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Concept-oriented, step-by-step animated, stress-free courses

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Why?

- Problems: (i) **Students' passive participation in class**
  (ii) Innovation that is **technically simple**, yet **"universally" applicable to multiple courses**
- Moto: *'What I hear, I might forget; what I see, I will remember;* ***but what I experience, I will actually know'***
- Objectives: (i) Create and present courses in Structural Eng. in form of an interesting and motivating **raising scheme** that invokes students' interest, keep them attentive and involved i.e., **active in class and at home**, and excites their **wish to deepen their knowledge** on the topic after the lecture
  (ii) Based on **available resources**, **sustainable**, i.e., inexpensive and easy to maintain and upgrade

When?

- 1992: Taken **courses** and exams in **Psychology**, **Pedagogy**, and **Methods of Education**, University of Belgrade, Serbia

  Understanding the variety of psychological profiles of students, variety of pedagogical needs and tools, and variety of educational methods, their advantages, shortcomings, and possible implementations

- 1989-2000: **Home-teaching**, **teaching assistant** (University of Belgrade, Serbia and EPFL, Switzerland)

  Recognizing the shortcomings of "classical" university lectures; identifying the most appropriate methods for teaching various students with different needs; started implementing some of educational ideas

- 2000-2008: **Developed short course** on SHM (while working in industry) for practitioners, researchers and managers

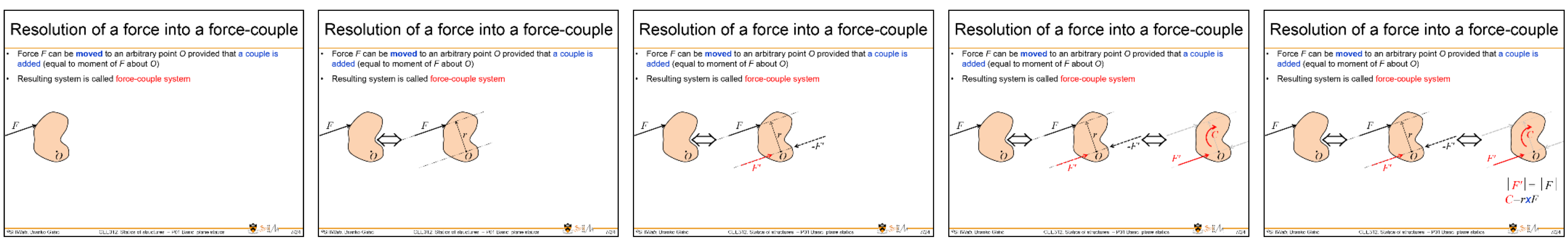
  Implementing the innovative approaches and getting feedback from a very diverse audience; sharpening, enriching, and shaping my educational profile

- 2009-present: **Teaching at Princeton University**

  Attending the lectures of my colleagues, co-teaching the courses, continuous discussions and exchange of ideas; implementing innovative approaches combining theoretical and practical components, both equally important

Where?

- The innovation has been applied at **Princeton University**
- It has been developed **for entire course** (CEE 312 Statics of Structures) and **then emulated for other courses** (CEE 439 / 539 Structural Health Monitoring)
- Concept has also been **extended** to Short Course on Structural Health Monitoring using Fiber Optic Sensors, held annually at Princeton University, targeting **industry, research institutions, and public agencies**, i.e., engineers, managers, researchers, and owners of structures



What?

- (i) **Concept-oriented, yet detailed**, step-by-step animated PowerPoint slides, made available to students

  Allow students to (i) follow the lecture with ease and understanding, ask professor to "rewind" if necessary; (ii) recreate at later time (e.g., at home) a logical sequence in learning process, and (iii) to create an easy-to-use reminder on the course for the future student's needs. **Concept-oriented nature** of the slides allows students to understand the "soul" of topic, while **detailed nature** allows full development of required skills.

- (ii) **"Make-up" and "self-check"** possibilities for "**stress free"** quizzes and exams

  "Make-up": students can take a make-up of interim quizzes and midterm exam if they don't feel satisfied with original results, regardless the grade they got. "Self-check" possibility allows students to "loosely" verify intermediate and final steps of quantitative problems given in quizzes or exams, based on "nice" numbers. Problems are provided as printed forms that minimize calculus and associated errors, allowing students to use their time for the core topics.

- (iii) Simple physical models, professional visits to sites and structures, selection of impressive real-life examples, intriguing homework and challenges, Geomag play sets, and humor, are also used.

Prognosis?

- Impact is documented through **course evaluations** that are both quantitative and qualitative
- The following **challenges** are identified:

  Changing of mindset / perception of objective of higher education among some students (visible shift from "getting education and knowledge" towards "passing exams with high grade")

  Reluctance to practice problems and embrace the value of permanent knowledge (leading to reduced STEM literacy)

  Perception of knowledge ("I am sure that I master the topic") vs. true knowledge created by "mirage" of Internet sources

  Balance between (required) teaching and (expected) entertaining during the lectures

  Overloading students during semester with both important and less important topics

- Expectances from FOEE (i) learn about other innovations, (ii) discuss with peers how to improve engineering education, (iii) get ideas on how to address the above challenges