

Python for Basketball Sports Science – 10-Week Syllabus

Week 1 – Getting Started with Python & Basketball Context

- Setting up Python environment (Anaconda, Jupyter, VS Code)
- Python basics: variables, data types, simple math
- Basketball application: calculate possessions, pace, and efficiency with Python
- Assignment: Write a script to calculate team pace using game stats

Week 2 – Control Flow & Functions

- Conditionals (if/else), loops (for/while)
- Functions and reusability
- Basketball application: simulate substitutions, write a function for effective FG%
- Assignment: Create a function that calculates multiple advanced stats (TS%, eFG%, USG%)

Week 3 – Data Structures in Basketball Context

- Lists, tuples, dictionaries, and sets
- Organizing rosters, schedules, and player stats
- Nested data structures for lineup management
- Assignment: Build a roster dictionary with player attributes and create queries

Week 4 – Working with Basketball Data

- Importing CSV, Excel, JSON files (pandas intro)
- Cleaning messy basketball datasets (handling missing values, renaming columns)
- Filtering and grouping stats (per game, per 36, rolling averages)
- Assignment: Import a play-by-play dataset and create a cleaned box-score summary

Week 5 – Data Visualization for Basketball

- Intro to matplotlib & seaborn
- Line plots, bar charts, scatter plots
- Basketball applications: shot locations, injury timelines, training load trends
- Assignment: Plot a player's season scoring trend + workload spikes

Week 6 – Intermediate Python & Debugging

- List comprehensions, dictionary comprehensions
- Error handling (try/except)
- Working with datetime (schedules, recovery days)
- Basketball application: simulate a season's back-to-back schedule impact

- Assignment: Write a script that highlights players at highest fatigue risk

Week 7 – Statistics & Basketball Analytics

- Descriptive statistics with NumPy/pandas
- Correlations, regression basics
- Basketball metrics: PER, Plus/Minus, lineup efficiency
- Case study: workload vs. injury risk analysis
- Assignment: Build a custom efficiency rating and compare across players

Week 8 – Sports Science Applications

- Training load analysis (ACWR, monotony, strain)
- GPS & wearable data in Python (distance, accelerations, load spikes)
- Biomechanics data (jump height, sprint speed, heart rate trends)
- Assignment: Analyze a season-long training load dataset and identify red flag weeks

Week 9 – Advanced Visualization & Mini-Projects

- Interactive plots with Plotly
- Shot chart heatmaps
- Injury/recovery dashboards
- Basketball case: back-to-back comparison dashboard
- Assignment: Build an interactive visualization of player performance trends

Week 10 – Capstone Project & Next Steps

- Capstone project presentations (student choice)
- Next steps: Git/GitHub, APIs (NBA stats, Synergy), intro to machine learning
- Final Project Deliverable: A Python-based basketball analytics or sports science tool