Course Name: **DISCRETE STATISTICS**

Course Code: **STAT 2002**

Number of Credits: **3**

Semester: **II**

Level: **2**

Pre-requisites: **STAT1001: Statistics for the Sciences, MATH1142: Calculus I**

RATIONALE: Nonparametric methods are developed that do not require imposing parametric assumption about the data, and they are valid under weak assumptions. Non-parametric methods are widely used for studying populations that take on ranked order, such as movie reviews or when data have a ranking but no clear numerical interpretation, such as, assessing course appraisal. Given that the parametric approaches rely on specific distributions, they are inappropriate to analyse such data, hence, other techniques would be required.

COURSE DESCRIPTION: This course will enable the students to perform a range of nonparametric methods and robust procedures that do not assume that the sample data are from pre-specified families of distribution.

We will first look at the definition of scales of measurement, the pros and cons for weak assumptions, test of locations and other distribution-free methods. This will prepare students who are interested in research (qualitative and quantitative), socio-economic and environmental problems, and ratings (movie, celebrities etc.) to name a few.

LEARNING OUTCOMES: On successful completion of the course, the student should be able to:

- State and discuss the types of scales of measurement required in conducting research
- Identify and apply appropriate statistical methods to real-world scenarios
- Construct appropriate hypotheses and confidence intervals for problems under investigation
- Analyse and interpret computer printouts
- Solve hypothetical and real-world problems in order to sensitise students to statistical encounters in the real world.

COURSE CONTENT

1. **Introduction:** Advantages and Disadvantages of Nonparametric Methods
2. **Scales of Measurements:** Nominal, Ordinal, Interval and Ratio; Weak measurement versus Strong statistics; Mosteller and Tukey Data Types
3. **Inference on Location:** Signed test, Wilcoxon signed rank, Wilcoxon Sum rank, Mann-Whitney U.
4. **Inference on Dispersion:** Siegel-Tukey test, Freund-Ansari test and Mood's test
5. **Rank Correlation:** Spearman's rank:- treatment of ties and no ties and Kendall's rank
6. **Test of Randomness:** Run test, Chi-square test,
7. **Goodness of Fit:** Kolmogorov-Smnirov test, Lilliefor's test, Chi-square test
8. **Design of Experiment:** Kruskal-Wallis test, Freidman's test, Kendall's concordance
9. **Categorical Data:** Contingency tables, Fisher's exact test, McNemar test, Mantel-Haenszel test

TEACHING METHODOLOGY: The course will be delivered by a combination of interactive lectures, tutorials and computer laboratory classes. The 39 contact hours are as follows: **27 hours of lectures**, **8 hours of problem solving sessions** and **8 hours supervised laboratory time**. Course materials such as exercises, assignments, solutions, etc., will be posted on the webpage http://ourvle.mona.uwi.edu/

ASSESSMENT:

The Course will be assessed as follows:

   i.   Mid-term test (1 hour) worth **15%** of the student's final grade

  ii.   Problem Papers/Lab assignments (about 5) worth **15%**

 iii.   Final written examination paper worth **70%** will be two hours in length

REFERENCE MATERIALS

Books:

Prescribed

    1. Sprent P., Smeeton, N. *2007, Applied Nonparametric Statistical Method, 4th Edition,* Springer, ISBN-13: 978-1584887010

Highly Recommended

2. Daniel, W.W. *2000, Applied Nonparametric Statistics, 2nd Edition,* Duxbury Press, ISBN-13: 978-0534381943

Recommended

3. Kvam P. H, Vidakovic B. *2007, Nonparametric Statistics with Applications to Science and Engineering, 1st edition,* Wiley-Interscience, ISBN-13: 978-0470081471

4. Agresti A. *2010, Analysis of Ordinal Categorical Data, 2nd edition,* Wiley, *ISBN-13: 978-0470082898*

ONLINE RESOURCES:
http://www.causeweb.org/
http://www.getstats.org.uk/
http://www.ats.ucla.edu/stat/seminars/statteach/sites.html
http://onlinestatbook.com/rvls.html