TN Department of Education | Postsecondary, Workforce, CTE, and Military Readiness

May 2025

Pharmacological Sciences

Primary Career Cluster:	Healthcare & Human Services
Course Contact:	CTE.Standards@tn.gov
Course Code:	C14H20
Prerequisite(s):	*Health Science* (C14H14)
Credit:	1
Grade Level:	9-12
Focus Elective Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Healthcare courses.
POS concentrator:	This course satisfies one out of two required courses to meet the Perkins V concentrator definition, when taken in sequence in the approved program of study.
Programs of Study and Sequence:	This is one of several options available as the third course in the *Therapeutic Services* program of study.
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org SkillsUSA: https://www.skillsusatn.org/
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/education/futurereadytn/pillar-4.html.
Promoted Tennessee Student Industry Credentials:	Credentials are aligned with postsecondary and employment opportunities and with the competencies and skills that students acquire through their selected program of study. For a listing of promoted student industry credentials, visit https://www.tn.gov/education/futurereadytn/pillar-1/student-industry-credentials.html.
Teacher Endorsement(s):	577, 720
Required Teacher Certifications:	Please refer to the Occupational Educator Licensure Guidance.
Required Teacher Training:	None
Teacher Resources:	https://www.tn.gov/education/futurereadytn/pillar-3/career-clusters/healthcare-and-human-services.html

Course at a Glance

This career cluster has been identified as a Core industry by TN Works. Core industries are sectors essential to the functioning of the economy. They often serve as the backbone for other industries and are critical for national infrastructure, security, and overall economic health. Governments typically prioritize and protect these industries due to their broad impact on economic stability and societal well-being.

CTE courses provide students with an opportunity to develop specific academic, technical, and 21st century skills necessary to be successful in career and in life. In pursuit of ensuring every student in Tennessee achieves this level of success, we begin with rigorous course standards which feed into intentionally designed programs of study.

Students engage in industry relevant content through general education integration and experiences such as career and technical student organizations (CTSO) and work-based learning (WBL). Through these experiences, students are immersed with industry standard content and technology, solve industry-based problems, meaningfully interact with industry professionals, and use/produce industry specific, informational texts.

Using a Career and Technical Student Organization (CTSO) in Your Classroom

CTSOs are a great resource to put classroom learning into real-life experiences for your students through classroom, regional, state, and national competitions, and leadership opportunities. Below are CTSO connections for this course, note this is not an exhaustive list.

- Participate in CTSO Fall Leadership Conference to engage with peers by demonstrating logical thought processes and developing industry specific skills that involve teamwork and project management.
- Participate in contests that highlight job skill demonstration, interviewing skills, community service activities, extemporaneous speaking, and job interview.
- Participate in leadership activities such as Organizational Leadership, Prepared Speaking, HOSA Service Project, Creative Problem Solving, and HOSA Service Project.

Using Work-Based Learning (WBL) in Your Classroom

Sustained and coordinated activities that relate to the course content are the key to successful work-based learning. Possible activities for this course include the following. This is not an exhaustive list.

- **Standards 1.1-1.5** | Virtually connect with a pharmacist to construct a teaching plan for seniors regarding drug interactions.
- **Standards 2.1-2.7** | Invite a DEA agent to talk about controlled substances.
- **Standards 3.1-3.2** | Shadow a compounding pharmacist
- **Standards 4.1-4.2** | Visit a hospital pharmacy to evaluate error prevention strategies.
- **Standards 5.1-5.2** | Shadow a certified pharmacy technician to observe quality assurance methods, prescription fill processes, inventory management, and patient record input.

Course Description

Pharmacological Sciences is an applied course in the *Therapeutic Services* program of study intended to prepare students with an understanding of the roles and responsibilities of the healthcare worker in a pharmacy setting. This course equips students with the communication, goal-setting, and information-processing skills to be successful in the workplace, in addition to covering key topics in pharmacology, pharmacy law and regulations, sterile and non-sterile compounding, medication safety, quality assurance, and more. Upon completion of this course, proficient students who have also completed a *Clinical Internship* can apply to sit for the Pharmacy Technician Certification Board examination immediately after high school graduation.

Course Standards

1. Pharmacology for Technicians

1.1 Medication Details: Receive and screen **prescription/medication orders for completeness and authenticity,** identifying classifications, generic and name brands of pharmaceuticals, strengths/dose, dosage form, physical appearance, route of administration, and duration of drug therapy. Prepare an **annotated list** explaining the top 200 medications per the criteria previous listed flagging narrow therapeutic index (NTI) medications.

1.2 Senior Customer Teaching Plan: Construct a **teaching plan for a senior customer** explaining:

a. definitions of various drug interactions including drug-disease, drug-drug, drug-dietary supplement, drug-OTC, drug-laboratory, and drug-nutrient;
b. effects of patient-specific factors on drug and non-drug therapy (e.g., cultural beliefs, disabilities, language barriers, socioeconomic status); and
c. proper storage of medications (e.g., temperature ranges, light sensitivity, restricted access.

1.3 Pharmaceutical Equivalents: Compare and contrast the **principles of pharmaceutical equivalents**, generic equivalence, bioequivalence, pharmaceutical alternatives, and therapeutic equivalents as defined by the U.S Food and Drug Administration (FDA). Summarize the **criteria for deeming a product therapeutically equivalent**.

1.4 Side Effects: Differentiate between **common and severe side effects or adverse effects**, **allergies, and therapeutic contraindications** associated with the top 200 medications as published in pharmaceutical print and online journals.

1.5 Legend vs. OTC Drugs: Research and present indications for **using legend in the place of selected over the counter (OTC) drugs** and herbal and dietary supplements.

2. Pharmacy Law and Regulations

2.1 Hazardous Materials in the Pharmacy: Investigate the **storage, handling, and disposal of hazardous substances and wastes** (e.g., MSDS) including procedures for prevention and treatment of hazardous substances exposure (e.g., eyewash, spill kit, MSDS).

2.2 Controlled Substance Management: Evaluate the **Drug Enforcement Administration (DEA) rules and regulations** surrounding the transfer of controlled substances, verification of a prescriber's DEA number, and documentation requirements for receiving, ordering, returning, loss/theft, and destruction of controlled substances. Investigate the **standards of practice of record keeping** for repackaged and recalled products and supplies, including the FDA's recall classification.

2.3 Data Integrity/Security and HIPAA: Summarize **professional standards related to data integrity and security and Health Insurance Portability and Accountability Act (HIPAA) guidelines**. Using HIPAA guidelines, create a **policy and procedure for the proper use of pharmacy reports** such as inventory reports, diversion reports, discrepancy reports, override reports, usage reports, input accuracy reports, and business summary reports. Include a **process for handling and destroying confidential/classified information**.

2.4 Infection Control in the Pharmacy: In a lab/clinical setting, demonstrate **application of concepts and skills of asepsis, Universal Precautions, sanitation, disinfection, and sterilization** for pharmacy settings in adherence to **standards and guidelines from the Centers for Disease Control and Prevention (CDC) and the Occupational Safety and Health Administration (OSHA).** Perform or check for functions such as proper laminar air flow, hand washing, ensuring a clean room or workspace, and cleaning of counting trays, countertops, and equipment.

2.5 Roles and Responsibilities of Pharmacy Employees: Research the **professional standards and state and federal laws regarding the roles and responsibilities of pharmacists, pharmacy technicians, and other pharmacy employees;** describe when a pharmacist should provide **consultation for a patient/client**. Explain the **process to determine the state, federal, and local laws and regulations that apply to a practice site**.

2.6 Facility, Equipment, and Supply Requirements: Examine **facility, equipment, and supply requirements** (e.g., space requirements, prescription file storage, cleanliness, and reference materials) required for a retail pharmacy as compared with a hospital-based pharmacy.

2.7 Federal Pharmacy Requirements: Develop a reference toolkit of **federal pharmacy requirements** for the each of the following:

a. receiving, ordering, refilling, labeling, dispensing, returning, take-back programs, and loss or theft of non-controlled substances;
b. OSHA Hazard Communication Standard (i.e., Employee Right to Know);
c. availability of medications (i.e., legend, over the counter, and behind the counter);
d. non-controlled substance prescription transfer;
e. OBRA-90 requirement for consultation;
f. process to determine the state, federal, and local laws and regulations; and
g. restricted drug programs.

3. Sterile and Non-Sterile Compounding

3.1 Infection Control in Compounding Pharmacy: Research and identify **infection control standards utilized in a pharmacy compounding department** as established by the CDC

and OSHA. Demonstrate application of skills in lab/classroom/clinical setting to meet the standards identified.

3.2 Compounding Skills: Demonstrate the following **skills surrounding compounding**:
   a. handling and disposal requirements (e.g., receptacles, waste streams);
   b. documentation (e.g., batch preparation, compounding record);
   c. determination of product stability (e.g., beyond-use dating, signs of incompatibility);
   d. selection and use of equipment and supplies;
   e. sterile and non-sterile compounding processes; and
   f. procedures to compound non-sterile products (e.g., ointments, mixtures, liquids, emulsions, suppositories, enema).

4. Medication Safety

4.1 Prescription Errors: Survey **most common types of prescription errors** and outline industry **standards surrounding medication safety.** Include at minimum the following:
   a. error prevention strategies for data entry (e.g., prescription or medication order to correct patient);
   b. patient packages insert and medication guide requirements (e.g., special directions and precautions);
   c. issues that require pharmacist intervention (e.g., DUR, ADE, OTC recommendation, therapeutic substitution, misuse, missed dose);
   d. common safety strategies (e.g., tall man lettering, separating inventory, leading and trailing zeroes, limited use of error-prone abbreviations);
   e. procedures for responding to FDA recalls of medications, devices, supplies, and supplements;
   f. guidelines for ensuring the stability of drugs such as oral suspensions, insulin, reconstitutables, injectables, and vaccinations;
   g. procedures for performing root cause analysis and reporting events such as medication errors, adverse effects, near miss, and product integrity; and
   h. requirements and strategies for addressing errors in practice (e.g., quality improvement teams, adverse drug reaction reporting, opportunity/suggestion cards).

4.2 Strategies for Preventing Medication Errors: Identify **strategies for preventing medication errors** by distinguishing medications that either look alike or sound alike, such as Ceftin, Cefotan, Cefzil, Rocephin and Cipro. Include **strategies related to recognizing high-alert/high-risk medications** such as Sporanox for patients who have ventricular dysfunction.

5. Pharmacy Quality Assurance

5.1 Medication Quality Assurance and Inventory Control: Interpret **quality assurance practices for medication and inventory control systems** (e.g., matching National Drug Code (NDC) number, bar code, and data entry) and for **infection control procedures and documentation** (e.g., personal protective equipment [PPE], needle recapping). Evaluate **information sources used to obtain data in a quality improvement process** (e.g., the patient's chart, patient's medication profile, computerized information systems, medication

administration record, immunization registry, medication therapy management [MTM] platforms)

5.2 Risk Management Guidelines and Regulations: Explain the **common assurance measures used to monitor quality in a pharmacy**. For example, explain risk management guidelines and regulations (e.g., error prevention strategies), communication channels necessary to ensure appropriate follow-up, medication control systems (e.g. automated dispensing systems, bar coding for floor stock and crash cart stock) and problem resolution (e.g., product recalls, shortages), and productivity, efficiency, and customer satisfaction measures.

6. Medication Order Entry and Fill Process

6.1 Patient Information: Identify all **information a pharmacist or pharmacy technician should obtain from the patient/client** before filling and dispensing any medication. Information should include at minimum: name of patient/client, date of birth, address, insurance policy, physician's name, and any drug allergies. Practice **interviewing skills** in a lab/clinical/classroom setting.

6.2 Order Entry Process: Detail the **order entry process per industry standards** for each of the following: a hospital, a free-standing pharmacy, and a retail-based pharmacy.

6.3 Dose Calculation: Calculate **correct doses required when given a simulated prescription** for a pediatric dose, adult dose, and geriatric dose based on weight, using the correct formulas, calculations, ratios, proportions, pharmacy math allegations and conversions. Also calculate **length of administration, times per day of administration**. Document results using appropriate **Sig codes** (e.g., b.i.d., t.i.d. and Roman numerals), **abbreviations, medical terminology, and symbols** for quantity dispensed, dose, concentration, and dilutions.

6.4 Prescription Fill Process: Demonstrate the following skills of the **prescription fill process**:

a. determine prioritization of prescription/medication order processing (e.g., stat, maintenance, waiting);
b. select appropriate product;
c. apply special handling requirements;
d. measure and prepare product for final check; and
e. stage prescriptions for final verification.

6.5 Prescription Labeling: Demonstrate the following skills of **prescription labeling requirements**:

a. auxiliary and warning labels,
b. expiration date, and
c. patient-specific information.

6.6 Drug Administration Supplies and Equipment: Select **equipment/supplies required for drug administration** (e.g., package size, unit dose, diabetic supplies, spacers, oral and injectable syringes). Demonstrate the following **skills of prescription packaging** requirements:

a. type of bags,

b. syringes,
c. glass,
d. PVC,
e. child resistant, and
f. light resistant.

6.7 Dispensing Process: In a classroom lab, demonstrate the following **skills of the dispensing process:**
   a. validation of prescription with pharmacist, and
   b. documentation and distribution.

7. Pharmacy Inventory Management

7.1 Coding of Pharmacy Inventory: Distinguish between the **functions and applications of NDC number, lot numbers, and expiration dates** of pharmacy inventory. Articulate the **importance of this information as it relates to protecting the safety of the public**.

7.2 Formulary or Approved/Preferred Product List: Define the concept of a **formulary or approved/preferred product list**. Research at least three different insurance companies for a listing of their approved formulary drug list. Compare and contrast the three lists with the top 200 drugs identified earlier in this course. Explain how the phrases **"Dispense as Written" or "Do Not Substitute"** can affect the formulary. Synthesize research into an informative essay.

7.3 Ordering Medications and Supplies: Assess procedures for **ordering medications and supplies** including:
   a. inventory control practices and record keeping (e.g. par and reorder levels, turnover rates, drug usage patterns, and perpetual inventory);
   b. suitable alternatives for ordering (e.g. transferring or borrowing medications from another pharmacy;
   c. procedures to address improperly stored inventory (e.g., out of range temperature issues); and
   d. procedures for identifying and returning dispensable, non-dispensable, and expired medications and supplies (e.g., credit return, return to stock, reverse distribution).

8. Pharmacy Information System Usage and Application

8.1 Electronic Medical Records and Prescriptions: Research **common software and databases used by pharmacies to manage electronic medical records and prescriptions**. Understand the **uses and capabilities of these programs** as they relate to the roles and responsibilities of the pharmacy technician.

Standards Alignment Notes

*References to other standards include:

- PTCB Knowledge Domain: Pharmacy Technician Certification Exam (PTCE) Blueprint. The PTCE content was developed nationally by experts in pharmacy technician practice

based on a national job analysis study. The updated blueprint is the basis for the PTCE effective November 2018.