

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: A Dimensional Analysis Approach – 11th Edition by Olsen, Giangrasso and Shrimpton, Pearson Prentice Hall Publishing, 2016. The e-text book is available from Pearson education for \$24.95. It is also available in hardcover.

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 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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