

Tentative List of Topics for Phys301: Fall Semester, 2021

- Mathematical Beauty and Laws of Physics; Various notations: Dot and Cross products in terms of δ_{ij} and ϵ_{ijk}
- Lorentz Transformations as rotations in 4D space-time; Warm ups: Binomial and Taylor Expansion, and Applications of Binomial Expansion truncation in Relativity.
- Taylor expansion; Stirling formula, Gaussian Integrals, Various Applications
- Number Theory: Real Numbers, Rational and Irrational Numbers, Farey Tree to generate all Rationals, Continued Fraction Expansion of Irrational Numbers, Ford Circles as pictorial representation of Rational Numbers
- Complex Numbers, Euler Formula; Representing Vectors and Rotations as complex numbers; Solving some simple differential equations using complex functions: Harmonic Oscillator, Cyclotron Problem
- Scalars, Vectors, Tensors and Spinors

The invariance of physical laws under rotations of the coordinate axes requires that they be expressed in terms of quantities such as scalars, vectors, and tensors. These quantities have definite transformation laws under such rotations
- More on Tensors: (a) Moment of Inertial (b) Generalization of Ohms' law: Conductivity Tensor (c) Generalization of Hooke's law: stress tensors (d) More on δ_{ij} and ϵ_{ijk} .
- Spinors: What are spinors: Applications in Quantum Mechanics
- Fourier Series and Fourier Integrals: Applications
- Various Differential equations that we encounter in physics
- Differential Calculus: Gradient Divergence and Curl ; Green's theorem, Stokes theorem
- Curvilinear coordinates: Rectangular, polar, cylindrical and spherical coordinates.

- Ordinary and Partial Differential Equations; Solving Partial Differential Equations by Separation of Variables:
- Symmetries and Special Functions: Bessel functions, Spherical Bessel Functions, Legendre Functions and Spherical harmonics
- More on Matrices ; Normal Modes

Grading Policy

(1) Class participation (25 percent): Your engagement in class and doing assigned home work problems on board when asked. There is zero tolerance for using cell phone during class.

(2) Quizzes (25 percent): There will be short quizzes (unannounced) regularly in class.

(3)Two in Class Tests (50 percent): Test I: Oct 17, Test II: Last Day of Class

Please Note the following :

Cell phones and other communicative devices are not to be used during class. Please keep them stowed away and out of sight. Laptops or tablets may be permitted for the purpose of taking notes only, but you must submit a request in writing to do so. Engaging in activities not related to the course (e.g., gaming, email, chat, etc.) will result in a significant deduction in your participation grade. Regarding electronic devices (such as laptops, cell phones, etc.), please be respectful of your peers and your instructor and do not engage in activities that are unrelated to class. Such disruptions show a lack of professionalism and may affect your participation grade.

We seek to create a learning environment that fosters respect for people across identities. We welcome and value individuals and their differences, including gender expression and identity, race, economic status, sex, sexuality, ethnicity, national origin, first language, religion, age and ability. We encourage all members of the learning environment to engage with the material personally, but to also be open to exploring and learning from experiences different than their own

Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and

disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit <http://ds.gmu.edu/> for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email:ods@gmu.edu — Phone: (703) 993-2474