King Fahd University of Petroleum & Minerals

Mechanical Engineering

Dynamics ME 201

BY

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Outline

- Department Mission
- Textbook
- Grading system
- Homework
- Attendance
- Exams
- Course Coverage
- Section 12.1 Introduction
- Vector and Scalar review
- Distance and Displacement review
- Speed and Velocity
- Examples

Department Mission

The department is committed to providing highest quality education in mechanical engineering, conducting world-class basic and applied research, addressing the evolving needs of industry and society, and supporting the development of more competitive and new industry in the Kingdom of Saudi Arabia.

Textbook

Engineering Mechanics, Dynamics

R. C. Hibbeler, 10th Edition

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Dynamic Study Pack

Grading system

- 10% Homework Assignments
- 20% 1st Major Exam
- 25% 2nd Major Exam
- 10% Quizzes
- 35% Final Exam

Homework (HW)

- HW problems are pre-assigned in syllabus.
- All HW problems assigned during a given week are due in class on the following Wednesday unless stated otherwise.
- Late HW will not be accepted.

Attendance

- According to KFUPM regulations, attendance is **MANDANTORY** and will be checked at the beginning of each lecture.
- The only acceptable excuse for absence is the one authorized by the Deanship of Student Affairs on their prescribed form.
- **For any unexcused absence, 0.5 marks will be deducted from the final grade**. More than 8 unexcused absences will be reported to the registrar office and result in a DN GRADE regardless of the student's grade.

Instructor

- **Office Hours :** 11:00 – 12:00 Daily
- **Location:** Building 22, Room 206
- **Phone:** 860-1330
- **E-mail**: abazoune@kfupm.edu.sa
- **Course Coordinator:** Dr. A. Aziz Bazoune

EXAMS

- **1st Major Exam (20%)**
  - Date: Sat. Oct. 28, 2006;
  - Time: 19:00 → 21:00
  - Location: (OAB)

- **2nd Major Exam (25%)**
  - Date: Mon. Dec. 18, 2006;
  - Time: 20:00 → 22:00
  - Location: (OAB)

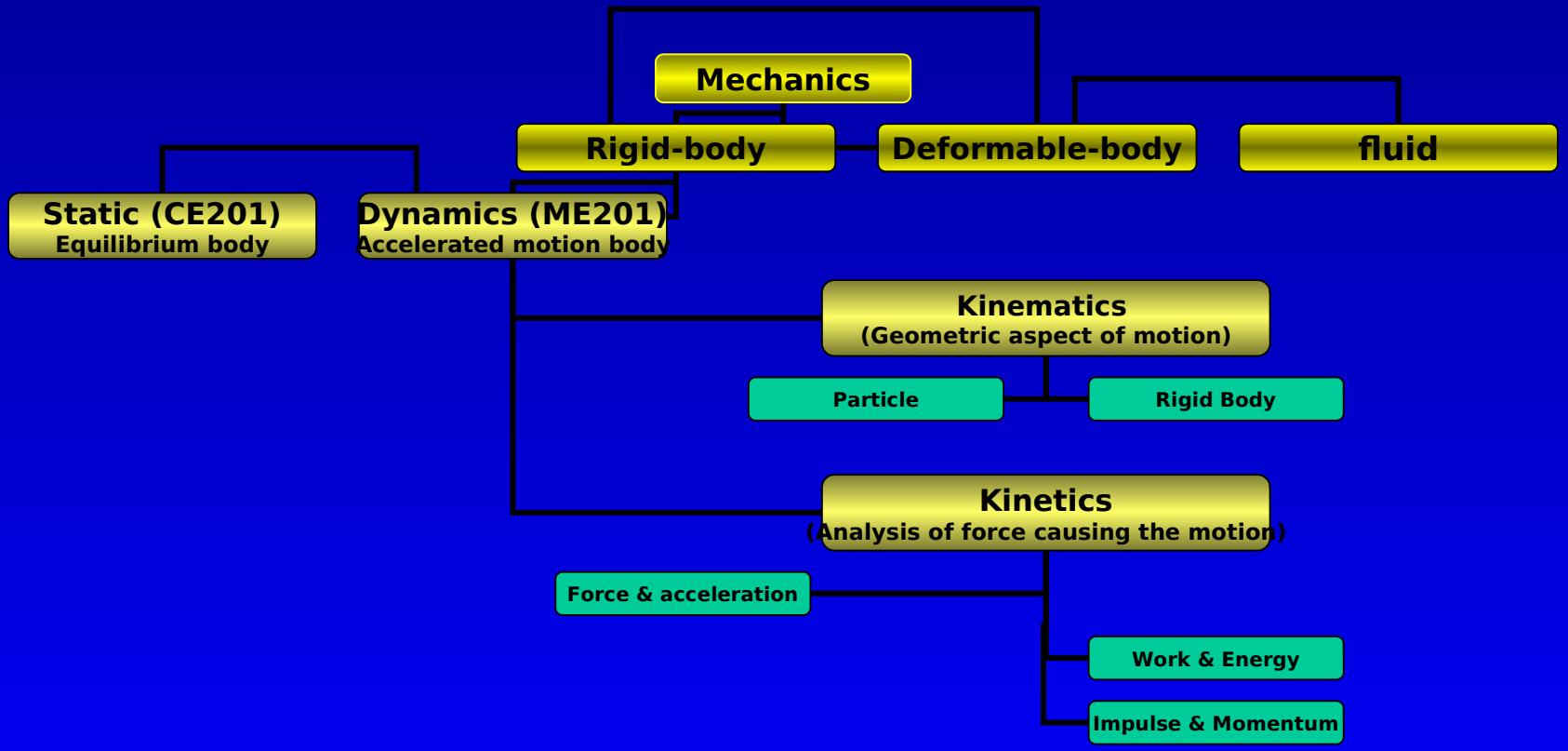
- **Final Exam (35%)**
  - Date: Sun. Jan. 21, 2007;
  - Time: 20:00 → 22:00
  - Location: (To Be Arranged)

Course coverage

- Kinematics of a Particle. (Ch. 12)
- Kinetics of a Particle: Force and Acceleration. (Ch. 13)
- Kinetics of a Particle: Work and Energy. (Ch. 14)
- Kinetics of a Particle: Impulse and Momentum. (Ch. 15)

- Planar Kinematics of a Rigid Body. (Ch. 16)
- Planar Kinematics of a Rigid Body: Force and Acceleration. (Ch. 17)
- Planar Kinematics of a Rigid Body: Work and Energy. (Ch. 18)
- Planar Kinematics of a Rigid Body: Impulse and Momentum. (Ch. 19)

Areas of mechanics (Section12.1)



Areas of mechanics (section12.1)

1) Statics (CE-201)
   - Concerned with body at rest.

$$\sum F_x = 0$$
$$\sum F_y = 0$$
$$\sum M = 0$$

2) Dynamics (ME-201)
   - Concerned with body in motion

1. **Kinematics**: is a study the geometric aspect of the motion.

2. **Kinetics**: Analysis of ***forces*** that causing the motion

$$\sum F_x = ma_x$$
$$\sum F_y = ma_y$$
$$\sum M = I\alpha$$

Review of Vectors and Scalars

- A Vector quantity has both magnitude and direction.
- A Scalar quantity has magnitude only.

- **Scalars (e.g)**
  - distance
  - speed
  - mass
  - temperature
  - pure numbers
  - time
  - pressure
  - area, volume
  - charge
  - energy

- **Vectors (e.g.)**
  - displacement
  - velocity
  - acceleration
  - force
  - weight (force)
  - momentum

Vectors

- Can be represented by an arrow (called the "vector").
- Length of a vector represents its magnitude. F
- Symbols for vectors:
  - (e.g. force) F , or **F** (bold type), or $\vec{F}$

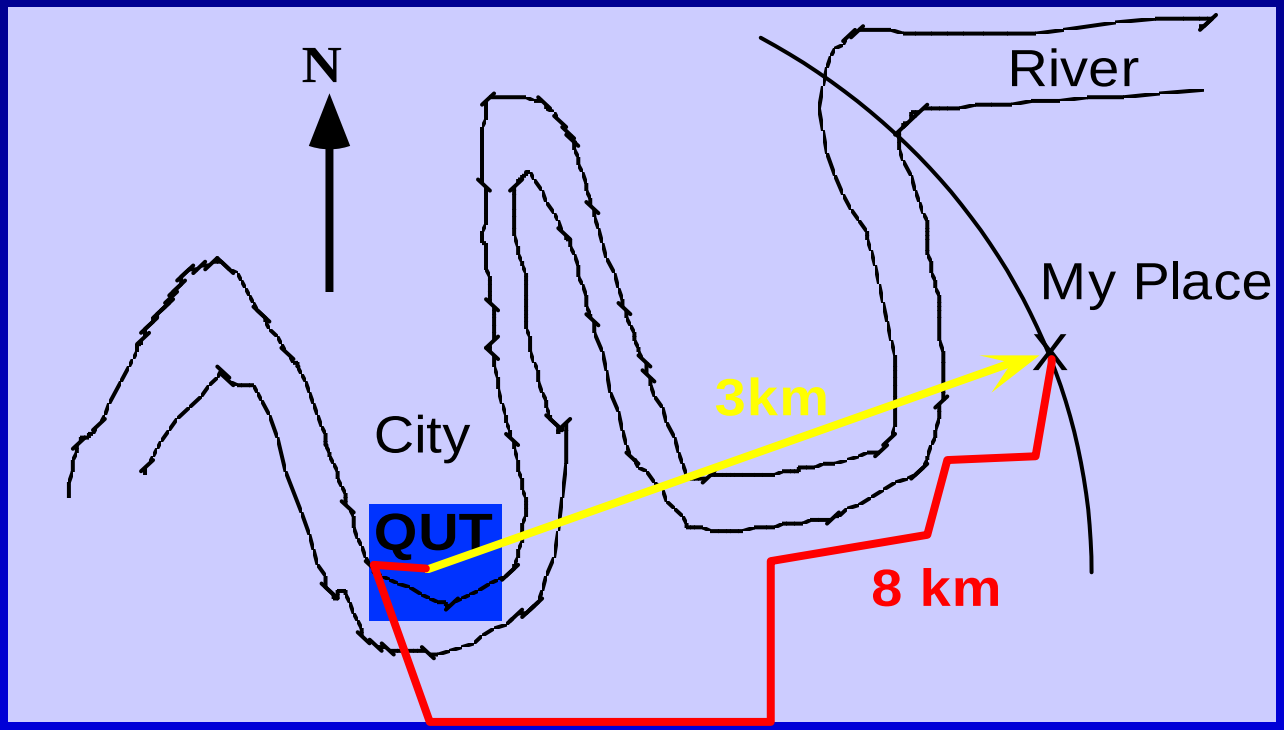


F



2 F

Distance and Displacement



- 8km = Distance
- 3km = Displacement

• Distance

- Total length of path travelled
- Must be greater than (or equal to) magnitude of displacement
- Only equal if path is straight
- Symbol *d*

• Displacement

- Refers to the change in particle's position vector
- Direct distance
- Shortest distance between two points
- Distance between Start and End points
- "as the crow flies"
- Can be describe with only one direction
- Symbol *S*
- $S = X_{final} - X_{initial}$

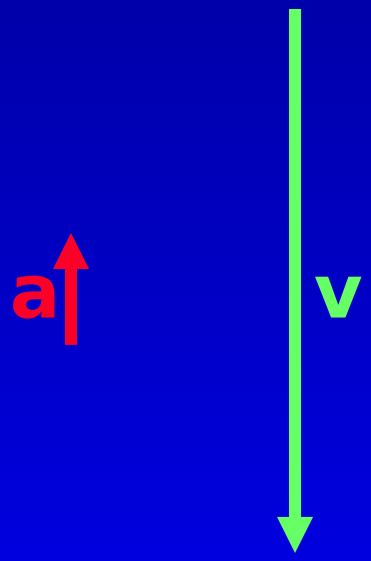
Average Speed and Average Velocity

$$\text{Average Speed} = \frac{\text{distance}}{\text{time}} = \frac{d}{t}$$

$$\text{Average Velocity} = \frac{\text{displacement}}{\text{time}} = \frac{s}{t}$$

$$v = \frac{\Delta x}{t} = \frac{x - x_o}{t}$$

Review



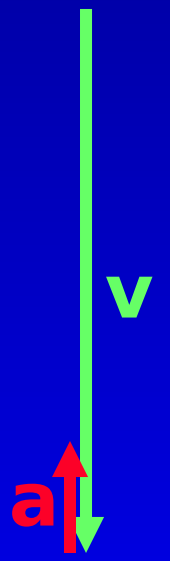
Are you going up or down?

Are you speeding up or slowing down?

What will your velocity be in 1 second?

Review

t=0



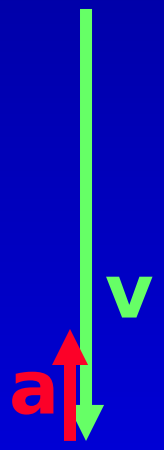
Are you going up or down?

Are you speeding up or slowing down?

What will your velocity be in 1 second?

Review

t=1



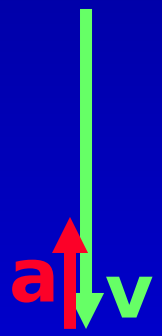
Are you going up or down?

Are you speeding up or slowing down?

What will your velocity be in 1 second?

Review

t=2



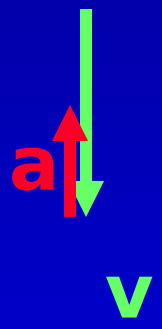
Are you going up or down?

Are you speeding up or slowing down?

What will your velocity be in 1 second?

Review

t=3



Are you going up or down?

Are you speeding up or slowing down?

What will your velocity be in 1 second?

Review

t=4



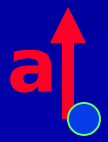
v

Are you going up or down?

Are you speeding up or slowing down?

What will your velocity be in 1 second?

Review



t=5

v

Are you going up or down?

Are you speeding up or slowing down?

What will your velocity be in 1 second?

Review



t=6

v

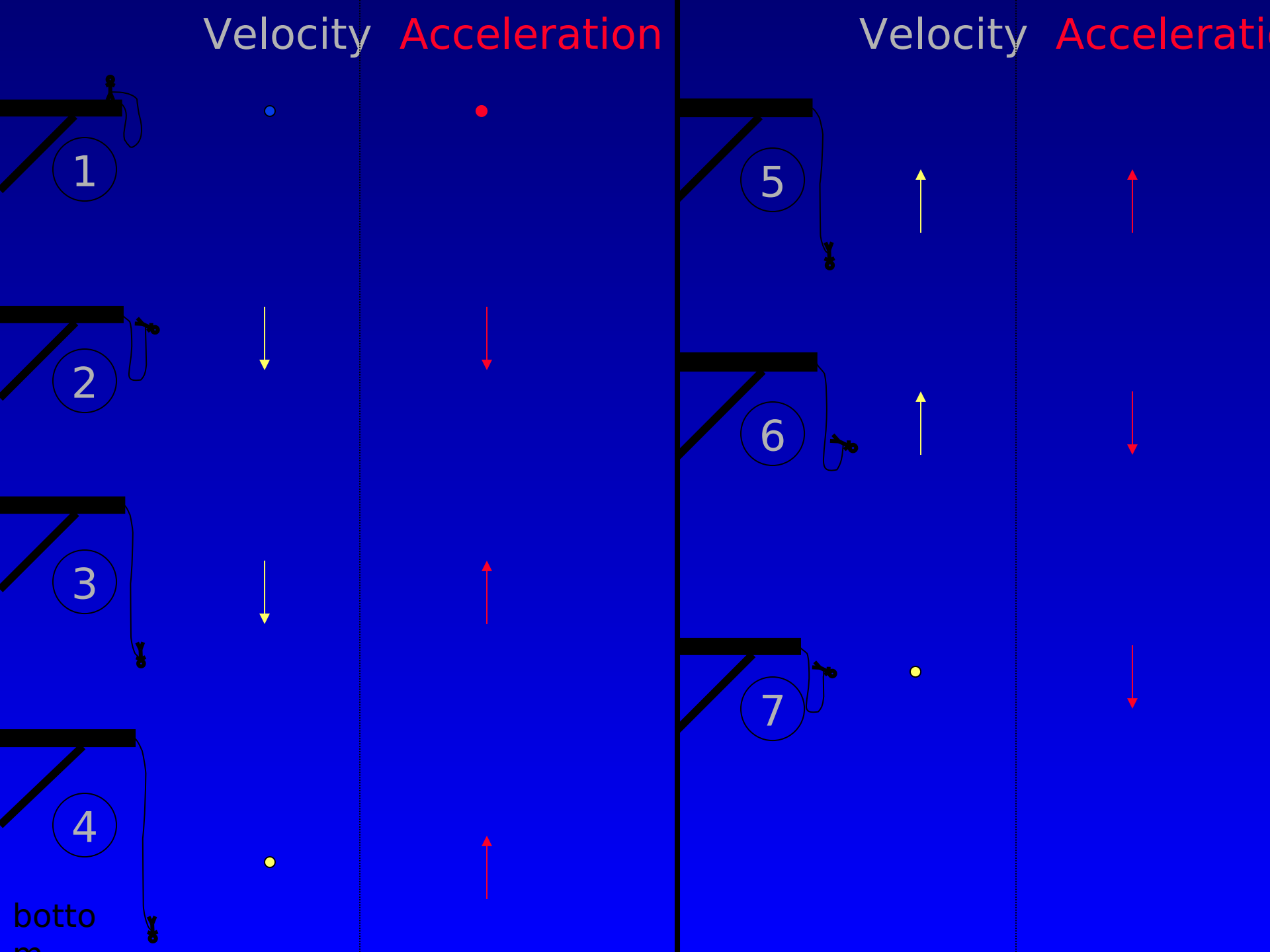
Are you going up or down?

Are you speeding up or slowing down?

What will your velocity be in 1 second?

Bungee Jumping




Velocity
Acceleration
Velocity
Acceleratio
1
2
3
4
5
6
7
botto
m

Thank you