

LAGUARDIA COMMUNITY COLLEGE
CITY UNIVERSITY OF NEW YORK
MATHEMATICS, ENGINEERING, & COMPUTER SCIENCE DEPARTMENT

MAT 106 – MATHEMATICS OF MEDICAL DOSAGES
2 PERIODS, 2 CREDITS PRE-REQUISITE: MAT 096

CATALOG DESCRIPTION

This course is designed for future health care professionals in the fields of nursing and veterinary technology. The course introduces students to the essentials of the medication administration process. Students become familiar with both the metric and household systems of measurement. Calculation of oral and parenteral doses are taught along with syringe scale reading. Calculations based on the size of the client as measured by weight or body surface area are included. The exploration of solutions prepares the student to calculate both intravenous and enteral dosages rates and flow rates. The mathematics for intravenous push, and the construction of titration tables are demonstrated. Pediatric dosages are calculated along with Daily Fluid Maintenance. Safe practices are stressed throughout the course.

INSTRUCTIONAL OBJECTIVES

- 1) To reinforce students' knowledge of basic mathematics
- 2) To familiarize students with the common systems of measurement used in healthcare.
- 3) To expose students to the techniques used in medical dosage calculations
- 4) To provide students with the ability to judge the appropriateness of answers by using estimation, and by calculating the safe dose range..
- 5) To calculate dosages for oral, parenteral, and intravenous routes of administration.

PERFORMANCE OBJECTIVES

At the completion of this course the students should be able:

- 1) To solve practical problems involving metric and household units of measure.
- 2) To convert from one unit of measure to another between systems as well as within a given system of measurement.
- 3) To calculate dosages using tablets and solutions for oral medication and parenteral therapy.
- 4) To calculate pediatric dosages and work out practical problems involving pediatric medications.
- 5) To calculate the rate of flow, dosage rate, and running time for intravenous fluids.

COURSE MATERIALS

Textbook: Medical Dosage Calculations – 11th Edition by Olsen, Giangrasso and Shrimpton, Pearson Prentice Hall Publishing, 2016.

Videos: Lectures covering each chapter are available in the Mathematics Tutoring Lab

EVALUATION

In order to achieve a passing grade, a student must successfully complete class work, class tests, and final exam. For purposes of computing the final grade, the suggested weighting is:

FINAL EXAM: 30%

CLASSWORK, ASSIGNMENTS, AND Quizzes: 70%

Assignments: At the end of each chapter there are **Practice Sets**. In these Practice Sets the **Try These for Practice** questions, the **Exercises** and the **Cumulative Review Exercises** should be done by the students; the answers are found in Appendix A of the textbook. The **Additional Exercises** and **Case Studies** are optional.

ATTENDANCE

Students are expected to attend all class meetings. Students are responsible for all information, material, and assignments covered in class regardless of class attendance. Students should consult the college catalog to find out the terms and conditions under which a WU, INC, or F grade may be given to a student.

Course Content Outline

Each Chapter is designed to be covered in one week

CHAPTER 1	Review of Arithmetic for Medical Dosage Calculations
	Diagnostic Test of Arithmetic
	Changing Decimal Numbers and Whole Numbers to Fractions
	Use of the Calculator
	Ratios
	Changing Fractions to Decimal Numbers
	Rounding Decimal Numbers
	Rounding Off
	Rounding Down
	Adding Decimal Numbers
	Subtracting Decimal Numbers
	Multiplying Decimal Numbers
	Dividing Decimal Numbers
	Estimating Answers
	Multiplying Fractions
	Dividing Fractions
	Complex Fractions
	Addition and Subtraction of Fractions
	Same Denominators
	Different Denominators

Percentages
Percent of Change

CHAPTER 2

Safe and Accurate Drug Administration

The Drug Administration Process
Six Rights of Medication Administration
The Right Drug
The Right Dose
The Right Route
The Right Time
The Right Patient
The Right Documentation
Drug Prescriptions
Medication Orders
Types of Medication Orders
Components of a Medication Order
Medication Administration Records
Technology in the Medication Administration Process
Drug Labels
Combination Drugs
Controlled Substances
Drug Package Inserts

CHAPTER 3

Dimensional Analysis

Mathematical Foundation of Dimensional Analysis
Changing Quantities with Single Units of Measurement
One-Step Problems with Single Units of Measurement
Multi-Step Problems with Single Units of Measurement
Changing One Rate to Another Rate
One-Step Problems with Rates
Multi-Step Problems with Rates

CHAPTER 4

The Metric and Household Systems

The Household System
Liquid Volume in the Household System
Weight in the Household System
Length in the Household System
Decimal-Based Systems
The Metric System
Liquid Volume in the Metric System
Weight in the Metric System
Length in the Metric System

CHAPTER 5

Converting from One System of Measurement to Another

Equivalents of Common Units of Measurement
Metric-Household Conversions

CHAPTER 6

Oral Medication Doses

One-Step Problems
Medication in Solid Form
Medication in Liquid Form
Medications Measured in Milliequivalents
Multistep Problems
Calculating Dosage by Body Weight
Calculating Dosage by Body Surface Area

BSA Formulas
Nomograms

CHAPTER 7

Syringes

Parts of a Syringe
Needles
Types of Syringes
Measuring Insulin Doses
Measuring a Single Dose of Insulin in an Insulin Syringe
Measuring Insulin with an Insulin Pen
Insulin Pumps
Measuring Two Types of Insulin in One Syringe
Measuring Premixed Insulin
Insulin Coverage/Sliding Scale Calculations
Prefilled Syringes
Safety Syringes
Needleless Syringes

CHAPTER 8

Preparation of Solutions

Determining the Strength of a Solution
Strengths of Solutions as Ratios, Fractions, and Percents
Liquid Solutes
Dry Solutes
Determining the Amount of Solute in a Given Amount of Solution
Determining the Amount of Solution That Contains a Given Amount of Solute
Irrigating Solutions, Soaks, and Oral Feedings

CHAPTER 9

Parenteral Medications

Parenteral Medications
Parenteral Medications Supplied as Liquids
Parenteral Medications Supplied in Powdered Form
Heparin

CHAPTER 10

Flow Rates and Durations of Enteral and Intravenous Infusions

Introduction to Intravenous and Enteral Solutions
Enteral Feedings
Intravenous Infusions
Intravenous Solutions
Equipment for IV Infusions
Infusion Pumps
Calculating the Flow Rate of Infusions
Changing between Milliliters per Hour and Drops per Minute
Flow Rate Conversion Number (FC)
Calculating the Duration of Flow for IV and Enteral Solutions
Fluid Balance: Intake/Output

CHAPTER 11

Calculating Flow Rates for Intravenous Medications

Intravenous Administration of Medications
Intravenous Piggyback Infusions
Converting Dosage Rates to IV Flow Rates
Converting IV Flow Rates to Dosage Rates
IV Push

Compound Rates
Titrated Medications

CHAPTER 12 **Calculating Pediatric Dosages**
Pediatric Drug Dosages
Administration of Oral Medications
 Administration of Parenteral Medications
Calculating Drug Dosages Based on Body Size
Administration of Intravenous Medications
 Using a Volume Control Chamber
Calculating Daily Fluid Maintenance

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