MSBS N5030 Principles and Methods of Epidemiology – Fall 2023 Course Schedule

1. **Brief description of the course:** The course in statistical methods in epidemiology is mainly students interested in conducting clinical epidemiologic studies. Students in the pre-dental, pre-medical, master's or doctoral programs who are interested in applying statistical methods to clinical or population data. Half of the course will be oral presentations given by the instructor and will cover fundamentals in epidemiology and the statistical methods to study them. The second half of the class will be via lab and seminars in which students will be able to practice hands-on what was presented in the didactic classes. Students would be given datasets to work with but they have the choice of using datasets from mentored research rotations. There would be a seminar presentation where results from the lab work would be discussed and presented.

2. **Syllabus**

Contact hours:

Lecture: 14 one-hour lectures:	14
Lab sessions: 14 one-hour seminars:	14
Seminar: 4 one-hour seminars:	4
Total:	**32**

Reading material: fully revised 6th Edition of *Gordis Epidemiology*.
Other assigned readings in PDF will be provided by the course director. Manuscripts for student presentations will be provided at least two weeks in advance.

Course goals:
This course is designed to introduce students to epidemiology, emphasizing its methodology and statistical approaches; and its application to prevention and control of public health problems. At the conclusion of this course, students should have a basic understanding of epidemiologic methods and study design. They will be able to distinguish between different types of epidemiological study designs and select appropriate epidemiological study designs to address specific research questions. In addition, they will understand the strengths and weaknesses of different epidemiological study designs and relevant summary measures relating exposures to disease risk. You will also understand appropriate statistical methods for testing hypotheses. Lastly, as part of the hands-on exercises, they will be able to perform simple statistical analyses, interpret their results, and define terms used in them.

	Statistical Methods in Epidemiology R Course		
	Hours	**Lecturer**	**Lecture/Seminar**
WEEK 1 1. Introductory session	2	Coker	Lecture

a. Measures of Disease Outcomes, Incidence, Prevalence & Mortality rates b. Basic Study Designs in Epidemiology c. Getting Started with R ○ Setting up directories ○ Importing data and basic command syntax ○ Importing data files ○ Saving scripts, creating reproducible analyses and automating tasks with do-files ○ Saving and printing output with log files ○ Basic descriptive commands for exploration 1. LAB:- To explore the R environment 2. LAB:- To import a excel/csv file, create an R script for opening and describing the data			
WEEK 2 2. Reading, Wrangling and Processing Data a. Create, save and edit R datasets b. Wrangling data c. Creating Variables d. Renaming Variables e. Variable and Value labels 1. LAB:- editing and saving a R dataset 2. LAB:- Using conditional commands to create and rename variables	2	Coker	Lecture
WEEK 3 3. Study Designs: a. Descriptive, Exploratory & Basic Statistical Analyses b. Summary Statistics (1) LAB:- Describing and analyzing a R dataset (summary – mean, median, range, standard deviation, identifying outliers, describing groups, frequency distribution)	2	Coker	Lecture
WEEK 4 4. Measuring associations in Study Designs 5. Data Visualizations a. Presenting categorical data b. Presenting continuous data c. Visualize relationships between two continuous measures- correlations	2	Coker	Lecture

(1) LAB:- Histograms, Boxplots, barcharts from several datasets (2) LAB:- graphing labels, titles and schemes			
WEEK 5 6. Hypothesis testing: Comparing two or more proportions a. Perform a chi-squared test and compute confidence intervals for differences in group proportions, relative risks and odds ratios b. Describe the appropriate use of chi-squared tests and the interpretation of the resulting output (1) LAB:- Chi-squared tests and interpretation	2	Coker	Lecture
WEEK 6 7. Hypothesis testing: Comparing mean in two or more groups; a. Hypothesis Testing b. Perform paired and unpaired t-tests for differences in group means c. Describe the appropriate use of paired and unpaired t-tests and the interpretation of the resulting output d. Mann–Whitney U test (1) LAB:- Comparing means in 2 or more groups using datasets	2	Coker	Lecture
WEEK 7 8. Introduction to simple linear regression 1. Correlation 2. Fit simple linear regression models, and interpret relevant estimates from the results 9. Confounding and Interaction Multivariable Regression methods: relate a continuous outcome to multiple predictors in one model, assess confounding and goodness-of-fit 3. Interpretation of output (1) LAB:- Comparing continuous measures (2) LAB:- Running Lin Reg model :- measuring associations and interpretation	2	Coker	Lecture

WEEK 8 10. Logistic regression 4. Introduction 5. Fit simple logistic regression models, and interpret relevant estimates from the results 6. Multivariable Regression methods: relate a categorical outcome to multiple predictors in one model, assess confounding and goodness-of-fit 7. Interpretation of output (1) LAB:- Running Log. Reg model :- measuring associations and interpretation	2	Coker	Lecture
WEEK 9 11. Survival analysis 8. Introduction 9. Kaplan–Meier estimates of survival rates 10. The log rank test 11. Cox regression (1) Understanding a survival data set Running Surv. models :- measuring associations and interpretation	2	Coker	Lecture
WEEK 10 12. Presenting a randomized controlled trial a. Introduction to the CONSORT statement b. The CONSORT checklist c. Intention-to-treat analysis d. Cluster randomized trials e. Reporting guidelines for other study designs LAB Student project analysis: f. Exploring your dataset g. Data prep h. Data visualizations	2	Coker	Lecture
WEEK 11 13. Introduction to presenting statistical analyses for clinical studies	2	Coker	Lecture

a. Introduction b. Presenting numerical data c. Beginning the results section d. Describing the results of the recruitment process e. Assessing non-response bias f. Presenting the results for different media g. Drawing up a profile of a group of subjects h. Drawing graphs i. Using text to refer to tables and graphs j. Presenting categorical data k. Presenting continuous data LAB l. Creating Table 1: Characteristics of study population			
WEEK 12 1. Effective Facilitation and Presentation Skill LAB Student project analysis a. Creating Table 2 : Regression analyses b. Creating result files	2	Coker	Lecture
WEEK 13: 1. Interpretation of Epidemiologic Studies LAB Student project analysis a. Analyses wrap-up b. Prep for presentations	2	Coker	Lecture
WEEK 14 1. Student Project Presentations (Seminar)	2	Coker	Lecture

Method of Evaluation:

40% Homework: Most weeks, there will be a homework assignment, usually short data analysis exercises requiring R.

60% Project Report: A simple report and presentation with analytic results in tables and figures.