

## **GPPH - Part I: { Syllabus for 12 Lectures }**

### **Subject: Classical Transport**

[Lectures 1, 2] (heuristic & formal derivations)

Topics:

- o conservation laws & transport
- o collisional relaxation
- o transport in simple (cylindrical) geometry

**Subject: "Neoclassical" Transport** -- "Classical" transport in realistic geometry for various regimes of collisionality

[Lectures 3-8] (heuristic & formal derivations)

Topics:

- o mathematics of toroidal geometry
- o short mean-free-path fluid-like transport ("Pfirsch-Schluter" Regime)
- o long mean-free-path "kinetic" transport ("Banana-Regime")

\*\*\* Note: *Classical, Neoclassical Transport* --- "Irreducible Minimum" level of transport produced by Coulomb collisional relaxation

**Subject: "Anomalous" Transport** -- Enhanced transport due to unstable fluctuating electromagnetic fields causing more rapid loss of confinement well above levels associated with collisional relaxation

[Lectures 9-12] (heuristic & formal derivations)

Topics:

- o drift waves, Shear-Alfven waves
- o ITG instabilities
- o trapped-particle instabilities
- o nonlinear estimates of transport & confinement