APPLICATION FOR NEW COURSE

1. Submitted by College of Education
   Department/Division offering course: KHP

2. Proposed designation and Bulletin description of this course

   a. Prefix and Number: KHP715
   b. Title: Three-dimensional biomechanical analysis of human movement
      *NOTE: If the title is longer than 24 characters (including spaces), write
      A sensible title (not exceeding 24 characters) for use on transcripts
      3-D Biomech Analysis

   c. Lecture/Discussion hours per week: 2.5
   d. Laboratory hours per week: 1
   e. Studio hours per week: 
   f. Credits: 3

3. Course description

   This course will provide an in-depth study of the basic methods of three-dimensional biomechanical analysis of human movement based on the inverse dynamics approach.

4. Prerequisites (if any)

   KHP 615
   or consent of instructor

5. May be repeated to a maximum of (if applicable)

6. To be cross-listed as

7. Effective Date: 8/1/06
   (semester and year)

8. Course to be offered
   ☑ Fall    ☑ Spring    ☐ Summer

9. Will the course be offered each year?
   ☐ Yes    ☑ No
   (Explain if not annually)
   Course is part of a two year rotation and will be offered every other spring

8. Why is this course needed?

   Course is required for Ph.D. in Exercise Science with emphasis is biomechanics. It is recommended for advanced masters students (KHP-biomechanics option)

   This course has been taught under a temporary KHP 782 seminar number.

9. a. By whom will the course be taught? Robert Shapiro

b. Are facilities for teaching the course now available?
   ☑ Yes    ☐ No
   If not, what plans have been made for providing them?
APPLICATION FOR NEW COURSE

10. What enrollment may be reasonably anticipated? 5-10

11. Will this course serve students in the Department primarily? ☑ Yes ☐ No
   Will it be of service to a significant number of students outside the Department?
   If so, explain.
   ☐ Yes ☐ No

Will the course serve as a University Studies Program course?
☐ Yes ☑ No
If yes, under what Area?

12. Check the category most applicable to this course
   ☑ traditional; offered in corresponding departments elsewhere;
   ☐ relatively new, now being widely established
   ☐ not yet to be found in many (or any) other universities

13. Is this course applicable to the requirements for at least one degree or certificate at the
    University of Kentucky? ☑ Yes ☐ No

14. Is this course part of a proposed new program:
    If yes, which?
    ☐ Yes ☑ No

15. Will adding this course change the degree requirements in one or more programs?*
    If yes, explain the change(s) below
    ☐ Yes ☑ No

16. Attach a list of the major teaching objectives of the proposed course and outline and/or reference list to be used.

17. If the course is a 100-200 level course, please submit evidence (e.g., correspondence) that the Community College System has
    been consulted. ☐ Check here if 100-200.

18. If the course is 400G or 500 level, include syllabi or course statement showing differentiation for undergraduate and graduate
    students in assignments, grading criteria, and grading scales. ☐ Check here if 400G-500.

19. Within the Department, who should be contacted for further information about the proposed course?

   Name: Robert Shapiro
   Phone Extension: 7-9852

*NOTE: Approval of this course will constitute approval of the program change unless other program modifications are proposed.
APPLICATION FOR NEW COURSE

Signatures of Approval:

[Signature]
Department Chair

[Signature]
Dean of the College

[Signature]
Date

[Signature]
Date

[Signature]
Date of Notice to the Faculty

[Signature]
Date

[Signature]
Date

[Signature]
Date

[Signature]
Date

[Signature]
Date of Notice to University Senate

*Undergraduate Council

*University Studies

*Graduate Council

*Academic Council for the Medical Center

*Senate Council (Chair)

*If applicable, as provided by the Rules of the University Senate

ACTION OTHER THAN APPROVAL

Rev 3/04
1. Introduction
2. Review of two dimensional methods
   2.1. Data collection techniques
      2.1.1. Calibration
      2.1.2. Tracking of markers
      2.1.3. Smoothing
   2.2. Kinematics
   2.3. Kinetics
      2.3.1. Inverse dynamics
3. Data capture and processing
   3.1. Three-dimensional data collection techniques
      3.1.1. Historical overview
      3.1.2. Photo/videographic methods
         3.1.2.1. Multi-camera
         3.1.2.2. Direct Linear Transformation method
         3.1.2.3. Nonlinear Transformation methods
      3.1.3. Electro-magnetic methods
   3.2. Principles of data analysis
      3.2.1. Coordinate systems
         3.2.1.1. Global
         3.2.1.2. Anatomical
         3.2.1.3. Local
      3.2.2. Subject marker systems
      3.2.3. Determination of coordinate systems based on marker set data
      3.2.4. Subject calibration
      3.2.5. Transformations among coordinate systems
         3.2.5.1. 4×4 matrix calculations
4. Mechanical modeling
   4.1. Determination of joint angles
      4.1.1. Cardan/Euler angle approach
      4.1.2. Joint Coordinate System approach
      4.1.3. Helical angles
   4.2. Three-dimensional kinetics
      4.2.1. Review of anthropometric data
      4.2.2. Review of force plate related calculations
         4.2.2.1. Center of Pressure
      4.2.3. Segment kinematics
         4.2.3.1. Determination of joint centers and segment centers of mass
      4.2.3.2. Calculation of segment kinematics
   4.2.4. Segment kinetics
      4.2.4.1. Forces
      4.2.4.2. Moments
         4.2.4.2.1. Euler equations
      4.2.4.3. Joint Power
5. Implementation and interpretation
5.1. Application software

5.1.1. Implementation of Visual3D (C-Motion Inc)

5.2. Presentation of data
Techniques of Three-Dimensional Biomechanical Analysis Techniques
KHP 715

Instructor: R. Shapiro (7-9852, rshap01@uky.edu)

Office Hours:

Class Time:

Room:

Final Exam Date:

Content: This course will provide an in-depth study of the basic methods of three-dimensional biomechanical analysis of human movement based on the inverse dynamics approach. There will be three main topics of discussion:
1. Data capture and processing
2. Mechanical modeling
3. Implementation and interpretation of three-dimensional analysis
(see attached outline for greater detail)

Objectives: The students will be expected to be able to understand and implement basic methods associated with three-dimensional data collection and calculation of biomechanical variables. The students will also be able to interpret and use appropriately the results of three-dimensional biomechanical analyses.

Credit Hours: 3.0
This course will combine both lecture and laboratory experiences.

Email: Course information will be provided via e-mail. You are required to obtain an e-mail account for this course.

Required Text:


Recommended (these will be on reserve in Young Library):


**Additional Readings:** Selected articles will also be assigned (see attached list for examples)

**Course Evaluation:**
- Homework: 15%
- Laboratory Assignments: 50%
- Final Exam: 35%

**Grading:**
- 90-100% A
- 80-89% B
- 70-79% C
- Below 70% E

*Numbers will be rounded to the nearest whole number: i.e., 89.4 = 89%, 89.6=90%*

**Notes:**

1) Absences: Students are responsible for work missed. Make-ups will be provided for excused absences, as listed in the current edition of the University of Kentucky Bulletin.

2) It is expected that all students abide by the student code with regard to submission of their work. Cheating, plagiarism or other violations of this code will result in the student receiving an "E" grade for the course and may also result in suspension or dismissal from the university. For further information review sections 6.3 and 6.4 of the Senate Rules.
Application for New Course Department of Kinesiology and Health Promotion

Prefix and Number: KHP 715

Title: Three-dimensional biomechanical analysis of human movement

Lecture / Discussion: hours per week 2.5 hours

Laboratory: 1 per week

Credits: 3

Course description: This course will provide an in-depth study of the basic methods of three dimensional biomechanical analysis of human movement based on the inverse dynamics approach.

Prerequisites: KHP 615 or, consent of Instructor

Cross listed as: NA

Rationale: Course is required for Ph.D. in Exercise Science with emphasis in biomechanics. It is also recommended for advanced masters students (KHP -- biomechanics option) This course has been taught under a temporary KHP 782 seminar number.
Professor Shapiro,

New course applications for KHP 715 and KHP 616 have been submitted and are being prepared to be submitted to the Graduate Council. During our review, I noticed the dean's signature is missing from both applications. The signature of the dean or his rep is required before the application can go forward.

Respectfully,

Cleophas V. Price

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People are always blaming their circumstances for what they are. I don't believe in circumstances. The people who get on in this world are the people who get up and look for the circumstances they want, and, if they can't find them, make them.

-- George Bernard Shaw, "Mrs. Warren's Profession" (1893) act II