Instructor: Dr. Robi Polikar
Office & Phone: 136 Rowan, 256-5372 (voice-mail available)
Office Hours: Open door policy: you may come in whenever the door is open.
E-mail: polikar@rowan.edu
Class Meeting: Thursdays 10:50 – 12:05, at Rowan 239

*** Read the entire syllabus - Important Information! ***

ABOUT THIS CLASS & OBJECTIVES

Many concepts of probability, statistics and random variables appear routinely in engineering applications, in particular in electrical and computer engineering. This should come in with no surprise, as so many parameters and variables in engineering applications are beyond our control, either because of physical limitations, such as noise, or because the system is too complicated and we cannot control every parameter. The concepts of probability and statistics allow us to make intelligent and informed decisions in the presence of uncertainty and variation.

We need statistics because of the variation in our measurements and manufacturing capabilities. If every resistor labeled 10KΩ were exactly 10KΩ, if every light bulb labeled 60W were exactly 60W, if every treatment plan were to have the exact same effect on every patient, and most certainly, if every student taking our classes were to get exactly same grade, there would be no need for statistics. But they don’t…! How do we then, based on this variation, decide whether a resistor labeled 10KΩ will produce the desired outcome, or how do we know whether a treatment plan will really work on a given patient? This variation requires us to make generalizations about a population, based on a smaller sample of measurements. Making such generalizations about the behavior of populations based on small sample measurements is the domain of probability and statistics.

The goal of this course is therefore to introduce probability and statistics concepts that are fundamental to decision making in engineering. Upon successful completion of this class, you will be able to methodically analyze an event that has random outcomes, and be able to make informative decisions based on the event’s statistical behavior. You will be able to identify various probability distributions, calculate and/or estimate associated parameters, as well as the confidence one can reasonably expect in such estimations. You will also be able to compare several different outcomes of a particular series of experiments and make informed judgments about these experiments using hypothesis testing and/or Anova testing.

CLASS MECHANICS

This class will meet once a week, in a 75-minute lecture. Any class period that cannot meet (due to holidays, weather, etc.) will be made up. We will have regularly scheduled homework assignments, as well as occasional oral reviews (where you will be asked to review a previous lecture or a topic) and/or “Were you paying attention” quizzes, one midterm, one final exam and a project. The details for these are provided below. There will also be regularly scheduled “Dr. P on assignment” help sessions, during which I will answer any questions you may have. I will also solve examples during these help sessions. No new material will be discussed during the help sessions. Attendance to help sessions is obviously not required.
ATTENDANCE POLICY & ESTIMATED AMOUNT OF WORK

This course is offered under the clinic consultant (CC) umbrella, because we have identified this area as essential in your overall engineering education. The CC mechanism currently allows only one credit, whereas the course content is typically covered in a 3 credit course at most institutions. While I will make sure that you are not assigned unduly heavy load, there is no denying that this is a rigorous class; successful completion of this course will nevertheless demand significant amount of time commitment from you. In an attempt to ease your burden, I will schedule regular help sessions (see below). As a rule of thumb, expect to spend three - four hours for each hour we spend in class. Please budget your time accordingly.

Do not make the mistake of not taking this class seriously due to its one credit. This class has a significantly higher failure rate than most others, not only because it is a rigorous topic, but also because some students made a poor judgment, mistaken by its deceptive one credit classification. This may be the most difficult and most time-consuming one-credit class you (will) have ever taken or will ever take!

Because of its accelerated nature, attendance is absolutely necessary for success in this class, and therefore is required. I will not take regular attendance, but only occasional random ones, which will be considered in assigning final grades. If you are absent on the day you are randomly called for oral review, or for a quiz (or for roll call) you will get a zero for that activity – unless you have an excused absence or an extenuating circumstance. I will not call on someone for an oral review if that person informed me of his/her excused absence ahead of time. A quiz missed due to excused absences may be retaken; those missed due to unexcused absences may not. A missed exam may not be retaken with the exception of most serious and extenuating circumstances that require official and written proof of such circumstances.

Excused absence is one where you have given me at least 48 hours of written notice (e-mail is acceptable) of your absence. You may have one – and only one – excused absence during the semester, though it can be for any reason.

Extenuating Circumstances are those that are truly beyond your control, and is limited to sudden illness, or death of family member. Written documentation must be provided for an extenuating circumstance to be valid (such as a letter from a physician, or an obituary / funeral house notice). Undocumented cases will not be honored. You must use your “excused absence” right for all other reasons.

Tardiness: You will be considered present if you are in class during the first 10 minutes of the class, and remain in class during the entire (remaining) duration of the class. One quiz or oral review missed due to tardiness will be counted towards your excused absence. Any additional absences / tardiness will result in a zero grade for the missed activity.

If you miss a class, you are responsible for any missed material, and given the pace and level of this course, even a single missed lecture will be difficult to catch up. So don’t miss class!

TEAM POLICY FOR CLASS RELATED WORK

You are not only allowed, but in fact encouraged to work in teams (usually of no more than two) for most class related work, including certain homework assignments (unless stated otherwise) – but not for exams / quizzes. Whether you can use a team for the final project will depend on the complexity of the project. You are free to form / deform as many teams as you wish during the semester for all homework / implementation assignments. As long as all team members contribute equally and their names appear on the homework assignments, one can be submitted by each team. Each team member, however, needs to explicitly state the sections that were his/her primary responsibility (see next paragraph). Team members may inform me – under the condition of anonymity – of other team members who are not equally cooperating or participating in team effort.
**Homework / Research & Implementation Assignments**

There will be regular homework assignments, from the text book or other sources, which will challenge you; however, you will realize that you learn a lot from these assignments. As an added bonus, you will notice that your analytical thinking and problem solving skills will also improve significantly, not to mention your math skills. Since all homework assignments are take-home with plenty of time to complete, since you can use calculators, computers, etc. to solve the homework questions, and since the questions themselves will be rather straightforward, assignments will be graded on a **correct / incorrect basis only with no partial credit**. In other words, you will get full score for each problem if it is correctly answered, none for anything less. Assignments must be neatly and professionally prepared, submitted on engineering paper. All homework assignments will be due one week (168 ±1 hour) from the day they are assigned, unless indicated otherwise. Numeric solutions will be given / posted soon after the due date. **Late Policy:** Late homework assignments will not be accepted.

As mentioned above, you are not only allowed, but in fact encouraged to work in teams for all homework assignments. You may work in groups of up to three for the homework assignments to reduce the workload, but only under the following conditions:

1. the load is divided equally, both in quantitative and qualitative sense;
2. each student has a clear understanding of the solutions to all questions, and has reviewed and verified the solutions of the others;
3. each student’s contribution is clearly indicated;
4. all students will receive the same grade, regardless of whose solutions might have been (in) correct (rule 2).

Please note that my educational philosophy is to make you successful, not to dump inordinate amount of work and see who survives the most torture. Therefore, I will give plenty of opportunities for bonus and extra credit, for those who wish to take advantage of it.

**Course Project**

A final project will help you put all course-developed skills to work and also to appreciate the importance of probability and statistics in our daily lives. In order to make this more interesting, you will be asked to identify a problem that is of interest to you (perhaps you whether Energizer® batteries do really last longer than other brands, or whether ECE students do really work harder than others). A formal project report using appropriate technical writing style and linguistic quality (to be graded for such) will be due at semester end.

**Class Ethics:**

- No eating /drinking in class (except bottled water). Absolutely no dinner! Please time yourself accordingly.
- **Cell phones must be kept outside of class or shut-off during class. No exceptions!** If your cell-phone rings during class / lab (or you use it in any other way, such as texting), you will be asked to leave and counted as unexcused absent. It will also cause very difficult-to-repair damage to “professionalism” part of your grade (see below). Furthermore, I reserve the right to answer any cell phone going off in the class.
- No web surfing, instant messaging and / or other unrelated use of computers, when we use computers in class / labs.
- In-class discussions are welcome, and in fact encouraged, within the limits of mutual respect and courtesy. I also expect proper business conduct in the class – I am all about in-class discussions, so long as such discussions include the entire class, and not between two students.
- You are responsible for checking the class web page often for announcements, homework / exam solutions.
- You are encouraged to work with other students for all exercises, except exams and quizzes.
- Please come to class in proper (business casual) attire. Slacks and shirts are fine; PJs and flip-flops (yes, it did happen) are not!
- Although I do not anticipate, and certainly hope that it will never be an issue, it is my responsibility to remind you that academic dishonesty – in any form, shape or manner – will not be tolerated, and will be dealt with according to university rules and regulations. In general, presenting any work, or a portion thereof, that does not belong to you, as if it does – or even attempting to do so – is considered academic dishonesty. **DO NOT DO IT, DO NOT EVEN ATTEMPT IT!** See the pledge of honesty at the end of this syllabus.
E-MAIL ETIQUETTE & POLICY:
In general, I prefer that class related questions be asked in the class, so that everyone can benefit from the discussion. If your answer requires a longer time to answer, then please ask in person. Use e-mail as a last resort only.

If you do use e-mail, I expect you to follow proper business etiquette for electronic communications, including a formal greeting (for example, “Dear Dr. Polikar”, and not “Hey!” or “Listen, Robi, help me out here…”), formal language and formal signature line (including your name, last name and Banner ID). E-mails that do not follow proper etiquette will not be answered, and will affect the professionalism portion of your grade.

Also, and this in very important: make sure that your Rowan e-mail account is active. I will use your Rowan e-mail address exclusively, and cannot / will not follow up with messages that bounce back for over quota issues or non-Rowan addresses. All e-mails sent to me MUST come from your Rowan e-mail address, preferably with a subject line starting with “BSP&M”. My e-mail client is configured to recognize all e-mails coming from Rowan addresses as legitimate. Any other e-mail address may – and probably will – be automatically classified as spam and I may not notice it in a timely manner.

GRADING SCALE
An absolute grading scheme will be used to assess your final grade:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam(s)</td>
<td>40%</td>
</tr>
<tr>
<td>Assignments</td>
<td>20%</td>
</tr>
<tr>
<td>Project</td>
<td>20%</td>
</tr>
<tr>
<td>Oral review/quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Professionalism</td>
<td>10%</td>
</tr>
</tbody>
</table>

Professionalism includes good academic citizenship, professional conduct, and active class participation.

OFFICE HOURS & CONTACTING THE PROFESSOR
I will hold open office hours for this class. This means that you may come in at any time to ask questions if my office door is open (which it usually is). A couple things to note however: Please do not come in if the door is closed, even if my light is on, or you know that I am, in fact, inside. My door is typically open, but if it is closed, that means either I am not in, or I am working on something and prefer – and request – not to be interrupted.

Also, you may always make appointments (for example, if you need my uninterrupted attention for an extended period of time), or you wish to discuss something in private.

ACCOMMODATION FOR DISABILITY
If you have a documented physical and/or learning disability, please feel free to inform me or the Center for Academic Success – CAS (director, Ms. Melissa Cox – cox@rowan.edu, or 256-4260) regarding what kind of accommodation you need to help you succeed in this class. While you are not required to disclose your disability to me, you must provide appropriate documentation to the CAS to receive official university assistance. All such requests will be held confidential to the extent possible.

INSTRUCTOR EVALUATION, QUESTIONS, COMMENTS, SUGGESTIONS
Questions, constructive criticisms, comments, and suggestions are always welcome. Please feel free to share your opinions about all aspects of the class: content, math level, workload, instructor’s communication skills (or lack thereof), etc. There will be a box outside of my office for anonymous comments. Feel free to use this box, if you wish to remain anonymous regarding your comments. Also, you may use the “I’ve got something to say” form, available at class homepage for your comments. A copy is attached to this syllabus. I will also give you a mid-semester evaluation form, so that you can have a formal opportunity to voice your concerns or appreciations (if any at all…).

1 Actual examples from previous student e-mails.
HONESTY STATEMENT

I, _____________________________, have carefully read and understood this document, and clarified any questions or issues I may have (if any) with the instructor. I understand the class expectations, agree to follow the class rules, and in particular I attest that all work I present as my own will be my own. I will not represent others’ work as mine. Collaborations for mutual work notwithstanding, I will not accept nor offer any help from/to anyone for work individually expected of me, and I will not use any unauthorized sources, including but are not limited to books, notes, preprogrammed calculators, the internet, other students, etc. during the exams / quizzes. I understand that showing others’ work as mine, or attempting to do so, is considered academic dishonesty, and such acts are subject to forfeit of any grade obtained from the exam as well as other disciplinary action from the university. I also attest that, I will not share any exam questions with other students - past, current or future - with the understanding that doing so will also be considered academic dishonesty.

_________________________________________              ____________________________
Name                                                                                             Banner ID
_________________________________________
Signature                                                                               Date
### Tentative Schedule

<table>
<thead>
<tr>
<th>Week of</th>
<th>Material to be Uncovered</th>
<th>Reading Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept 2</td>
<td>Introduction – Overview of the class content, basic definitions, descriptive statistics, pictorial representation of statistical data (guest lecture - G. Ditzler)</td>
<td>Ch 1</td>
</tr>
<tr>
<td>Sept 9</td>
<td>The study of randomness and uncertainty: probability, counting techniques, conditional probability, Bayes theorem</td>
<td>Ch 2</td>
</tr>
<tr>
<td>Sept 16</td>
<td>Random variables and probability distributions – the discrete world: the probability and cumulative distribution (mass) functions, expected value, binomial and Poisson distributions</td>
<td>Ch 2, Ch 4</td>
</tr>
<tr>
<td>Sept 23</td>
<td>Random variables and probability distributions – the continuous world: the probability and cumulative distribution (density) functions, Gaussian (normal), exponential, gamma distributions.</td>
<td>Ch 4</td>
</tr>
<tr>
<td>Sept 30</td>
<td>Joint probability distributions, independence, covariance and correlation, random sampling, statistics and their distributions in sampled data, the central limit theorem</td>
<td>Ch 2, Ch 4</td>
</tr>
<tr>
<td>Oct 7</td>
<td>Random sampling (cont.), Confidence intervals and confidence levels, large sample confidence intervals of mean and population</td>
<td>Ch 5</td>
</tr>
<tr>
<td>Oct 14</td>
<td>Confidence intervals in statistics (cont.) – intervals based on normal distribution, the student’s t-distribution</td>
<td>Ch 5</td>
</tr>
<tr>
<td>Oct 21</td>
<td>Hypothesis testing, Type I and Type II errors, tests of mean for large and small sample sizes (midterm exam on Friday)</td>
<td>Ch 6</td>
</tr>
<tr>
<td>Oct 28</td>
<td>Hypothesis testing (cont.) – tests of proportion for large and small sample sizes, p-values of statistical tests</td>
<td>Ch 6</td>
</tr>
<tr>
<td>Nov 4</td>
<td>Two-sample inference for comparison of means and their confidence intervals, the z-test and the t-test,</td>
<td>Ch 6</td>
</tr>
<tr>
<td>Nov 11</td>
<td>Power of a test, nonparametric tests</td>
<td>Ch 6</td>
</tr>
<tr>
<td>Nov 18</td>
<td>Analysis of Variance - ANOVA test</td>
<td>Ch 9</td>
</tr>
<tr>
<td>Nov 25</td>
<td>Thanksgiving Break (This class may be rescheduled)</td>
<td>Ch 9</td>
</tr>
<tr>
<td>Dec. 2</td>
<td>ANOVA - post-hoc multiple comparison tests, multifactor ANOVA</td>
<td>Ch 9</td>
</tr>
<tr>
<td>Dec. 9</td>
<td>Simple linear regression – least square estimation, coefficient of determinations: the ( r^2 ) parameter,</td>
<td>Ch 7</td>
</tr>
<tr>
<td>Dec. 16</td>
<td>Final Exam</td>
<td>Ch 7</td>
</tr>
</tbody>
</table>

- Please note that this is a tentative schedule, and we may have to adjust things as we go along. In particular, we may not be able to finish discussion on certain topics as specified in the tentative schedule, and/or we may modify the schedule based on your interests. In case of such a deviation from the above the tentative schedule, I will inform of the appropriate reading assignments.
- Let’s see if you have really read all the way this far. If you did, please send me an e-mail, introducing yourself – attach a recent picture of yourself, if you don’t mind – and provide the following information (provided in two rows of an excel sheet that does not include your name or other identifying information), to be later used in class: your age, gender, height (in cm), weight (kg), lifestyle activity level (0: sedentary, 1: moderately active, 2: very active); blood pressure (systolic & diastolic in mmHg– if you have not had this measured recently, go to any pharmacy, target, walmart, etc. and there are machines there to do it), your latest cholesterol measurement (in mg/dL, only if you already know it), your current GPA, the hard drive capacity (GB) and RAM capacity (GB) of your computer (if you have one), distance of your hometown to Glassboro (km). Include in your e-mail that you have read, understood and agree by the rule and mechanics of this class.
- See the following example for a sample excel sheet.

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Height</th>
<th>Weight</th>
<th>LifeS</th>
<th>Sys. BP</th>
<th>Dia. BP</th>
<th>Chol</th>
<th>GPA</th>
<th>HD</th>
<th>RAM</th>
<th>Dist</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>M</td>
<td>180</td>
<td>72</td>
<td>1</td>
<td>118</td>
<td>76</td>
<td>220</td>
<td>3.74</td>
<td>1000</td>
<td>8</td>
<td>24</td>
</tr>
</tbody>
</table>
I am having difficulty in understanding the following concepts:

This week’s class was informative / interesting / entertaining / _______ (circle all that apply) because:

This week’s class was confusing / boring / too fast / too slow / _______ (circle all that apply) because:

It would have been much better / beneficial if you could…:

Please continue the following activities as I find them useful in ______

While you are at it, please provide your feedback on the following on a scale of 1 – 5,

1: Poor / Strong disagreement with the phrase, 5: Excellent / strongly agree with the phrase
1. The professor’s ability to communicate in a clear and understandable manner: ______
2. The professor’s responsiveness to student’s needs, questions and ideas:_______
3. The professor treat students in a professional manner:_____
4. The professor is enthusiastic about the subject and genuinely believes in its importance:_____
5. The professor’s knowledge of the subject material is thorough:_____
6. The professor is well prepared for the classes:_____
7. The professor’s ability to impart knowledge about the subject is:_____
8. The professor encourages questions and comments during the class session:_____
9. The professor’s use of the class time is:_____
10. The professor actively involves students in the teaching / learning process:_____
11. The professor’s availability outside of class hours is:_____
12. The professor satisfactorily answers students’ questions in class and in the office:_____
13. Professor clarifies / repeats material that is difficult to understand:_____
14. Professor makes use of the latest technology to improve student’s learning experience:_____
15. Lecture materials (e.g. slide) are helpful for the understanding of the subject material:_____
16. The professor is genuinely concerned that students take valuable experience from the class:_____
17. Considering everything, how would you rate this teacher:_____

What do you not like about Dr. Polikar’s teaching, if any, and what would you suggest that he can do improve?

What do you enjoy about Dr. Polikar’s teaching, if any, that he should continue in this and future classes?

“I’ve got something to say!” Course & Instructor Evaluation – Robi Polikar © Fall 2010.