**Introduction to Statistics - Syllabus**

|  |  |
| --- | --- |
| **Instructor** | Federico Marchetti |
| **Contact Information** | [Click here to display contact information](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\contact.html) |
| **Class Meets** | On Line Class |
| **Textbook** | Open Course Library Statistics Course (Digital) (free on line) |
| **Prerequisites** | Intermediate Algebra or equivalent |

**Table of Content:**

1. [Presentation of the Course](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Presentation_of_the_Course)
2. [Required Material](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Required_Material)
3. [Outcomes](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Outcomes)
4. [Structure of the Course](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Structure_of_the_Course)
5. [What Kind of Work Will Be Required](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#What_Kind_of_Work_Will_Be_Required)
6. [Evaluations](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Evaluations)
7. [Special Issues](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Special_Issues)

**Presentation of the Course**

This course is distributed under a [Creative Commons "Attribution" License](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\index.html#license). Please, check the [Creative Commons site for details of this license](http://creativecommons.org/licenses/by/3.0/).

*In this course, we will introduce some of the more common tools for analyzing data of several types. We are not aiming at introducing all or even most of them.* The main goal of the course is to highlight the general assumptions and methods that underlie all statistical analysis. The purpose is to get a good understanding of the scope, and the limitations of these methods. We also want to learn as much as possible about the assumptions behind the most common methods, in order to evaluate if they apply with reasonable accuracy to a given situation.

Our goal is not so much learning bread and butter techniques: these are pre-programmed in widely available and used software, so much so that a mechanical acquisition of these techniques could be quickly done "on the job". What is more challenging is the evaluation of what the results of a statistical procedure really mean, how reliable they are in given circumstances, and what their limitations are.

[Check the detailed map of our course](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\Map.html)

**Important Note**

This is a pilot course, you could call it a beta version of a course that will eventually be made available to anybody interested, to use and/or modify as they may need. I expect there will be more rough edges than we would like (which would be zero). **Your participation, which is repeatedly called for in this Syllabus, can make a big difference, and is urgently needed.** By "participation", I mean, besides the item mentioned later, your comments, complaints, suggestions, which are all welcome. Also, whenever you feel something may be lacking or missing, say so, and we'll try to adjust what may need adjustment. At the end, this course should be the result of our joint effort to make it as useful as possible

[Back to Top](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Table_of_Content:)

**Required Material**

Our course is available in digital form, hence access to an Internet-connected computer is necessary. Also, access to the World Wide Web is going to be definitely useful, for the gathering of data to be analyzed, as well as for general retrieval of information.  
Besides access to the Internet, you will need a few programs. **All necessary software is available for download under a GPL license, and free to use.**  
Specifically, we will need (see the file: [about tools available on line](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\0-Intro\tools.html) for links to download sites)

* A PDF reader, as much of the material will consist of PDF files. Free PDF readers are available for any platform you may use.
* A browser, for access to the World Wide Web. Additionally, we have all of the material posted in HTML, besides PDF, format. When formulas are involved, this requires your browser to support MathML. Firefox and Opera support MathML natively. Other browser may need an additional plug-in (e.g., this is the case for Internet Explorer). Such files are also posted as PDF, just in case.
* A text editor, for the production of reports. While a word processor can be used for this purpose, it is not necessary. A report may need to include some mathematical formulas, but less so than most Mathematics courses. Hence, if necessary, "typewriter math" (as described in the file [How To Write Math On A Computer](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\HowToWriteMath.html)) will do all right. If, for any reason, you would rather use a word processor, please, read carefully the file [How To Submit Your Work](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\Submit.html) .  Open source word processors with excellent ability to present formulas are [Open Office](http://www.openoffice.org/)/ [LibreOffice](http://www.documentfoundation.org/) Writer, [Abiword](http://www.abisource.com/), and [Kword](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\www.koffice.org\kword\) (the project has recently forked a separate development line, [Calligra](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\www.calligra-suite.org)), all available on most platforms. If you use any of these, make sure to **submit a PDF version of your work** (or equivalent, as explained in the direction on submitting your work), and **not in your word processor format**. There are also many free more specialized tools that will produce professional quality mathematical papers (as well as general purpose texts), such as [Lyx](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\www.lyx.org\), and [GNU/Texmacs](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\www.texmacs.org\) (both allow the creation of professional quality LaTeX files - the standard typesetting format for scientific work - without the need to learn this extremely rich language), but their remarkable capabilities are not really be needed here.
* A spreadsheet capable of performing standard statistical procedures, and producing reports, both textual and graphical. While most good spreadsheets have adequate support for these needs (if you don't have a spreadsheet, the previous links to Open Office, and Libre Office will lead you to the dowload page for their Calc, which is a very good equivalent to the better known Microsoft Excel program. You may also be interested in acquiring [*Gnumeric*](http://projects.gnome.org/gnumeric/), available on most platforms: this is an open source program, free to download, with many more statistical functions and tools included than most of the other similar programs.
* Some of you may prefer to work out at least part of their production by hand. If you have the means to create a digital image of your work to submit, that is fine too. While a scanner would be the best way, from a technical point of view, careful use of a digital camera (even some in cellular phones) will be more than adequate. Just make sure that your image is in a standard format (like JPEG, TIFF), and that it is sharp enough: look at it carefully yourself, on a computer, before sending it out. **Please, send it as one or more images, not embedded in a word processing file.**

**Additional (Not Required) Materials**

There are many useful commercial and non commercial offerings available to students. **Nothing besides what is included in this course will be required or referred to.** This does not imply that you might not find one or more of these offerings useful. Feel free to experiment, if you wish. [A file with a partial list of offerings is here](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\0-Intro\sources.html).

**About the format of the material**

The textual material in this course is in "plain vanilla" HTML (you can access it with any browser), XHTML (HTML with MathML, used to render formulas in your browser - current versions of Firefox and Opera read these files well, but you might need a plug-in to read them in Internet Explorer), and PDF. The last two formats are mainly used to allow for reasonable display of mathematical formulas. Which one should you use, assuming you have a choice? Mathematics in PDF files looks much nicer, so you might want to prefer that format, but hyperlinks are not supported (yes, there are ways to have PDF support hyperlinks, but ours are "plain vanilla" PDF files). On the other hand, XHTML has live hyperlinks, which might make them convenient, at least in a first reading.

[Back to Top](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Table_of_Content:)

**Outcomes**

**Technical and Computational Skills**

These skills pertain to the ability to apply formulas and methods to specific statistical goals. These skills are important, but not as much as one could imagine, for a number of reasons. While it is always better to have a clear concept of what is involved in calculations you are performing, it is a fact that most of these are now pre-programmed in software, requiring much less manual ability from the operator than in the past.

Hand (or even calculator) based calculations are only feasible for really small data sets, where, incidentally, the meaningfulness of these calculations is often open to debate. In fact, in those circumstances, it is definitely appropriate to apply **first** a critical analysis of the problem, and **only afterwards** proceed to apply standard methods, if appropriate.

Large data sets, where it is easier to argue for the validity of *standard methods*, mostly based on limit laws, can only be reasonably handled through computer programs. "Real" statistical packages, both commercial (S, SPSS, ...), and open source (such as R, PSPP, ...), essential when dealing with very large data sets, are beyond the scope of an introductory course. On the other hand, fairly large data sets are easily handled by spreadsheets which are, by and large, the standard tool for data sets of this size. Since practically all standard analysis tools are hard-coded in most spreadsheets (and the open source spreadsheet *Gnumeric* is especially well endowed in this area), the actual technical skill required to operate meaningfully is relatively limited.

For these reasons, while the ability to operate the software on specific data is definitely an expected outcome of the course, it is not its primary focus.

**Critical evaluation skills**

This is the main goal we will pursue in this class. Most methods, both "descriptive" and "inferential", assume, openly or implicitly, a model behind the data. The appropriateness of the model is of critical importance, and should definitely be brought in the open. To be very clear: *data don't speak by themselves*. For example, a numerical data set is only a list of numbers. Any further conclusion we may draw from it is based on additional assumptions that we are making, and it is best if these assumptions are made explicit. Even applications, like polls, that are by now well established, rely on assumptions that are often very delicate to verify. We will strive to discuss as extensively and clearly as possible, what these assumptions imply, and how a given experiment could fail to meet them.

A connected issue is the understanding of what common statistical conclusions really imply. As we will see, "Statistical Tests" are a prime example of not so obvious meaning of their outcomes, but similar comments can be made about any estimation technique.

Please, be also aware that we have a limited time frame in which to operate. For this reason, it will be impossible to cover all most common statistical tools. Hopefully, by concentrating on the basic ideas behind the tools we will see, you will have no trouble learning about other methods that all follow the same general ideas we will discuss, whenever you should face them in your further studies or in a work environment.

[Back to Top](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Table_of_Content:)

**Structure of the Course**

The course is divided in modules, by content, as in a traditional textbook. The modules will cover:

1. Introduction to Statistics
2. Summarizing Observed Results
3. Probabilistic Models for Statistical Experiments (two modules)
4. Interval Estimation
5. Statistical Tests (two modules)
6. Correlation (linear dependency between variables)

Each module is planned for a week's worth of work and will include presentation of the material. Some of the items are original for this course, and some are derived from an open course developed by some universities in Texas (see the [sources file](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\0-Intro\sources.html#Rice) for references).

Additionally, besides small examples, we will "carry along" several data sets, of different type. These data sets will be available as testing ground for each new tool that we will introduce and discuss.

You are also asked (if possible, organizing in small groups of 2 - 3 people) to go out on the World Wide Web, search for data sets that intrigue you, and work on them all through the course, applying, in turn, the techniques that we introduce. Your instructor will be happy to look at your proposals, and help you define them for the best.  
[Back to Top](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Table_of_Content:)

**What Kind of Work Will Be Required**

We will try to work on several levels at the same time. Students are expected to

* Read and understand the text and all other explanatory material
* Solve small problems highlighting features discussed in the text
* Apply the theory to different data sets, using software
* Discuss and explain the output of the software. In particular, detail what it implies about the question that came with the data set.

"Small problems" refers to "paper and pencil" problems, that address specific aspects of the theory. They are called "small", since they do not require extensive computational facilities (meaning, a fairly basic calculator will be more than enough), and, in fact, should often be even solved as *Math problems*, that is, they should lead to a formula and concrete numbers should only appear at the very end, if at all.

In practical terms, most of the time, you will be asked to apply the theory you are studying to the simulated data sets that you will download at the beginning of the course. Sometimes, this will be supplemented by a group of "small problems". **Not all assignments are necessarily completely listed at the beginning of the course. In general, you have to expect that new items (and not only assignments) may appear during the course of the Quarter. Keep checking for updates, and changes!**

**How To Turn In Your Work**

[Assigned work can be turned in a many ways](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\Submit.html), electronically (e-mail), by fax, or in person. Since there may be some math to write (not as much as in other math courses, but still some), you may want to check [some suggestions on how to create digital files with this type of content](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\HowToWriteMath.html)

**Participation**

Additionally, **you are expected to participate actively in weekly discussion forums over the current material. While your contributions will not be graded numerically, they will be recorded and credited as active participation.** Specific topics might be indicated as adding to your participation credits.The main topic, that will add a lot to your participation credits, is constructive (which does not mean bland, but topical and thought through) comment, criticism, suggestions, questions, and so on concerning this specific course, and its material, and how it does or does not work for you. This feedback is independent of a survey you will be asked to respond to during the Quarter, and is crucial to help improve the course, form its "beta" stage to a more effective level.

Another participation item is referred to in the [sources file](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\0-Intro\sources.html): your active comment and referral of videos that you find useful for his course on the web, in particular from the [http://www.khanacademy.org](http://www.khanacademy.org/) site. In fact, any serious referral or comment on web resources that you may find will be greatly appreciated.

Another activity that will be credited as participation is provided by a total of 80 quizzes that can be accessed on the [WAMAP site](http://www.wamap.org/). This site, sponsored by the State of Washington, provides free tools to support college classes. In particular, the quizzes, chosen from a pool of problems contributed by various instructors, will allow for immediate response, and **may be taken any number of times**. Each time, you will see slightly different problems, or even the same problem, but with different numbers. The purpose of these quizzes is to have a permanent facility for drill and practice. Again, these will not contribute to your grade as assignments, but will be counted as participation.

**How do you access WAMAP?**

Just follow the [simple instructions in this file](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\wamap.html).

**When should you take the quizzes?**

It is actually up to you: they are available right now, your participation will be considered at the end of the quarter, hence, if you decided to do so, you could even take them all during the last week. However, this is definitely not a recommended choice! Every week, you will find a list of quizzes pertaining to that week's material, and it is a good idea to work on them at that time. Of course, it is also a good idea to go back, and review previous weeks' quizzes, so as to keep everything fresh.

[Back to Top](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Table_of_Content:)

**Evaluations**

In order to evaluate your work, I will look at

* Ability to solve "small problems" as described above
* Successive individual work on the data sets, as we apply the theory introduced in each module. As suggested above, you are expected to be able to
  + Apply the available tools correctly
  + Justify the use of a specific model to the data
  + Explain what the the output means. In particular, give a clear answer to any question that came with the specific assignment, including, if appropriate, commenting on the effectiveness of the model used
* Work effectively in your small team at collecting interesting data, and extracting as much information as possible. This means, again, choosing an appropriate model, and using the tools available. The final report should explain your model choice, comment on its effectiveness, and detail the results obtained.

Assignments applying the items listed above will be posted periodically.

**Exams**

**Additionally, we plan on having two proctored tests, consisting of a collection of "small problems"**. These tests may be taken in any appropriate facility: please, inform your instructor of your choice, and put him in contact with your proctor in a timely manner. [Check the course map for schedule and details](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\Map.html#exams)

**Late Submissions**

Work is due by the indicated date (generally, Tuesday of the week following the assignment posting). If you miss the deadline, your work will not be evaluated quantitatively. **You are still urged to submit it anyway.** Late submissions will be considered proof of active participation.

**Grading**

Grading is an imperfect attempt at summarizing the evaluation of three months of work into a number. The following are **guidelines**, which may be adapted and bent, in order to take into account additional information (as an example, progress in overcoming an early difficulty with some material will be adequately recognized: what you know at the end of the course is what really counts, more than what you knew at the beginning).

|  |  |
| --- | --- |
| **Item** | **Percentage** |
| "small" assignments | 25% |
| individual data analysis | 25% |
| group data analysis | 20% |
| active participation | 5% |
| proctored exams | 25% |

**Grade Scale**

|  |  |
| --- | --- |
| 85% - 100% | A |
| 70% - 84% | B |
| 55% - 69% | C |

[Back to Top](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Table_of_Content:)

**School Closures**

School closures due to weather conditions or other causes do not, in principle, cause as much trouble as they do for face to face classes. Nonetheless, since some of you may opt for bringing any required submission to the College, in person, in these circumstances deadlines will be deferred until the school reopens. This, of course, applies also to proctored exams, in case they were scheduled at such times. Inclement weather may actually affect some or all of us, in terms of power disruptions, which can be very damaging for on line, or off-line computer work. If you are affected, let me know - and I'll let you know if **I** should be affected.

[Back to Top](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Table_of_Content:)

**Student with Disabilities**

It is the goal of the College and of every instructor to ensure, to the maximum extent possible, that students with disabilities be able to access all resources they may need in order to complete successfully their classes. If you have special needs, please contact your instructor, as well as the Services for Students with Disabilities office, and every effort will be made to help you. In particular, students with disabilities have the right to request and receive reasonable accommodations to ensure access to programs and facilities at Shoreline Community College. To receive reasonable accommodations, students are responsible for requesting accommodations and documenting the nature and extent of their disability in a timely manner. Students should direct their requests for reasonable accommodation to the Services for Students with Disabilities office. (State of Washington Laws of 1994, Ch. 105, Washington Core Services.).

**Cheating**

Cheating is a serious offense, and any student caught cheating will be held accountable and appropriate penalties assessed. They could range all the way up to being deferred to the College. On a substantive note, the main victim of a cheating infringement is the infringer. You are here not just to gather required credits, but mainly to learn about important tools that you will need in your life. If you are struggling with any part of the course, the correct action is to go to your instructor, and ask for help. Taking a shortcut will have consequences, and, at best, will deprive you of the opportunity to learn something valuable.e

[Back to Top](file:///\\Ssccwfssvr\userdata$\sdeboo\My%20Documents\Shireen\Conf-Training-Grants\OpenCourse%20Library\Phase%20Two\MATH146\Instructor\InstructorVersion\CourseModules\syllabus.html#Table_of_Content:)