S)

Using Heat in Food Preservation

3 2 1 0 75. Describe methods of using heat to preserve food (S)
3 2 1 0 76. Describe the role of time and temperature in heat preservation (S)
3 2 1 0 77. Describe the process of canning (LA)

Using Cold in Food Preservation

3 2 1 0 78. Describe methods of using cold to preserve food (S, LA)
3 2 1 0 79. Describe the important variables in refrigerated cold preservation (S, LA)

Using Drying, Chemical Additives and Irradiation in Food Preservation

3 2 1 0 80. Describe the use of dehydration as a food preservation method (S, LA)
3 2 1 0 81. Describe the use of irradiation as a food preservation method (S, LA)
3 2 1 0 82. Describe the use of chemical additives as a food preservation method (S, LA)

Using Fermentation

3 2 1 0 83. Describe the fermentation process (S, LA)
3 2 1 0 84. Describe the benefits of fermenting food (S, LA)
3 2 1 0 85. Identifying common foods that are preserved by fermentation. (S)

Explaining the Importance of Sanitation:

3 2 1 0 86. Describe the importance of sanitation. (LK HS 12)
3 2 1 0 87. Identify sources of contamination. (LK HS 14)
3 2 1 0 88. Differentiate between cleaning and sanitizing.

Practicing Personal Hygiene in Food Processing

3 2 1 0 89. Describe the importance of personal hygiene in food processing. (CD, LA)
3 2 1 0 90. Describe methods of demonstrating good personal hygiene habits. (CD, LA)

Describing the Cleanliness of Processing Equipment

3 2 1 0 91. Describe the importance of the cleanliness of food processing equipment. (CD, LA)
3 2 1 0 92. Identify factors that affect the cleanliness of food processing equipment. (CD)

Maintaining a Clean Processing Plant:

3 2 1 0 93. Identify factors that affect cleanliness in a food processing plant (CD)
3 2 1 0 94. Describe the importance of cleanliness in a food processing plant (CD, LA)

Using Approved Practices in Handling and Processing Dairy Products

3 2 1 0 95. Explain milk handling from the cow to the processing plant (LA)
3 2 1 0 96. Describe the processing of fluid milk (LA)
3 2 1 0 97. Describe the processing of milk products and by-products (E, LA)

Identifying Dairy Products

3 2 1 0 98. Identify fluid milk products
3 2 1 0 99. Identify processed milk products
3 2 1 0  100. Distinguish milk products from non-dairy products (CD)

Describing Proper Handling of Red Meat

3 2 1 0  101. Describe proper handling of red meat prior to cooking (CD, LA)
3 2 1 0  102. Explain recommended red meat cooking procedures (LA)
3 2 1 0  103. Identify recommended storage of cooked meats

Identifying Cuts of Meat

3 2 1 0  104. Explain the difference between primal and retail cuts (CD, LA)
3 2 1 0  105. Explain the process of determining whether meat is beef, veal, pork or lamb (CD, LA)
3 2 1 0  106. Identify beef and veal cuts (CD)
3 2 1 0  107. Identify pork cuts (CD)
3 2 1 0  108. Identify lamb cuts (CD)

Quality and Yield Meat Grading

3 2 1 0  109. Explain how the quality grade influences the taste of meat (CD, M)
3 2 1 0  110. Explain the factors that influence yield grade of meat (CD, M)
3 2 1 0  111. Calculate Yield Grade (E, M)

Discussing the Processing of Meat:

3 2 1 0  112. Explain slaughtering/harvesting (CD. LA) (LK HS 96)
3 2 1 0  113. Describe cutting, grinding, and blending meat (E, CD)
3 2 1 0  114. Explain tenderizing processes (aging, cubing, chemical/electrical treatment, and marinating) (LA)
3 2 1 0  115. Describe preservation methods (dehydrating, curing, smoking, canning, freezing, freeze drying and irradiating) (LA)

Handling and Processing Poultry and Eggs: LK HS 83, HS 96

3 2 1 0  116. Describe the steps in processing poultry (LA)
3 2 1 0  117. Describe the grading process for poultry and eggs (LA)
3 2 1 0  118. Identify the parts of egg
3 2 1 0  119. Describe the steps in egg processing (LA)

Handling and Processing Fish and Shellfish:

3 2 1 0  120. Identify types of fish and shellfish used for food
3 2 1 0  121. Define aquaculture (S)
3 2 1 0  122. Identify spoilage issues related to seafood
3 2 1 0  123. Identify methods of preserving fish
3 2 1 0  124. Describe the commercial processing of fish CD
3 2 1 0  125. List the general structure and composition of a grain seed S
3 2 1 0  126. Describe the grain milling process CD
3 2 1 0  127. List the types of flour and explain their uses
3 2 1 0  128. Describe the processing of breakfast cereals (LA)
3 2 1 0  129. Explain the concept of “value-added” agriculture in terms of cereal grains

Identifying Cereal Products

3 2 1 0  130. Identify the role of further processors
3 2 1 0  131. Identify common food products made from cereal grains
3 2 1 0  132. Identify industrial products made from cereal grains
3 2 1 0  133. Explain the importance of industrial products in increasing the demand for cereal grains (LA)
3 2 1 0  134. Identify the environmental benefits of using renewable resources for industrial products (SS, LA)

Handling and Processing Fruits and Vegetables:

3 2 1 0  135. Identify general properties and characteristics of produce (fruits and vegetables)
3 2 1 0  136. Identify harvesting methods for produce
3 2 1 0  137. Describe proper handling and storing of produce (LA)
3 2 1 0  138. Identify enzyme activity detrimental to fruit and vegetable storage (S)
3 2 1 0  139. Identify alternative methods for preserving produce

Producing Beverages
3 2 1 0  140. Identify the types of beverages produced in the food industry
3 2 1 0  141. Identify sweeteners used in beverages
3 2 1 0  142. Describe characteristics of soft drinks (LA)
3 2 1 0  143. Describe characteristics of non-carbonated and “healthy beverages” (LA)
3 2 1 0  144. Describe the process for making beer and wine (LA)

Producing Candies and Sweets
3 2 1 0  145. Explain how sugar is produced
3 2 1 0  146. Define and classify confectioneries
3 2 1 0  147. Explain the process of sugar reduction and why it is important (S)
3 2 1 0  148. Explain how chocolate is produced
3 2 1 0  149. Describe the confectionary manufacturing process (CD)

Processing of Fats and Oils
3 2 1 0  150. Identify the sources of fats and oils used in food processing
3 2 1 0  151. List the different properties of fats and oils (S)
3 2 1 0  152. Describe the production and processing methods of fats and oils (LA)
3 2 1 0  153. List the essential fatty acids and explain why they are important (S)
3 2 1 0  154. Identify key health issues related to fats and oils

Using Safe Methods in Storing Foods in the Home:
3 2 1 0  155. Describe methods of safely storing foods in the home (LK HS 41)
3 2 1 0  156. Identify potential food storage problems in homes (LK AHS 32)

Following Safe Methods in Handling and Preparing Foods in the Home
3 2 1 0  157. Describe methods of safely handling and preparing foods in the home (LA)
3 2 1 0  158. Describe the importance of cooking meats to the proper temperatures (LA)
3 2 1 0  159. Observe a meal being prepared in the home and identify potential safety issues (E, LA)

Food Packaging and Labeling
3 2 1 0  160. Explain the importance of food packaging (LA)
3 2 1 0  161. Identify the characteristics of a food packaging material
3 2 1 0  162. Identify the different materials and forms of food packages
3 2 1 0  163. Explain the three different types of food packaging containers
3 2 1 0  164. Explain the importance of food labels
3 2 1 0  165. Identify foods affected by food labeling
3 2 1 0  166. Identify the parts of a food label
3 2 1 0  167. Explain the format of a nutrition panel
3 2 1 0  168. Define terms that may be found on a food label (LA)

Determining Risks Associated with Food
3 2 1 0  169. Explain the difference between true and perceived risks (L, LA)
3 2 1 0  170. Identify risks that can be caused by food
3 2 1 0  171. Identify ways that risk can be eliminated

Explain Potential Carcinogenic Hazards Associated with Food
3 2 1 0  172. Define carcinogens (S, LA)
3 2 1 0  173. Identify carcinogenic hazards associated with foods (S)

Explaining Potential Pesticide Hazards Associated with Food

3 2 1 0  174. Identify the benefits of using pesticides
3 2 1 0  175. Explain how pesticide levels can be reduced (LA)

Identifying Government Agencies That Regulate Food:

3 2 1 0  176. Discuss the Food and Drug Administration (SS, LA, CD)
3 2 1 0  177. Discuss the Food Safety and Inspection Service (SS, LA, CD)
3 2 1 0  178. Discuss the Environmental Protection Agency (SS, LA, CD)
3 2 1 0  179. Discuss the United States Department of Agriculture (SS, LA, CD)

Complying With GMP and HACCP

3 2 1 0  180. Define and explain the importance of GMP (LA)
3 2 1 0  181. Define and explain the HACCP system in food safety (LA)

Explaining the Development Process of New Food Products:

3 2 1 0  182. Understand the importance of supermarket inventory management (CD)
3 2 1 0  183. Outline the product life cycle (CD)
3 2 1 0  184. Describe the research and development process (CD)
3 2 1 0  185. Explain the importance of packaging for new food products

Describing the Marketing of Foods

3 2 1 0  186. Define the utilities provided by the food marketing system (LA)
3 2 1 0  187. Describe the functions provided by the food marketing system (LA)
3 2 1 0  188. List and define the 4 Ps of marketing (CD)
3 2 1 0  189. Describe the type of markets for food products (SS, LA)
3 2 1 0  190. Explain the role of public food programs (SS, LA)

Assessing The Role of Governments in Food Economics

3 2 1 0  191. Explain concentration ratio
3 2 1 0  192. Identify the government’s role in ensuring competition in the food markets (SS, LA)
3 2 1 0  193. Define workable competition
3 2 1 0  194. Define the government’s role in promoting food safety (LA, CD)
3 2 1 0  195. Explain the government’s role in ensuring food security (SS, LA)

Associating Food Economics with Economic Development: LK MS59, HS102

3 2 1 0  196. List and define the most common challenges facing developing countries (LA, SS)
3 2 1 0  197. Explain why nations specialize and trade (SS, LA)
3 2 1 0  198. Explain the role of Public Law 480 in promoting economic development. (SS, LA)
3 2 1 0  199. Understand the role of trade agreements (SS, LA)

Using Genetic Engineering with Food

3 2 1 0  200. Explain the terms “genetic engineering,” “GMO,” and “transgenic.” (S, LA)
3 2 1 0  201. Learn how GMOs are created in the laboratory (S)
3 2 1 0  202. Describe the uses of GMOs (S, LA)
3 2 1 0  203. Explain the regulation of GMOs

Debating the Pros and Cons of Genetically Modified Foods

3 2 1 0  204. Acquire a basic understanding of how GMOs are formed (S)
3 2 1 0  205. Describe the positive aspects of GMOs in food (S, LA)
3 2 1 0  206. Describe the negative aspects of GMOs in foods (S, LA)
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Analyzing the Supply of Food For An Increasing World Population

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Addressing Environmental Concerns Related to Food Production and Processing

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215. Discuss wastewater issues related to food processing (LA)
216. Describe the wastewater treatment process (LA, S)
I. 03056 AP Biology

Molecules and Cells

1. Describes how the unique chemical and physical properties of water make life on Earth possible.

2. Explain how some life processes directly rely on these unique chemical and physical properties.

3. Explain the role of carbon in the molecular diversity of life.

4. Illustrates how cells synthesize and break down macromolecules.

5. Relates how the laws of thermodynamics relate to the biochemical processes that provide energy to living systems.

6. Describes how enzymes regulate the rate of chemical reactions.

7. Compares and contrasts prokaryotic and eukaryotic cells.

8. Diagrams the various cell components.

9. Discusses the function and structure of cell membranes.

10. Outlines the process of cellular respiration.

11. Describes the process of photosynthesis.

12. Identifies the relationship between photosynthesis and cellular respiration.

Heredity and Evolution

13. Compare and contrast meiosis and gametogenesis.

14. Explain what features of meiosis are important in sexual reproduction.

15. Summarize how genetic information is organized in chromosomes.

16. Identifies how Mendel’s work lay the foundation of modern genetics.

17. Compares and contrasts RNA and DNA in terms of their structure and function.

18. Identifies similarities and differences between prokaryotic and eukaryotic genes.

19. Explains how genetic information can be altered.


21. Outlines the major steps in viral reproduction.
22. Lists some current recombinant technologies.

23. Discusses some legal and ethical problems that may arise from applications of nucleic acid technology.

24. Explain the current biological models for the origins of biological macromolecules.

25. Summarize the current evidentiary support for an evolutionary view of life.

26. Explain the role of natural selection in the process of evolution.

27. Relates how heredity and natural selection are involved in the process of evolution.

Organisms and Population

28. List the representative organisms from the Bacteria, Archaea, and Eukarya.

29. Explains the phylogenetic classification system (i.e., domains, kingdoms, and the major phyla and divisions of animals and plants.)

30. Discuss evidence that organisms are related to each other.

31. Relate how scientists study evolutionary relationships among organisms.

32. Describes the patterns of reproduction and development that are found in plants and animals and how they are regulated.

33. Evaluates how the organization of cells, tissues, and organs determine structure and function in plant and animal systems.

34. Tells how the organ systems of animals interact.

35. Infer how plants and animals might react to various environmental clues, and how hormones might mediate these responses.

36. Evaluates various models in describing the growth of a population.

37. Relates how population size is regulated by abiotic and biotic factors.

38. Summarizes how energy flow through an ecosystem is related to trophic structure.

39. Explains how elements (carbon, nitrogen, phosphorous, sulfur, and oxygen) cycle through the ecosystem.

40. Describes how biotic and abiotic factors affect community structure and ecosystem functions.
1. 14102 Human Body Systems

1. Explain the functions of different human body systems, and lists the major organs within each system.

2. Describe how multiple body systems are interconnected and how those interconnections and interactions are necessary for life.

3. Describe the differences in the appearance of epithelial and connective tissue.

4. Explain the basic structure and function of the skeletal system.

5. Describe how bone markings, bone landmarks and bone measurements can provide information about gender, race, ethnicity and height of a missing person.

6. Describe how the structure of DNA is linked to function in the body.

7. Explain how restriction enzymes cut DNA.

8. Define biometrics.

9. Identifies how gel electrophoresis results can help solve a missing persons’ case.

10. Outline the structure and function of the central nervous system.

11. Summarizes the techniques scientists use to map brain function.

12. Correctly predicts how electrical signals are created and transmitted in the human body.

13. Summarizes the roles of ions in creating electrical impulses in the human body.

14. Explain how neurotransmitters help propagate electrical impulses.

15. Describe the way in which hormones interact with target cells.

16. Differentiate between endocrine and exocrine glands as well as protein/peptide and steroid hormones.

17. Illustrate how the structure of the eye focus light on the retina.

18. Describe how the eye and the brain work together to allow a person to see.

19. Explain visual perception, including visual acuity, depth perception, peripheral vision, color vision, and the interpretation of optical illusions.

20. Predict how long the body can function in the absence of water, food or oxygen.
3 2 1 0 21. List and describe the human body systems that create, process and distribute food, water and oxygen.

3 2 1 0 22. Deduce the factors, both environmental and personal that can impact the body’s ability to survive with limited fuel.

3 2 1 0 23. Describe the structure and function of the organs in the digestive system.

3 2 1 0 24. Explain how energy is stored in ATP and how energy is released from ATP.

3 2 1 0 25. Infers how the calories consumed in daily diet versus the calories expended in daily activities affects overall health.

3 2 1 0 26. Describe the structure of the respiratory system, especially the lungs, and the basic mechanics of breathing.

3 2 1 0 27. Illustrates how the structure of the lungs facilitates the exchange of oxygen and carbon dioxide between air and the body.

3 2 1 0 28. Analyzes the process through which the respiratory and cardiovascular systems facilities the transport of oxygen to all cells in the body.

3 2 1 0 29. Describe the structure and function of the human urinary system.

3 2 1 0 30. Describe how the structure of the kidney relates to its function in the body.

3 2 1 0 31. Illustrate the composition of normal blood and normal urine.

3 2 1 0 32. Explain how the body uses hormones to maintain a water balance.

3 2 1 0 33. Describe how the types of joints found in the human body differ in both structure and function.

3 2 1 0 34. Demonstrate the meaning of terms that describe the motion at joints, such as flexion and extension.

3 2 1 0 35. Describe how the three types of muscle tissue differ in structure and function.

3 2 1 0 36. Describe the requirements for muscle contraction.

3 2 1 0 37. Illustrate the connection between nerves and muscles.

3 2 1 0 38. Explain the relationship between the heart and the lungs and trace the path of major circulatory routes.

3 2 1 0 39. Define pulse and blood pressure and name and locate several pulse points on the body.

3 2 1 0 40. Identify the body’s major arteries and veins and name the body region supplied by each.
41. Describe the ways in which the human body can generate ATP as well as how long the energy will last in each case.

42. Describe the structure and function of human skin.

43. Explain how different degrees of burns damage layers of the skin.

44. Describe how the human body senses and processes signals of pain.

45. Compare the structure and function of compact and spongy bone.

46. Describe the types of bone fractures.

47. Outline what happens to bone structure as we age.

48. Describe the structure and function of the lymphatic and immune system.

49. Describe the interaction between antigens and antibodies.

50. Explain how the systems work together to maintain homeostasis in the body and to complete basic functions such as movement and communication.
### Kansas Health Science Education

#### Secondary Health Science Competency Profile

**CIP Code:** 51.9999

**Rating Scale:**
- 3 Skilled- Works Independently
- 2 Limited Skills- Requires Assistance
- 1 Skill Undeveloped
- 0 No exposure- No instruction or training

<table>
<thead>
<tr>
<th>Teacher:</th>
<th>School:</th>
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<tbody>
<tr>
<td>Enrolled Date:</td>
<td>Completion Date:</td>
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<td>Graduation Date:</td>
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**Student Signature**

**Teacher Signature**

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**Directions:** The following competencies are required for full approval of a course in a Health Science Education Program. Check the appropriate number to indicate the level of competency reached for student evaluation.

**Foundation Standard 1: Academics**

**Benchmark:** Health care will know the academic subject matter required for proficiency within their area. They will use this knowledge as needed in their role. In addition to stated high school graduation requirements, the following are included:

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>3</th>
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<tbody>
<tr>
<td><strong>1.1 Human Structure and Function</strong></td>
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<tr>
<td>1.11 Describe the basic structures and functions of cells, tissues, organs, and systems as they relate to homeostasis</td>
<td>L2.A, L6.B</td>
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<tr>
<td>1.14 Analyze the interdependence of the body systems as they relate to wellness, disease, disorders, therapies, and care rehabilitation</td>
<td>L2.C</td>
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<tr>
<td><strong>1.2 Disease and Disorders</strong></td>
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<td>1.22 Analyze methods to control the spread of pathogenic microorganisms</td>
<td>L2.B, L2.C, L2.D</td>
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<tr>
<td>1.23 Contrast various types of immunities</td>
<td>L2.A, L2.C, L2.F</td>
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<tr>
<td>1.24 Analyze body system changes in light of diseases, disorders, and wellness</td>
<td>L2.C, L2.D, L2.F</td>
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<td><strong>1.3 Medical Mathematics</strong></td>
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<tr>
<td>1.32 Apply mathematical principles to conversion equations used in the healthcare delivery system</td>
<td>L2.A, L2.E, L9.C</td>
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### Foundation Standard 2: Communications

**Benchmark:** Health care workers will know the various methods for giving and obtaining information. They will communicate effectively, both orally and in writing.

<table>
<thead>
<tr>
<th>2.1 Concepts of Effective Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.11 Reorganize and adjust communication to other’s ability to understand by recognizing the barriers of communication L3.A, L3.B, L3.C, L3.D</td>
</tr>
<tr>
<td>2.12 Identify the elements of communication using the send-receiver model. L3.A, L7.A</td>
</tr>
<tr>
<td>2.15 Identify and interpret verbal and non-verbal behaviors to augment communication L3.A, L7.A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2.2 Written Communication Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.23 Analyze communications for appropriate response and provide feedback L2.D, L3.A, L4.D</td>
</tr>
<tr>
<td>2.25 Use medical terminology to communicate information, data and observations L3.A, L4.A</td>
</tr>
<tr>
<td>2.26 Use medical terminology within a scope of practice in order to interpret, transcribe and communicate information, data and observations L3.A, L4.A</td>
</tr>
</tbody>
</table>

### Foundation Standard 3: Systems

**Benchmark:** Health care workers will understand how their role fits into their department, their organization and the overall health care environment. They will identify how key systems affect services they perform and quality of care.

<table>
<thead>
<tr>
<th>3.1 Systems Theory</th>
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</table>

<table>
<thead>
<tr>
<th>3.2 Health Care Delivery System</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>3.3 Health Care Delivery System Results</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>3.4 System Change</th>
</tr>
</thead>
</table>

### Foundation Standard 4: Employability Skills

**Benchmark:** Health care workers will understand how employability skills enhance their employment opportunities and job satisfaction. They will demonstrate key employability skills and will maintain and upgrade skills, as needed.

<table>
<thead>
<tr>
<th>4.1 Key Employability Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.12 Adopt personal appearance and hygiene habits appropriate to the health care environment and industry expectations L10.A</td>
</tr>
<tr>
<td>4.18</td>
</tr>
</tbody>
</table>

### 4.2 Interpersonal Communications


### 4.3 Personal Growth and Development


### 4.4 Career Decision-making

| 4.41 | Explore a potential health science career path in at least one of the following health care services: diagnostic, therapeutic, support service, health informatics, or biotechnology research and development | L2.E, L6.E, L10.B |
| 4.42 | Consider levels of education, credentialing requirements, employment opportunities, workplace environments, and career growth potential for a service area | L6.E, L10.C |

### Foundation Standard 5: Legal Responsibilities

<table>
<thead>
<tr>
<th>Benchmark:</th>
<th>Health care workers will understand the legal responsibilities, limitations, and implications of their actions within the health care delivery setting. They will perform their duties according to regulations, policies, laws and legislated rights of clients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Legal Implications</strong></td>
<td></td>
</tr>
<tr>
<td>5.15</td>
<td>Comply with established risk management criteria and procedures</td>
</tr>
</tbody>
</table>

### Legal Practices

### Foundation Standard 6: Ethics

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Description</th>
<th>3210</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>Legal and Ethical Boundaries</td>
<td></td>
</tr>
<tr>
<td>6.11</td>
<td>Differentiate between morality and ethics and the relationship of each to health care outcomes</td>
<td>L2.A, L7.C</td>
</tr>
<tr>
<td>6.15</td>
<td>Discuss bio-ethical issues related to health care</td>
<td>L2.A, L2.E</td>
</tr>
<tr>
<td>6.2</td>
<td>Ethical Practice</td>
<td></td>
</tr>
<tr>
<td>6.23</td>
<td>Report activities and behaviors by self and others that adversely affect the health, safety, or welfare of students, clients, or co-workers</td>
<td>L2.A, L3.B, L9B</td>
</tr>
<tr>
<td>6.25</td>
<td>Practice responsibility within the ethical framework of the Patients' Bill of Rights</td>
<td>L9.A, L10.A</td>
</tr>
<tr>
<td>6.26</td>
<td>Value clients independence and determination</td>
<td>L9.A</td>
</tr>
<tr>
<td>6.3</td>
<td>Cultural, Social, and Ethnic Diversity</td>
<td></td>
</tr>
<tr>
<td>6.31</td>
<td>Discuss the impact of religions and cultures on those giving and receiving health care with an understanding of past and present events</td>
<td>L7.A, L7.C, L9.A, L9B</td>
</tr>
</tbody>
</table>

### Foundation Standard 7: Safety Practices

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Description</th>
<th>3210</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>Infection Control</td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>Personal Safety</td>
<td></td>
</tr>
<tr>
<td>7.3</td>
<td>Environmental Safety</td>
<td></td>
</tr>
<tr>
<td>7.4</td>
<td>Common Safety Hazards</td>
<td></td>
</tr>
<tr>
<td>7.5</td>
<td>Emergency Procedures and Protocols</td>
<td></td>
</tr>
</tbody>
</table>

### Foundation Standard 8: Teamwork

**Benchmark:** Health care workers will understand the roles and responsibilities of individual members as part of the healthcare team, including their ability to promote the delivery of quality health care. They will interact effectively and sensitively with all members of the health care team.

| 8.1 | Health Care Teams |

| 8.2 | Team Member Participation |

### Foundation Standard 9: Health Maintenance Practices

**Benchmark:** Health care workers will understand the fundamentals of wellness and the prevention of disease processes. They will practice preventive health behaviors among the clients.

| 9.1 | Healthy Behaviors |

### Foundation Standard 10: Technical Skills

**Benchmark:** Health care workers will apply technical skills required for all career specialties. They will demonstrate skills and knowledge as appropriate.

| 10.1 | Occupational Safety |
| 10.11 | Apply Standard Precautions as described in the rules and regulations set forth by the Occupational Safety and Health Administration (OSHA) | L2.A, L9.A |
**Foundation Standard 11: Information Technology Applications**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Description</th>
<th>Level 3</th>
<th>Level 2</th>
<th>Level 1</th>
<th>Level 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1</td>
<td>Communication Technology Health Information Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.2</td>
<td>Information Technology</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
14253 Pharmacology

3210 1. Cite historical perspectives contributing to the development of pharmacology through the present.
3210 2. Utilize the nursing process and the five concepts of human functioning to assess appropriate/inappropriate responses to therapy.
3210 3. Identify the roles of the professional nurse in relation to medication administration and education in both acute care and community health settings.
3210 4. Explain the correct measures to ensure the prevention of medication errors. Evaluate example measures taken to determine if they ensure the prevention of medication errors.
3210 5. Employ critical thinking skills to determine the effectiveness of medication administration on client care outcomes.
3210 6. Predict potential drug-drug interactions and drug-food interactions based on physiological responses to pharmacological agents and apply critical thinking skills for appropriate intervention.
3210 7. Recognize differences in physiology and pathophysiology that must be considered in assessing correct dosages administered to “at risk” populations such as the fetus, infant, child, pregnant woman, and the frail elderly.
3210 8. Use the legal and ethical principles related to research and practice of medication administration in nursing to evaluate best practice in real-world scenarios.
3210 9. Relate the differences in pharmaceutical use and its effects across the lifespan, when administering medications to culturally diverse populations for commonly occurring diseases.
3210 10. Define the pharmacological terminology pertinent to specific categories and classifications of medications in relation to drug effects on commonly occurring diseases.
3210 11. Identify major classifications of drug therapies/functions by prototypes as used in the treatment of commonly occurring health challenges.
3210 12. Interpret effective communication in reports of the action, rationale for use, common and/or life-threatening side effects, nursing implications, and client teaching issues for each major classification of medications.
3210 13. Describe basic principles of pharmacology including sources of drugs, divisions of pharmacology, differences between the chemical, generic and brand name of drugs.
3210 14. State the functions of various regulatory agencies and legislative acts that regulate drug use.
3210 15. Describe the function of each of the various publications that catalog drugs.
3210 16. Describe the classical and practical parts of a prescription.
3210 17. Identify the common Latin abbreviations used in prescription writing.
3210 18. Describe the proper handling of prescriptions and drugs including a basic “safe” policy for storage of medications.
3210 19. Describe the routes of administration of drugs including advantages and disadvantages of each.
3210 20. Describe the effects of drugs.
3210 21. Identify the function of both mild and strong analgesics, and describe their actions.
3210 22. Identify the function of local anesthetics, types, and use of vasoconstrictors.
3210 23. Identify sedative/hypnotics, and describe their actions.
3210 24. Identify antianxiety drugs, and describe their actions.
3210 25. Identify classifications of antibiotic drugs: penicillins, erythromycins, tetracyclines, cephalosporins, and sulfonamides.
3210 26. Identify hypotensive drugs, anticoagulant drugs, drugs used for cardiovascular disease, diabetic drugs, hypothyroid drugs, corticosteroids; and describe their uses.
Identify and describe the uses of antihistamine drugs, bronchial dilators, anticonvulsants, antisialagogues, and local hemostatics.
I. 22213 Nutrition and Health Science

3 2 1 0 1. Food, Nutrition and Human Beings
3 2 1 0 2. Describe the functions of food and nutrition in relation to human beings.
3 2 1 0 3. Define what is meant by: food, nutrition and calories.
3 2 1 0 4. Nutritional Elements
3 2 1 0 5. Describe the function of carbohydrates.
3 2 1 0 6. Identify the food sources of carbohydrates.
3 2 1 0 7. Recommend the amount of dietary carbohydrates for a particular person.
3 2 1 0 8. Classify carbohydrates.
3 2 1 0 9. Describe the function of protein.
3 2 1 0 10. Differentiate between essential and non-essential amino acids.
3 2 1 0 11. Identify food sources of protein.
3 2 1 0 12. Recommend protein requirements for a particular person.
3 2 1 0 13. Describe the function of fats.
3 2 1 0 14. Identify the types of fats.
3 2 1 0 15. Identify food sources of fat.
3 2 1 0 16. Recommend fat requirements for a particular person.
3 2 1 0 17. Explain the connection between fat and cholesterol.
3 2 1 0 18. Describe the importance of vitamins.
3 2 1 0 19. List the causes of vitamin deficiency in the body.
3 2 1 0 20. Distinguish between fat-soluble vitamins and water-soluble vitamins.
3 2 1 0 21. Name the general functions of minerals.
3 2 1 0 22. Identify major minerals (i.e. Calcium, phosphorous, magnesium, sodium, potassium, chloride).
3 2 1 0 23. Identify trace minerals (e.g., iron, iodine, copper, etc.)
3 2 1 0 24. Define the functions and requirements of water in the body.
25. Discuss the role of water in the digestion and absorption of food.

26. Basic Nutritional Groups

27. Discuss the importance of dividing nutrition into groups.

28. Outline basic nutritional needs of adults.

29. Outline basic nutritional needs of vulnerable groups (children, pregnant and lactating mothers, old age).

30. Describe several diseases caused by malnutrition (e.g., Rickets, Beriberi, Marasmus, Kwashiorkor, pellagra, Anemia, obesity).

31. Use critical thinking skills to determine the credibility of articles on nutrition and health and food product labels and claims.

32. When given a food label, be able to determine percent calories from fat, carbohydrate, and protein and identify and explain a nutrient or health claim.

33. When given a food plan, be able to use a diet analysis software program to input food data, and generate reports. Use these reports to analyze the food plan in terms of adequacy, balance, calorie control, moderation and variety and report your results in writing.

34. Critique a publication for nutritional validity using the CARS (credibility, accuracy, reasonable, support) checklist.

35. For each of the chronic diseases, heart disease, hypertension and diabetes, identify in writing the physiological pathways of how exercise can improve or prevent these conditions.
21009 Robotics

1. Build or assemble robotic devices or systems.
2. Align, fit, or assemble component parts using hand tools, power tools, fixtures, templates, or microscopes.
3. Troubleshoot robotic systems using knowledge of microprocessors, programmable controllers, electronics, circuit analysis, mechanics, sensor or feedback systems, hydraulics and pneumatics.
4. Train robots using artificial intelligence software to perform simple or complex tasks such as designing and carrying out a series of tests.
5. Disassemble and reassemble robots or peripheral equipment to make repairs such as replacement of defective circuit boards, sensors, controllers, encoders, and servomotors.
6. Perform corrective maintenance on robotic systems or components.
7. Install, program, and repair programmable controllers, robot controllers, end-of-arm tools, or conveyors.
8. Read blueprints, schematics, diagrams, or technical orders to determine methods and sequences of assembly.
9. Analyze and record test results, and prepare written testing and documentation.
10. Explain complex mathematical information used in robotic operations.
11. Verify dimensions and clearances of parts to ensure conformance to specifications, using precision measuring instruments.
12. Debug robotics programs.
13. Read and utilize blueprints in the technical process.
14. Read and utilize production layouts.
15. Read and utilize technical drawings as necessary in robotic assembly and usage.
16. Troubleshoot mechanical failures or unexpected problems.
17. Integrate robotics with peripherals or other equipment.
18. Demonstrate knowledge of how automated robotic systems increase production volume and precision in a variety of high-throughput operations.
19. Resolve engineering or science problems using robots.
20. Analyze test results in relation to design or rated specifications and test objectives, and modify or adjust equipment to meet specifications.
21. Record test procedures and results, numerical and graphical data, and recommendations for changes in product.
21053 Emerging Technologies

Coursework should represent objectives reflective of the locally adopted process. Those listed below are example/foundational only.

1. Demonstrate the research skills necessary to identify and evaluate emerging technologies
2. Seek and identify sources of information on new technology.
3. Identify solutions and problems that go beyond the expected and obvious.
4. Identify sciences and technology areas most impacted and with most potential to utilize the new technologies.
5. Be able to explain why it is important for STEM professionals to keep abreast of evolving technologies.
6. Be able to discuss the advantages, disadvantages, and prospects of current emerging technologies.
7. Discuss in depth a chosen emerging technology, based on independent research.
8. Explain the change process.
9. Develop a plan for anticipating change.
10. Address each of the following areas to varying degrees based on available information:
    a. anticipated employment,
    b. drivers and constraints,
    c. size and location of market,
    d. connection(s) to existing technologies,
    e. ability and ease of replication,
    f. physical and capital costs,
    g. industry and education partnerships to be leveraged,
    h. national best practices,
    i. illustrate qualifications, and recommendations, aims and approaches for the Technological innovation
    j. Innovation system modeling
    k. Technology monitoring, forecasting and assessment
    l. Trend analysis methods & scenarios
    m. Impact assessment
    n. Risk analysis
    o. Action (policy) analysis
    p. Technology road mapping
    q. Communication and implementation of innovation forecasts
I. 21014 Biotechnical Engineering

Biotechnical Engineering Procedures

1. Summarize the components of effective communication.
2. List the forms of documentation needed for effective communication.
3. Outline the steps necessary to keep one's self safe in a laboratory setting.
4. Relates what could happen to experiment results if measurement is performed or recorded incorrectly.
5. Distinguishes the difference between accuracy and precision.
6. Explains how both accuracy and precision play a vital role in the design process.

Biotechnical Engineering History and Industry

7. Outline the evolution of biotechnical engineering.
8. Illustrate the major biotechnical engineering milestones using a wide variety of internet resources.
9. Assess the impact of each milestone based on their research.
10. Identify the fundamental concepts common to all major industries in biotechnical engineering.
11. Identify and explain how biotechnical engineered products impact society.
13. Investigate the relationship between financial markets and scientific research.

Values and Ethics

14. Distinguish between values and morals.
15. Identify some of the parameters that shape an individual's ethics.
16. Discuss bioethics.
17. Explain why it is important to consider the bioethical issues of technological advancements.
18. Outline the steps that might be used in determining the societal and environmental ramifications of biotechnology research.
19. Explain why it is important to keep an open mind to different perspectives in biotechnical research.

Bioinformatics

20. Summarize the molecular techniques that are used by bioinformaticists.
21. Create a portfolio demonstrating the research and integration of forensics with engineering.
22. Illustrate the process necessary for creating a fuming chamber for lifting prints from evidence.
23. Analyze the technology utilized in the field of forensics.
Apply knowledge of genetic engineering to the design of a novel and beneficial application of the reporter gene, green fluorescent protein.

Describe how to isolate proteins.

Describe the applications of fermentation in food production and renewable energy.

Design a method or instrumentation to be used for measuring rates of fermentation.

Explain what variables affect CO₂ production in yeast in order to determine the ideal conditions for fermentation.

Demonstrate the application of engineering principles by improving upon existing hospital designs or surgical equipment designs.

Explain the concepts of product liability, product reliability, product reusability and product failure.

Identify anatomical joint features and movements.

Design a joint model with the same degrees of freedom as the human counterpart.

Synthesize skeletal system concepts with the design process for engineering joints.

Summarize the most common forms of heart disease and disorders.

Explain procedures involving artificial heart surgery.

Estimate the cost of a proposed noninvasive implant.

Design a portable ECG monitor and study the electrical aspects associated with the heart.
I. 14255 Biomedical Innovation

1. List the health challenges of the 21st Century.

2. Describe the design of an effective oral presentation.

3. Demonstrate how to locate a research journal articles using the Internet.

4. Explain emergency room procedures used to triage and rank patients.

5. Analyze medical website content and assess overall credibility of the information.

6. Propose solutions to the health-related problems of the 21st century.

7. Demonstrate an understanding of the different research study designs by designing a study.

8. Critique science data presented in popular media and compare with science data presented in scientific journals.

9. Apply knowledge of statistical analysis methods to analyze the results of experimental studies.

10. Design and conduct an experimental study.

11. Reflect on the various biomedical career fields involved in the topics covered in this class.

12. Use the design process to create a model, prototype, or schematic for a chosen solution.

13. Reflect on a medically-related problem that someone they know has experienced in order to identify a biomedical problem for which they would like to design a new or better product.

14. List multiple sources of water contamination.

15. Explain why water quality is a global issue.

16. Interpret the results of various chemical assays and identify specific contaminants.

17. Interpret maps indicating land use to determine possible sources of water contamination.

18. Analyze and evaluate a local water source.

19. Develop an action plan to prevent or treat water contamination.

20. Describe how to set up case control and cohort studies.

21. Interpret evidence such as laboratory data, imaging results, disease map, and molecular data to determine the source of a mystery illness.
22. Interpret patterns displayed on a world map of disease.

23. Apply what they have learned about epidemiology, human body systems, and laboratory testing to deduce the source of a mystery infection.

24. Investigate the medical conditions of a foreign country and discuss how culture, geographical location, and access to care affect health.

25. Describe the action of restriction enzymes.

26. Explain how to assemble recombinant DNA and clone a gene of interest using bacterial cells.

27. Predict the results of a ligation experiment.

28. Interpret plasmid maps to determine results of specific digestion with restriction enzymes.

29. Solve recombinant DNA logic problems.

30. Describe observations of the internal and external anatomy of a specimen such as a fetal pig.

31. Evaluate a specimen such as fetal pig for any abnormalities that may have led to its death.
I. Project Management and Resource Scheduling

3210 1. Recognize different resource types (Work, Material, Cost, Budget, Personnel/Skills, Generic, etc)

3210 2. Understand the concept of scope and demonstrate in context of assessing the size of a project.

3210 3. Develop plans for project management and resource scheduling.

3210 4. Identify key personnel and responsibilities for project.

3210 5. Develop SWOT analysis [Strengths, Weaknesses, Opportunities, and Threats] for project.

3210 6. Analyze workload of tasks and projects.

3210 7. Determine required personnel groups and management hierarchy.

3210 8. Determine resources necessary for project completion.

3210 9. Determine essential tasks necessary for project completion.

3210 10. Design potential timelines for assignments.

3210 11. Explore appropriate technologies for project management and resource scheduling.

3210 12. Create and present a project management and resource scheduling plan.

3210 13. Create Gantt charts.

3210 14. Evaluate and assign resources to tasks.

3210 15. Implement project management skills to design and complete a collaborative project.

3210 16. Learn various survey strategies to track project progress.

3210 17. Develop strategies for monitoring interconnected assignments.


3210 19. Create strategies to manage project budgets.

3210 20. Build survey analysis for customer satisfaction