**PHYS 3122 – Final – Electrostatics Subjects**

1. ~~Image charge problems~~
2. Calculation of Electric Fields in Matter including concepts of polarization, bound-charges, displacement field **D.**
3. Linear dielectric media and their susceptibility.

**PHYS 3122 – Final – Magnetostatics Subjects**

1. Magnetic force on charged particles
2. Magnetic force on currents (***I***, ***J***, ***K)***
3. Calculation of the magnetic field ***B*** generated by a current distribution (***I***, ***J***, ***K)***
    a. Using the Biot & Savart theory
    b. Using the Ampère theory
    c. Examples of the loop of current, the infinite wire, and the solenoid.
4. Concept and origin of the magnetic vector potential ***A*** and all magnetostatic relationships between ***A***, ***B*** and ***J*** including boundary conditions for ***A*** and ***B*** across current distributions.
5. Calculation of the magnetic field vector potential ***A*** generated by a current distribution (***I***, ***J***, ***K)***
6. Multipole expansion of the vector potential ***A***, in particular dipolar term. Taylor expansion formalism needed to go beyond dipolar order if needed.
7. Magnetic field ***B*** and magnetic vector potential ***A*** of an ideal magnetic dipole.
8. Force and torque on ideal magnetic dipoles. Interaction energy between dipoles.
9. Magnetic field ***B*** and magnetic vector potential ***A*** in matter. Magnetization, bound currents, surface currents. Auxiliary field ***H.***
10. Linear magnetic materials and their susceptibility. Paramagnetism and diamagnetism.