**Week 1: Foundations of Evolution**

**1) Origin of Life**

* Abiogenesis
* Oparin-Haldane Theory
* Miller-Urey Experiment

**2) Chemical Evolution**

* Prebiotic Chemistry
* RNA World Hypothesis

**3) Geological Time Scale**

* Eons, Eras, and Key Events in Earth’s History

**4) Evidences of Evolution**

* Fossils
* Comparative Anatomy
* Embryology
* Molecular Biology

**5) Darwinism**

* Natural Selection
* Peppered Moth Case

**6) Mutation Theory**

* Role of Mutations
* Causes
* Effects
* Examples

***Additional Topics:***

1. *Extremophiles & Early Life*

* *How Extremophiles Inform About Early Life?*

1. *Fossil Record Analysis*

**Week 2: Mechanisms of Evolution**

**1) Modern Synthetic Theory**

* Combining Genetics + Darwinism

**2) Hardy-Weinberg Principle**

* Equilibrium
* Allele Frequencies

**3) Speciation**

* Allopatric Speciation
* Sympatric Speciation
* Polyploidy

**4) Adaptive Radiation**

* Darwin’s Finches
* Hawaiian Silverswords

**5) Mechanisms of Organic Evolution**

* Gene Flow
* Genetic Drift
* Population Bottlenecks

***Additional Topic:***

1. *Neutral Theory of Evolution*

**Week 3: Speciation and Adaptation**

**1) Coevolution**

* Mutualism
* Predator-Prey Arms Races

**2) Python Basics**

**3) Biopython Introduction**

**4) Sequence Databases & BLAST**

**5) Sequence Alignment Concepts**

***Additional Topic:***

1. *Epigenetics & Evolution*

* *Non-Genetic Inheritance Mechanisms*

**Week 4: Human Evolution & Applied Evolution**

**1) Human Evolution**

* Hominin Lineage
* Genetic and Cultural Evolution

**2) Applied Evolution**

* Antibiotic Resistance
* Pesticide Resistance
* Conservation Genetics

**3) Evolutionary Medicine**

**4) Constructing Phylogenetic Trees**

**5) Divergence Time Estimation**

**6) Tree Reliability: Bootstrapping**