Introduction to Bioinformatics (BSC4434/5459)

COURSE SYLLABUS

INSTRUCTOR: DR. MELANIE A. SUTTON

Welcome Message

Welcome to Introduction to Bioinformatics, ONLINE! My name is Dr. Melanie A. Sutton, and I will be guiding you through this course. I am eager to help you make the most of this online learning experience. It is recommended that you log into the course daily -- be sure to watch for new items in the Announcements and Current Events Forums and your **PRIVATE STUDY AREA** Forums in the Discussion section of the course.

Although this course requires no prior programming experience, this is NOT an "easy A" course, primarily because all the content is technical in nature and requires you to learn new software tools (e.g., Perl, Microsoft Excel and Access) and terminology you’ve perhaps never seen before. This course will require you to spend time each week reading assignments and supplemental readings, watching Elluminate sessions when made available to you, doing hands-on assignments and taking quizzes to confirm you have completed these activities.

If you have not used eLearning, Elluminate or eDesktop previously, don't worry. Your first stop will be to review the Start Here! content page (available only when you log in to eLearning) to review tutorials. Allow at least 20 hours during your first sessions with these to come up to speed if you are not technically inclined. Your will then proceed on to Important Course Information and review the information and tutorials there.

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Course Overview

In order to keep pace with recent developments in genomics and proteomics, informaticists must develop and teach new tools so our students will have the skills to enter this burgeoning job market. As one example, to find out who is hiring, how much you are worth, and online hiring trends, see biohealthmatics.com, and also subfield listings in public health informatics.

Central to these new technologies is bioinformatics, a field encompassing the collision of two fundamental technologies: molecular biology and small fast computers. In the National Institutes of Health's August 2005 press release, "Public Collections of DNA and RNA Sequence Reach 100 Gigabases", we get this glimpse of the field and update on the GenBank database,

"For nearly 20 years, the three leading public repositories for DNA and RNA sequence data have collaborated to provide access to the ever increasing amount of genetic data produced by institutions around the world. The three repositories have now reached a significant milestone by collecting and disseminating 100 gigabases of sequence data. For a frame of reference, one hundred
billion bases is about equal to the number of nerve cells in a human brain and a bit less than the number of stars in the Milky Way.

These 100,000,000,000 bases, or "letters" of the genetic code, represent both individual genes and partial and complete genomes of over 165,000 organisms. While a single gene from organisms as diverse as humans, elephants, earthworms, fruit flies, apple trees, and bacteria can range from less than one hundred to over several thousand bases long, an organism's genome can be longer than one billion bases. The free access to this information allows scientists to study and compare the same data as their colleagues nearly anywhere in the world, and makes possible collaborative research that will lead ultimately to cures for diseases and improved health."

Biologists and informaticists are literally in danger of drowning in their own success! This absolutely necessitates the creation of new tools that allow us to move through all this information and make some sense of it. This requires very fast computers, very clever programming and well educated operators. Bioinformatics has become a sought after degree by the pharmaceutical industry where most molecular research groups now include one bioinformaticist. Most NIH and NSF grants to universities dealing with sequence information also have a similar bias.

At UWF, this course is based on a hands-on approach that we hope will develop your interests in scientific discovery. The course is also structured to involve you in meaningful ways with practical (and exciting) aspects of real research in bioinformatics, by showcasing how computer-based tools are used to enhance research.

What do former students say about this class? Here is one example:

"I listed you as one of my contacts for reference and there is a professor at LSU's Coastal Fisheries Institute and Department of Oceanography and Coastal Sciences that [is] interested in me...his work involves [sic] population modeling. He has told me that his students do a lot of programming and that he is aware of the work that I did in Bioinformatics. I really am glad that I took your class because as it turns out my experiences in that class may help me get an assistantship..."

**Topics Covered**

1. Introduction to Course; Cracking the Code of Life
2. Beginner's Guide to Perl
3. Programming strategies; Representing and reasoning about sequence data
4. Landing a Job in Informatics; A Professional Code of Ethics for You; Professional Writing
5. Introduction to Organizing Data with Excel; Basics of Excel
6. Excel Functions
7. Excel Charting / Project
8. National DNA Day; Using Your Skills in the Real World
9. Introduction to Organizing Data with Access; Building Tables in Access
10. Queries in Access
11. Reports in Access / Project
12. Ethical Protocols for Data Collection; Protecting Human Research Participants; Post-Course Career Planning

Total instructional hours: 48 hours

**Course Goals**

Goals of this course include:

1. Demonstrate the ability to recall course material from historical milestones, emerging technologies, and relevant codes of ethics in bioinformatics.
2. Develop and demonstrate proficiency in writing, online professional social networking, Perl, Excel, and Access.
3. Demonstrate the ability to produce quality critical analysis.

**Course Student Learning Outcomes**

This course meets the following programmatic goals for the Department of Biology, the Medical Informatics
Certificate, and Master of Public Health programs. Upon completion of this course, students will be able to:

1. Describe how the bioinformatics/public health information infrastructure is used to collect, process, maintain, and disseminate data.
2. Describe how societal, organizational, and individual factors influence and are influenced by bioinformatics/public health communications.
3. Discuss the influences of social, organizational and individual factors on the use of information technology by end users.
4. Apply theory and strategy-based communication principles across different settings and audiences.
5. Apply legal and ethical principles to the use of information technology and resources in bioinformatics/public health settings.
6. Collaborate with communication and informatics specialists in the process of design, implementation, and evaluation of bioinformatics/public health programs.
7. Demonstrate effective written and oral skills for communicating with different audiences in the context of professional bioinformatics/public health activities.
8. Use information technology to access, evaluate, and interpret bioinformatics/public health data.
9. Use informatics methods and resources as strategic tools to promote bioinformatics/public health.
10. Use informatics and communication methods to advocate for community bioinformatics/public health programs and policies.

Fulfillment of these course goals and student learning outcomes will be assessed through examinations, a set of laboratory exercises (with associated online discussion, quizzes, or other assessment requirements), and completion of course projects in the area of bioinformatics, or related subfields of marine, ecological, medical, public health or pharmaceutical informatics.

**Course Coordinator and Contact Information**

**Melanie A. Sutton, Ph.D.**

**Associate Professor**, University of West Florida

**Email:** msutton@uwf.edu *

*All communication will be within eLearning for grading/tracking purposes. See Class Communication section below and Communication content page in eLearning for more information.

**Required Texts and Materials**

There is no required textbook for this course. Electronic resources will be provided within eLearning.

This course will draw upon a variety of reading materials to cover the topics provided above, with electronic versions of relevant articles provided via the UWF library course eReserve system. An extensive online course website will also supplement these materials, with relevant links to labs, hands-on assignments and other bioinformatics sites.

The course is also supplemented with these codes of ethics:

- NIH Protecting Human Research Participants Certification

A set of required online tutorials developed by the UWF Library and others will also be provided. Links to these tutorials will be provided in various assignments and on the Professional Writing Guide provided in eLearning.

**Additional References/Bibliography**

- See additional links embedded in modules in eLearning.
**Prerequisites or Corequisites**

Please see the official UWF Catalog.

Working knowledge of how to use personal computers, including knowledge of word processing, spreadsheet packages and Internet searching. If you have never used spreadsheets or databases before, be prepared to complete extra tutorials to come up to speed.

Computer phobic? Think again...No prior knowledge of programming is required as a prerequisite. Students will be taught basics in the course and will also have the opportunity to utilize online tutorial sessions for additional skill development in order to complete assignments for this course. You must be willing to review (and re-review, when necessary!) these tutorials if you want to be successful.

Your course projects will emphasize practical applications in the emerging field of bioinformatics or related informatics areas (e.g., marine, ecological, medical, public health, or pharmaceutical informatics.). Although some background in genetics will be covered in this course, the course sequence PCB 3063/PCB 3063L: Genetics is not a required prerequisite for this course.

**Grading and Evaluation**

You will complete this course by proceeding through specific electronic resources and completing a set of labs. You will complete a set of course projects, applying the skills you have learned in the various activities of this class. You will complete exams online and graduate students (if this is a dual-listed course) will have additional work.

Fulfillment of the programmatic goals described above will be assessed as follows (see Gradebook in eLearning for final official weighting for each criteria during your semester of enrollment):

- **~20% - Quizzes** (completed individually)
  - There will be one or more quizzes associated with each module in the course. These exams will be based on module materials, supplemental readings, laboratory exercises, and the provided online resources. These exams will include multiple choice, fill-in-the-blank, short answer, and essay questions.

- **~20% - Participation/Critical Thinking/Professional Writing** (module exercises and associated assessments, completed individually)
  - Module exercises and associated assessment in the form of discussion participation provide the hands-on component to the course. In some exercises requiring participation, you will be investigating case studies related to modern informatics applications, exploring research conducted by faculty here at UWF, or learning how to use globally accessible databases or source code. The goal is to motivate you by showing you the excitement of informatics-based projects, while also helping you to develop a better understanding of "good" design and algorithmic development which can impact the larger industrial and research communities. To emphasize the importance and significance of developing your ability to communicate scientific information effectively, participation in selected online forum discussions will be graded using the APA-style guidelines provided in the Professional Writing Guide and other requirements indicated in the Discussion Forum Grading Rubric content pages. Grading of reading progress in various discussion forums will also form part of your participation grade.

- **~60% Course Projects** (completed individually)
  - Information on these requirements will be made available as associated module project deadlines approach. If needed, links to tutorials developed by the UWF Library and others to help you correctly include professional referencing within your project write-ups.

**Required Tutorials**: Tutorials will be posted in many modules for those students with limited computer backgrounds. These tutorials will cover how to use eDesktop, common programming errors, how to use Perl, Excel, Access, etc. Review and be willing to RE-REVIEW these tutorials to facilitate your efforts to complete assignments in a timely manner, and CORRECTLY! See Important Course Information content for more information.

**Discussion Participation**. All discussion postings must use proper grammar and spelling to receive credit. If you are asking questions for assistance, you must clearly state the question, what errors appear, and the computer platform you are using.
Graded Assignments: You can expect to receive a grade and feedback for any graded assignment within 7-10 days of the due date.

Calculation of Final Grade: Due to the distance learning nature of this course, all requirements must be completed within the time scheduled, unless prior arrangements are made with the instructor. Your final grade will be weighted based upon the percentages indicated above. Online facilities will be provided so students can monitor their own progress. The final grade will be on a 10-point scale, roughly: A range = 90-100, B range = 80-89, etc., with plus/minus grades as appropriate.

Characteristics of Submitted Student Work and Assignments

For the purposes of programmatic assessment, the following mastery levels will be used:

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<tr>
<td>Exceeds Expectations (Very Good to Excellent)</td>
<td>Student has a clearly defined sense of the value of informatics research and related ethical issues. Student can articulate and defend arguments with specificity.</td>
<td>Student consistently demonstrates clarity of thought process, ability to communicate well with other students and instructor, and consistently demonstrates abilities and understanding that surpass expected average.</td>
</tr>
<tr>
<td>Meets Expectations (Satisfactory)</td>
<td>Student demonstrates adequate awareness of the value of informatics research and related ethical issues. Student can articulate and defend arguments, but lacks some specificity.</td>
<td>Student has adequate communication skills and demonstrates basic level of understanding of project management, however, these abilities rarely surpass expectations.</td>
</tr>
<tr>
<td>Below Expectations (Unsatisfactory)</td>
<td>Student does not demonstrate adequate awareness of the value of informatics research and related ethical issues, or student is unable to articulate and defend arguments with any specificity.</td>
<td>Student demonstrates poor communication skills with other students and/or instructor or demonstrates a critical inability to grasp central concepts, execute technologies, or think logically to synthesize appropriate conclusions.</td>
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Class Meetings

This is a fully online course within UWF's eLearning system, taken by students local to the main UWF campus in Pensacola, Florida, and by students from across the U.S. and from overseas. In fairness to all students enrolled in this course, there are no face-to-face lectures - all course materials and assistance will be provided electronically.

On the first day of the term, the course template will appear under the current term for the College of Arts and Sciences in eLearning. Once in eLearning, your first stop first stop is to go to the Content link under the eLearning banner and click on the Start Here page (available only when you log in to eLearning). On this page is key information on how the course is laid out in eLearning and includes links for tutorials for working in an online environment. If you are new to online learning, be sure and review these tutorials.

Next proceed to read through the Important Course Information content pages in eLearning. This is where the Course Syllabus, Course Schedule and other important information can be found.

The course is broken into modules. See the Course Schedule within eLearning for deadlines to each module. Information and your assignments for each module are found within the Content area.

This course assumes a workweek with the schedule indicated on the Course Schedule link under Important Course Information. Using this schedule, each week, you would log into the course site and click on the Content link located under the eLearning banner for assignments related to that week. You should also look ahead to see scheduling dates for any tests, assignments or forum participation sessions. Online exams should be taken during the time frames indicated. Similarly, assignments should be posted or uploaded during the times indicated. More information on testing procedures and assignments will be available as these dates approach in
the semester.

**Class Communication**

**Discussion Postings:** Unless a problem is personal in nature, it is easier and faster for instructors to respond to a posting in the Muddiest Points Forum, so a response can be composed that helps everyone. Instructors cannot reply to every discussion posting in other forums, but will read every posting and always offer constructive responses when necessary. Always check the Announcements Forum and the Current Events Forum, as well as the FAQs page for information that will be helpful to everyone.

**Outstanding Issue Quiz and Outstanding Issue Dropbox:** If a problem is related to a graded item or is personal in nature, post an attempt to the special UNGRADED, confidential quiz labeled, "Outstanding Issue Quiz" (click the Quizzes link located under the eLearning banner). Use of this quiz has increased efficiency and tracking of issues on a student/course basis and is the preferred method of grade-related and private communication (instead of email). In this manner, all your correspondence related to the course and any technical problems you experienced are retained as a permanent record in eLearning. If you have documentation to support any issue you present to your instructors via the Outstanding Issue Quiz, you upload this to the confidential Outstanding Issue Dropbox area. Responses to your Outstanding Issues quiz or dropbox submission will be found in the Outstanding Issue Quiz area, so be sure to check back in this location for any additional instructions regarding your submission. Across the hundreds of students enrolled in this course each academic year, this process has proven to be a more timely and efficient way of communicating feedback to students regarding any issues that impact course grades. In addition, this process has allowed us to work with the HelpDesk and resolve technical problems with eLearning much faster than email.

**Online Test Taking Guidelines**

**Save answers to quiz questions frequently to avoid loss of points.** Also, please do not begin any timed, online exam/quiz in the course that may overlap with the eLearning maintenance window. The eLearning maintenance window runs 3:00-6:00 am CST (Central Standard Time) each day. If you initiate an exam that overlaps with this time and experience any technical errors, your recorded score is likely to be close to 0 for such an attempt. There are no exceptions to this policy.

If you experience any other technical problems or errors during any timed exam that does not overlap with the eLearning maintenance window, you are required to notify the Helpdesk immediately at helpdesk@uwf.edu or (850) 474-2075. **Failure to contact the HelpDesk to report the problem will result in a grade of 0 automatically being assigned.** If you are unable to get immediate assistance from the HelpDesk during the exam, but have documented the problem in an email or voice mail to the HelpDesk, you may attempt to restart the exam using the same browser, or attempt to re-enter the exam with another browser. If you are still unable to restart the exam and continue with saving, please note that for your final submitted score to be recorded, you MUST still prove that you documented the original technical problem with the HelpDesk via helpdesk@uwf.edu or (850) 474-2075. Failure to do so will result in an automatic grade of 0 being assigned.

**Deadlines**

All class activities are specified in a module’s Overview and Assignments content page with exact details of the activities’ deadlines and instructions. As a general rule all deadlines are by 11:59 pm CST (by eLearning’s clock!) on days outlined on the Course Schedule unless otherwise noted in eLearning.

**Late Policy**

Do not submit assignments late. A late assignment holds up grading for the entire class and thus will earn a 0 or **SIGNIFICANT point reduction per day** (at instructor’s discretion). Quizzes you forget to take are scored 0 points and an assignment submitted one minute late is late - please do not wait until the final moments of a module to begin the upload process. Since each module builds on the next and recurring skills are required for the course projects, you are REQUIRED to still attempt all assignments, even if you are late and no points will be awarded. Not completing or attempting weekly assignments in this course negatively impacts your ability to complete your course projects. If you consistently fail to complete or attempt weekly assignments before the due dates, your inconsistent work ethic will earn an additional and significant penalty on course project grades at the end of the semester.
Special Technology Utilized by Students

- You will access the instructional content for this course through the UWF eLearning Management System (eLearning). You can access eLearning directly by using this URL: http://elearning.uwf.edu
- **Students are required to have access to consistent Internet service throughout the term.** If you know you will be without consistent Internet service for a period of time, you are required to notify your instructor ahead of time and work ahead.
- **Students are required to complete this course utilizing the equivalent of a cable-speed modem.** Completing the course modules via a telephone dial-up connection will not be possible, due to the significant download times for larger audio-visual content.
- **Microsoft Office** will be used for some activities. Students have access to the current UWF-supported version of Microsoft Office via eDesktop. See the Using eDesktop content page in eLearning for more information. All assignments in the course will be based on the version of Microsoft Office currently supported through UWF's eDesktop environment.
- Students will need to use the FireFox web browser for course activities within eLearning. There are too many issues with Internet Explorer and eLearning at this time. **Internet Explorer 8.0 is NOT supported.** The latest FireFox can be downloaded from the following website: http://www.mozilla.com/en-US/firefox
- **Notepad or similar text editor** is suggested for gathering your discussion posts. There are issues with the formatting if you copy/paste from Word into the body of your discussion post. It is best to wait until your text is in the discussion body before you format.
- **eDesktop** is required for course assignments. See the Using eDesktop content page in eLearning for more information. This software is provided free by UWF.
- **Elluminate** is required for pre-recorded tutorials. See the Using Elluminate content page in eLearning for more information. This software is provided free by UWF.
- **Required Browser Plugins:** You may need to upgrade your Browser software with the following free plugins to take full advantage of all the media elements in this Web-based course. However, you may already have these plugins installed on your computer. If so, there is no need to download and install them again.
  - **Adobe Acrobat Reader:** Required to open many web-based text documents in a format easy to read and print.
  - **PowerPoint Viewer:** Required if you do not have PowerPoint already installed on your computer. This viewer allows you to open the PowerPoint presentations in this course and then be able to print them in multiple formats.
  - **Macromedia Flash Player:** Required to open any animations that may be in your course. Remember, if these programs are already installed on your computer, you do not need to download and install them again.
- **Technical Assistance:** If you have any technical problems, contact the ITS HelpDesk at (850) 474-2075 or via email helpdesk@uwf.edu first.

Compliance with UWF Policies on Satisfactory Progress

If you have a question regarding the UWF policies for assignment of grades of 'W' or 'I', please visit the UWF Withdrawal Policy or the UWF Incomplete Grade Policy.

Expectations for Academic Conduct/Plagiarism Policy

- **Academic Misconduct Policy** [Link]
- **Plagiarism Policy** [PDF]
- **Student Planner and Handbook** [Link]

It is the philosophy of The University of West Florida that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

In addition, any behavior that interferes with the conduct of a class is classified as disruptive behavior and will not be tolerated. Although not exhaustive, examples of disruptive behavior would include: inappropriate or
threatening online postings or e-mails, etc.

**Assistance via Student Disability Resource Center**

The **Student Disability Resource Center** (SDRC) at the University of West Florida supports an inclusive learning environment for all students. If there are aspects of the instruction or design of this course that hinder your full participation, such as time limited exams, inaccessible web content, or the use of non-captioned videos and podcasts, please notify the instructor or the SDRC as soon as possible. You may contact the SDRC office by e-mail at `sdrc@uwf.edu` or by phone at **(850) 474-2387**. Appropriate academic accommodations will be determined based on the documented needs of the individual.

Every effort will be made to accommodate the special needs of disabled students. Please inform the instructor privately during the first week of class to indicate your particular needs. All such accommodations are officially arranged through the Office for Disabled Student Services and a letter from this office must accompany your request.

**Students must contact SDRC every semester** to obtain academic accommodations based on the documented needs of the individual and the courses taken that semester.

**Quality Assurance**

This course is reviewed during the semester and in an ongoing basis for quality by assessment personnel within the School of Allied Health and Life Sciences (SAHLS) to meet national standards established by the Southern Association of Colleges and Schools, the Council on Education for Public Health, and/or to address **quality enhancement initiatives of SAHLS**. Student feedback is also vital to this process. When reviewing our programs, our accrediting partners expect to see 100% participation in the State-of-Florida mandated SUSSAI (State University System Student Assessment of Instruction) evaluations. Thus, at the end of the semester, we need to hear from the folks that enjoyed the class and from the folks that have suggestions for improvement (ok, and from the folks that want to fill out the survey as quickly as possible with no comments to share!). BUT, we do need to hear from each and every student in this class, and we value your input.

When SUSSAI evaluations are ready for you to complete, you will see a News posting in the course. Please take a few minutes to complete the evaluation on this course and feel free to contact Connie Works at **(850) 474-3080** or `cworks@uwf.edu` if you require any technical assistance! Please be assured that all evaluations that are completed online are of a confidential matter. Your name, student number, and e-mail address will not be revealed to your instructor, department, or college. Only one evaluation per course per student can be submitted. Please do not delay completing the evaluation when the time approaches. Due to the significance of this information, instructors will not be able to pre-release grades in eLearning if we are not close to the 100% participation goal before finals week. Thank you!

**Campus Emergency Information**

In the case of severe weather or other emergency, the campus might be closed and classes canceled. Official closures and delays are announced on the UWF website, Argus, and broadcast on WUWF-FM and WUWF-TV. Please take time to review UWF’s Emergency information at [http://uwfemergency.org](http://uwfemergency.org).

The UWF emergency system includes:

- **WUWF-FM (88.1MHz) & WUWF-TV** – the official emergency alert system broadcaster keeping students and faculty informed of dangerous situations and evacuation routes: [http://uwf.edu/wuwf](http://uwf.edu/wuwf)
- **ArgoAlert (Emergency Notification System)** - [http://uwfemergency.org/notification.cfm](http://uwfemergency.org/notification.cfm)

**Health, Counseling, & Wellness Services**

To help provide a balanced learning environment at UWF, health, counseling, and wellness services are offered to assist and educate students in living a healthier lifestyle, encouraging students to strive for mental and physical health.
Student Health Services include quality primary health care, education, and prevention services. For more information on services, call (850) 474-2172 or visit their website at http://uwf.edu/healthcenter.

Counseling and Wellness Services consists of two departments, which work independently: Counseling Services and Wellness Services. For more information, call (850) 474-2420 or visit the Counseling and Wellness website at http://uwf.edu/cws.

All three departments are located in the Student Health, Wellness, and Counseling Center, Bldg. 960.