Overview:

Ever wonder what to do with all that data? Too much data? Not enough data? Right kind of data? Maybe you should have thought of that before you ever collected it! The goal of this course is to help you organize your data (past or future) and to learn how to apply many of the statistical tests (that you have learned, should have learned, or will learn) to data collected from aquatic systems, along with learning some new methods of sampling, analysis, and presentation.

Topics will include mathematical distributions, transforming data, outliers, significant figures, number of samples needed, effect of sampler size, sample design, mark-recapture and depletion methods of estimating abundance, length-frequency analysis, length-weight relationships (K, W_r, ANOCOVA), and basic statistical tests (e.g., t-tests, paired t-tests, tests of normality, correlations, simple ANOVAs, regression analysis). Additional topics will include ratios, pseudo-replication, nonparametric statistics, repeated-measures ANOVA, multiple comparison testing, and variable selection techniques. Handouts (computer printouts and primary literature) will be used extensively as supporting materials. Students will learn the basics of SAS (Statistical Analysis System), JMP and EXCEL programming for data management and analysis, along with being introduced to R.

Grades will be based on weekly/biweekly problems sets and a class project. Each student will conduct an independent "sampling" project on a fisheries or aquatic science topic of their choice, including review of the literature, proposal and budget preparation, completion of field and/or laboratory work, and preparation of paper and oral presentation based on their research.
Instructor: Dr. Chuck Cichra
Professor / Extension Fisheries Specialist
University of Florida / IFAS
SFRC - Fisheries & Aquatic Sciences
7922 NW 71st Street (Room 27, Bldg. 544)
Gainesville, Florida  32653-3071

Office: (352) 273-3621
Cell: (352) 339-6173
Fax: (352) 392-3672
Email: CECichra@ufl.edu
Website: http://sfrc.ufl.edu/people/faculty/cichra/

Teaching Assistant: Mrs. Crystal Hartman
Biological Scientist
University of Florida / IFAS
SFRC - Fisheries & Aquatic Sciences
7922 NW 71st Street (Room 25 and 26, Bldg. 544)
Gainesville, Florida  32653-3071

Office: (352) 273-3622
Cell: (352) 214-8179
Fax: (352) 392-3672
Email: c.hartman@ufl.edu

Office Hours: Call or e-mail for an appointment, meet after class, or stop in if our doors are open.

Feel free to call or e-mail questions to either of us.

Course Website:
This course will be supported by a UF e-learning CANVAS website located at https://lss.at.ufl.edu/. It will include the course syllabus, PowerPoint presentations, recommended readings, handouts, course assignments, proposal format and budget Excel files, presentation and paper guidelines, and other materials.
**Directions:**

**From UF Campus**

1) From campus at the corner of W. University Ave. and NW 13th St. (US 441) go north to NW 53rd Ave. (3.5 mile). Go west past NW 43rd St. and the Devil's Millhopper State Geologic Site to NW 71st St. (4.6 mile). Turn right (north) and go to the end of the paved road (1.1 mile). Fisheries and Aquatic Sciences and the Center for Aquatic and Invasive Plants’ buildings are on the right at end of paved road. The Administration Building is the brick building to the east (your right). Our offices are in the longest steel strand building.

2) Alternatively, from W. University Ave., you can take NW 34th St. north to NW 39th Ave. (2.5 mile). Turn left (west) and go to NW 43rd St. (1 mile). Turn right. Drive north on NW 43rd St. to NW 53rd Ave. (1 mile). Turn left (west) and proceed as above.

**From Interstate 75**

Take Exit 390 at NW 39th Ave. Drive east to NW 43rd St. and proceed as above. There is no exit at NW 53rd Ave.
Grading:

<table>
<thead>
<tr>
<th>Points</th>
<th>Problem Sets</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>600 Take-home (~8 problem sets)</td>
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<table>
<thead>
<tr>
<th>Points</th>
<th>Class Project</th>
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<tbody>
<tr>
<td>15</td>
<td>Project pre-proposal</td>
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<tr>
<td>110</td>
<td>Project proposal</td>
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<tr>
<td>175</td>
<td>Project paper</td>
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<tr>
<td>100</td>
<td>Final oral presentation</td>
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Total: 1000

Grading Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Points</th>
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<tbody>
<tr>
<td>A</td>
<td>931-1000</td>
</tr>
<tr>
<td>A-</td>
<td>900-930</td>
</tr>
<tr>
<td>B+</td>
<td>871-899</td>
</tr>
<tr>
<td>B</td>
<td>831-870</td>
</tr>
<tr>
<td>B-</td>
<td>800-830</td>
</tr>
<tr>
<td>C+</td>
<td>771-799</td>
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<tr>
<td>C</td>
<td>731-770</td>
</tr>
<tr>
<td>C-</td>
<td>700-730</td>
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<tr>
<td>D+</td>
<td>671-699</td>
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<td>D</td>
<td>631-670</td>
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<tr>
<td>D-</td>
<td>600-630</td>
</tr>
<tr>
<td>E</td>
<td>0-599</td>
</tr>
</tbody>
</table>

Problem sets must be turned in to Dr. Cichra by the beginning of lecture on the assigned due date.

Project-related work must be turned in to Dr. Cichra or to the Fisheries and Aquatic Sciences' main office by 5:00 PM on the assigned due date.

10% of the assignment's total value will be deducted per day for any work not turned in on time.

Excused tardiness for course work will be granted if an acceptable excuse if provided. If you know that you will not be in town on due dates, please make prior arrangements for turning in assignments (preferably early if possible). Assignments can be faxed or E-mailed.
APPLIED FISHERIES STATISTICS - 2016 Schedule

DRAFT

(This schedule will change by Sep 04 with input from students, and from other instructors. Tentative due dates for problem sets will be added)

<table>
<thead>
<tr>
<th>Tuesday</th>
<th>Thursday</th>
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<tbody>
<tr>
<td>Aug 23</td>
<td>Introduction to course</td>
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<tr>
<td>Aug 30</td>
<td></td>
</tr>
<tr>
<td>Sep 06</td>
<td></td>
</tr>
<tr>
<td>Sep 13</td>
<td>3086 McCarty B - SAS Lab</td>
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<tr>
<td>Sep 20</td>
<td></td>
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<tr>
<td>Sep 27</td>
<td></td>
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<tr>
<td>Oct 04</td>
<td>3086 McCarty B – Lit. Lab</td>
</tr>
<tr>
<td>Oct 11</td>
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<tr>
<td>Oct 18</td>
<td>EXCEL II Workshop</td>
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<tr>
<td>Oct 25</td>
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<tr>
<td>Nov 01</td>
<td>User Surveys / Qualtrics</td>
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<td>Nov 08</td>
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<td>Nov 15</td>
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<td>Nov 22</td>
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<tr>
<td>Nov 29</td>
<td>Papers due</td>
</tr>
<tr>
<td>Dec 06</td>
<td>Oral Presentations</td>
</tr>
</tbody>
</table>

NO FINAL Exam

Classes will be held every Tuesday and Thursday, unless announced otherwise.

Classes will consist of primarily lectures/discussions, along with computer sessions (SAS, JMP, and EXCEL).
Course Topics / Outline:

Organize / Explain Course
  Purpose, instructors, topics, grading, schedule, project, proposal, paper, presentation

Common sampling techniques

Sampling and basic statistics
  Mean, median, mode, standard deviation, variance
  Significant figures
  Sampling designs

Distributions
  Terminology
  Histograms
  Value in sampling
  Mathematical frequency distributions - generation and application
    Positive binomial
    Poisson series
    Negative binomial
    Normal

Normality
  Tests for normality
  Violation of statistical assumptions
    What do you do if your data are not normal?
  Transformations
    What are transformations?
    Why do we transform data?
    Methodologies
    Common transformations for fisheries and aquatic science data
    Tests to see if transformations worked
    If you can't transform, then what?
      Non-parametric statistics?

Outliers
  What are they?
  Methods to see if you have them (Detection)
  Effects of outliers on analyses
  What do you do with them when detected?

Catch-per-unit-of-effort (CPUE) sampling
  Number of samples
  Size of samples(r)

Mark-recapture techniques
  What is it?
  Why use it?
  Assumptions
    What happens if you violate them?
    How much can you violate them?
Methodology
   Biases
   Calculating confidence limits
   Sample sizes - allocation of effort (M vs C)

Estimating fish abundance by depletion
   Zippin method

Comparing distributions
   Size distributions
   Age structure
   Chi-square analysis
   Kolmogorov-Smirnov test

Length-weight relationships
   Condition factors (K)
   Relative weights (Wr)
   Methodology
      Standard weights
      Length-weight regressions
      Analysis of covariance

Length-frequency analysis
   Histograms
   Anderson's numerical analyses
      Proportional stock density (PSD)
      Relative stock density (RSD)

Empirical modeling
   What is it?
   Why use it?
   An example using regression analysis

Pseudo-replication

Repeated-Measures Analysis of Variance

Multiple comparison testing

Statistical methods (SAS examples will be used throughout the course)
   T-test
   Paired t-test
   Analysis of variance (1-way, 2-way, interaction, etc.)
   Analysis of covariance
   Correlation analysis
   Regression analysis
      Simple / Multiple
   Variable selection techniques (forward, backward, stepwise)
   Non-parametric
## Project Paper Grading Sheet

<table>
<thead>
<tr>
<th>Content</th>
<th>POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>9</td>
</tr>
<tr>
<td>Goal of study, objectives, introduction</td>
<td>17</td>
</tr>
<tr>
<td>Description of study site &amp; methods</td>
<td>35</td>
</tr>
<tr>
<td>Analysis of project data (including project design)</td>
<td>35</td>
</tr>
<tr>
<td>Literature review</td>
<td>17</td>
</tr>
<tr>
<td>Overall discussion</td>
<td>26</td>
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<tr>
<td>Readability</td>
<td>7</td>
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<tr>
<td>Follows AFS guidelines</td>
<td>18</td>
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<tr>
<td>Neatness, grammar</td>
<td>11</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>175</strong></td>
</tr>
</tbody>
</table>

**COMMENTS:**
**Pertinent References:**


**Numerous pieces of primary literature, sample data analyses, computer programs, manuals, and reports will be handed out and/or placed onto the course CANVAS e-learning website during this semester.**
**Academic Honesty:**

As a result of completing the registration form at the University of Florida, every student has signed the following statement: “I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University.”

The Honor Code (http://www.dso.ufl.edu/scrr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

**UF Counseling Services:**

Resources are available on-campus for students having personal problems or lacking clear career and academic goals which interfere with their academic performance. These resources include:

2. Student Mental Health, Student Health Care Center, 392-1171, personal counseling;
3. Sexual Assault Recovery Services (SARS), Student Health Care Center, 392-1161, sexual assault counseling; and
4. Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

**Software Use:**

All faculty, staff and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.