

**Dr. Kwon's Golf Biomechanics Instructor Training Program - Level 2**  
**Course Outline (15 hours)**  
(Last updated in February 2021)

**Objectives**

- To share data collected from elite golfers with golf practitioners
- To provide the generalized patterns, descriptive statistics (means and standard deviations), and correlation profiles of key kinematic & kinetic parameters
- To identify important performance variables through data analysis
- To promote evidence-based practices by eliminating misconceptions and misunderstanding on golf swing

**Class 1. Introduction**

- Current database
- Normal distribution (the empirical rule)
- Statistical methods used
  - Normal distribution
  - Correlation analysis
- Golf performance factors
- Swing events & phases

**Class 2: Temporal Profiles**

- Data set
- Times to impact
- BS & DS phase times
- Transition vs. early DS phase time

**Class 3: Functional swing plane**

- Functional swing plane
- FSP orientation
- Data set
- FSP slope vs. body height
- Perspective vs. slope
- FSP position
- Clubhead and hand deviations
- FSP & swing style based on FSP
  - Planar
  - Spiral
  - Reverse spiral
- Reverse spiral vs. FSP direction
- Mid-hand motion plane orientation
- Hand plane direction & swing style

- Square
- Out
- In
- Relative inclination & direction of inclination

**Class 4: Body CM motion**

- Linear motion components
  - Forward/backward
  - Toward/away
  - Up/downward
- Frontal plane motion
- Horizontal CM motion range
  - Away
  - Toward
- Vertical CM motion range & low point position
  - Upward-BS
  - Downward
  - Upward-DS
  - Low point position

**Class 5: Pelvis & thorax motions**

- Linear motion of pelvis CM
- Angular motion of pelvis
- Frontal plane motion of pelvis
- Pelvis horizontal motion ranges
- Pelvis vertical motion ranges
- Pelvis forward/backward motion ranges
- Pelvis rotation ranges & L-rotated position at BI
- Pelvis lateral tilt ranges
- Pelvis P/A tilt ranges
- Angular motion of thorax
- Thorax rotation ranges & positions
- Thorax lean direction ranges and positions

**Class 6: On-plane motion**

- Inclined axle-chain system
- Shoulder/hip line angles
- Shoulder line motion ranges & positions
- Hip line motion ranges & positions
- Upper lever & wrist cock angles

- Upper lever rotation ranges & positions
- Wrist cocking/uncocking ranges & positions
- X-factor studies
  - Summary of X-factor studies
- X-factor
- X-factor stretches
- X-factor & stretch values
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#### **Class 7: Kinematic sequences**

- Angular velocities
- Kinematic sequences in golf
- BS peak angular velocities
- DS peak angular velocities
- Peak wrist cocking/uncocking velocities
- Peak-to-BI angular decelerations
- Peak-to-BI decrease in angular velocity
- Angular velocities at BI
- Summary – angular velocities
- Backswing sequence
- Down swing sequence
- Sensor motion artifacts
- Normal vs. abnormal DS sequences
- Early vs. late release

#### **Class 8: XF stretch vs. kinematic sequences**

- Background
- Shoulder line angular velocity
- XF stretch patterns
- Group data
- Group LBS (large BS stretch)
- Group LDS (large DS stretch)
- Group STS (small total stretch)
- Group LSA (late shoulder acceleration)
- Summary – XF stretch vs. kinematic sequence

#### **Class 9: Ground reaction force**

- Ground reaction force patterns
- Forward/backward GRF patterns
- Peak forward/backward forces

- Combined, lead & trail foot forces
- Toward/away GRF patterns
- Peak toward/away forces
  - Combined, lead & trail foot forces
- Vertical GRF patterns
- Peak vertical forces
  - Combined, lead & trail foot forces
  - Unweighing
- Timings of the GRF peaks

#### **Class 10: Golfer-ground interaction moments**

- Golfer-ground interaction moments
- GRF moments
- Frontal plane GRF moment patterns
- Peak frontal plane GRF moments
  - Combined, lead, and trail
- Frontal plane moments at EPR & TB
- Swing style classification based on the frontal plane GRF moment pattern
  - Moment arm-dominant
  - Force-dominant
  - Hybrid
  - Dual-peak styles
- Frontal plane moment arm pattern
- Peak frontal plane moment arm
- Peak ground reaction moment patterns
- Peak pivoting moments
  - Combined & trail
- Timings of moment peaks

#### **Class 11: Center of pressure motion**

- COP shift patterns
- Peak COP positions
- COP positions at events
- COP velocity patterns
- Peak COP velocity

#### **Class 12: Summary**

- Meaningful swing parameters
- References
- Q & A