PHYSICS 516: Mathematical Methods
COURSE SYLLEBUS
SPRING 2018

MEETING TIME AND PLACE: MWF 2:00 – 2:50 PM, GRB W211
INSTRUCTOR: Prof. Satya Nandi
OFFICE: Herman Brown Hall (HBH) 240 **E-MAIL:** sn35@rice.edu
OFFICE HOURS: MWF 3:00 – 4:00 PM

REQUIRED TEXT: "Mathematical Methods of Physics", 2nd Edition, by Jon Mathews and R.L. Walker (Addison-Wesley Publishing Company, ISBN#0-8053-7002-1)

SUPPLEMENTARY TEXT:
G.B. Arfken and H.J. Weber "Mathematical Methods for Physicists", Fourth, Fifth, or Sixth Edition. You don't need to purchase this book. A copy will be placed on reserve at the library.

HOMEWORK: We shall have regular homework assignments. Due dates will be announced in the class. The homework will be graded. The homework assignments are an essential part of the course. It is by doing these that you develop a complete understanding of the course materials, and the problem-solving skills, as well as for your success in the exams. I expect to provide assistance with your difficulties in solving problems. Late homeworks will not be accepted unless an extension has been granted by me due to serious reasons such as sickness or emergency.

EXAMS: There will be a two –hour midterm exam and a three-hour comprehensive final. The dates and times of the exams will be announced in the class. Both exams will be closed-book, closed lecture-notes. However, I will allow two pages of notes for the mid-term, and four pages notes for the final exam. You can write anything on these notes that you think might be useful for the exam. There will be no make-up exams, unless there is a proven, bona-fide reason (due to ill health, a note from your doctor will be required).

ATTENDANCE: You are expected to attend every lecture. If you miss a lecture, it is your responsibility to find out what was covered and what information was given out by the instructor.

DROP or ADD:
The current Rice university policy will be strictly followed. Students should make themselves familiar with this policy to avoid problems later in the semester.

Disability Support Services:

If you have a documented disability or other conditions that may affect your academic performance, you need to discuss it with the Rice Disability Support Services, and get documentation from them regarding your disability need. I will provide the needed accommodation.

GRADING: Grades will be determined based on 100 points apportioned as follows:

Homework:	50
Midterm:	20
Final Exam:	30

The grading scale will be:

$A \geq 90 > B \geq 80 > C \geq 65 > D \geq 50 > F$

The actual dividing line will not be higher that these. They may be lowered to reflect the class distribution and the overall performance of the class. Plus/ minus to the letter grades may be assigned for the scores significantly (as determined by me) above /below the dividing lines.

Course Objective and BRIEF OUTLINE OF THE COURSE MATERIALS

The goal of this course is the equip the students with the mathematical techniques the physics graduate students need for their other graduate glasses (both at the beginning and higher level), as well as their research. This will also be very useful for the undergraduate seniors who are planning for the graduate Studies in Physics. I have taught this course eleven times, and the students have told me that materials covered in this course were very useful for them in their other graduate classes, as well as research. Occasionally, I had graduate students from engineering who also found tis course very useful in their studies.

The course will follow, for the most part, the topics outlined in the required textbook by Mathews and Walker (Ch. 1-4, Appendix A-1, A-2, Ch. 6-9, 11,15). However, more detail and information will be extracted from other texts as necessary. A brief sequence and outline of the course will be as follows:

1. Ordinary differential equations (closed form, power series, approximation methods).
2. Infinite series (convergence, transformations)
3. Evaluation of definite integrals (elementary methods, symmetry arguments).
4. Complex variables (Cauchy's theorem, Laurent Series, Singularities, Contour Integration).
5. Integral transforms (Fourier, Laplace).
6. Vectors and matrices (vector space, linear operators, co-ordinate transformations, Eigenvalue problems, Hilbert space).
7. Special functions (Legendre, Bessel, Hypergeometric).
8. Partial differential equations (General discussion, wave equations, diffusion equations, integral transform method)
9. Eigenfunctions, Eigenvalues and Green's function.
10. Integral Equations
11. Tensor analysis

The last two topics 10 and 11 will be covered as time permits.