- **The objective of this project is to become familiar with the basic anthropometric concepts.**

- **Follow the "General Project Instructions" handed out in answering the questions below and in preparing and writing your report. Make sure to read the entire project description to make sure you do all the work required.**

INTRODUCTION

Anthropometric measures are fundamental to the development of biomechanical models. Without it, biomechanical models to predict human reach, force, and space requirements cannot be developed. Since anthropometric data is required information for development of biomechanics models, arrangement of workplace, design of machine tools, etc., the standardization and accuracy become essential. The goal of this project is to compare anthropometric measures from two sources:

1) The Drillis and Contini proportionality constants (DC) and
2) Measurements taken from several human subjects (TM)

by determining and comparing these anthropometric dimensions:

1) hip height
2) lower leg link
3) upper leg (thigh) link
4) trunk/torso link
5) arm length (upper and lower arm)
6) vertical grip reach (standing)
7) shoulder width

MATERIALS AND METHODS

All sets of measurements are to be standardized by dividing the body segment lengths by stature in order to make comparisons. Data are provided to you since this is a REMOTE course. Anthropometric measurements were made on three females and three males. Measurements were done using a tape measurement. **Results are to be tabulated in a standardized form and compared to the DC data.** The joint landmarks and link definitions are listed below:

The joint landmarks:

Hip: The hip is represented by the greater trochanter which can be located with the subject in the erect position by finding the flattened depression on the upper lateral aspect of the thigh. It can also be palpated for the greater trochanter by flexing and abducting the leg.

Knee: This joint is located at the lateral aspect of the knee directly onto the joint space just above the head of the fibula.

Ankle: The center of the bony portion of the lateral malleoulus.

C7/T1: Midpoint of the interspace between the 7^{th} cervical and 1^{st} thoracic vertebral bodies; it is located at the distal end of the neck.

Shoulder: The shoulder joint is located at the lateral palpable point of the acromion which is located at the intersection of the clavicle and the humerus.

Elbow: The point between the lateral epicondyle of the humerus and the head of the radius. It can be located at the wrinkle line on the skin.

Wrist: The lowest palpable point on the radius; it is easy to be located when the palm faces the anterior direction.

Center of the hand: The midpoint of the centerline between the tip of the third finger and the wrist

The links of the body segment:

Thigh Link: The straight line between the hip and the knee.
Shank Link: The straight line between the knee and the ankle.
Ankle Link: The ankle height.
Upper Arm Link: The straight line between the shoulder and the elbow joints.
Lower Arm Link: The straight line between the elbow and the wrist joints.
Hand Link: The straight line between the wrist and the center of the hand.
Shoulder Link: The straight line between the left and right shoulders.
Torso Link: The straight line between the C7/T1 and the midpoint of a line passing through the right and left hip joints.

The measurement of the body segment lengths is according to the above landmarks which are also illustrated in Figure 1.

When making your comparisons, there are some obvious things to discuss:

> Do statistics help in interpreting the results? Is experimental error involved? Do the differences found have any implications regarding the use of standardized data for design purposes?

There are also many less obvious points – it is your job to discern and discuss them.

EXPERIMENTAL DATA

Body Part	Male 1	Female 1	Male 2	Female 2	Male 3	Female 3
Overall Height	75.25	65.75	67.5	62.1	70	63
Hip Height	41	37	37	33.25	37.8	34.125
Lower Leg	18	17	17	16	17	15.75
Upper Leg (Thigh)	20	18	15.5	16	18	16.5
Trunk/Torso	24.5	18	22	19.8	23	19.5
Arm Length (Upper and Lower)	22	21.5	21.5	21.3	23	19
Vertical Grip Reach (Standing)	90	79	82.5	75.5	84.2	76
Shoulder Width	19.5	16	16	17	17	13.5

all data are in inches

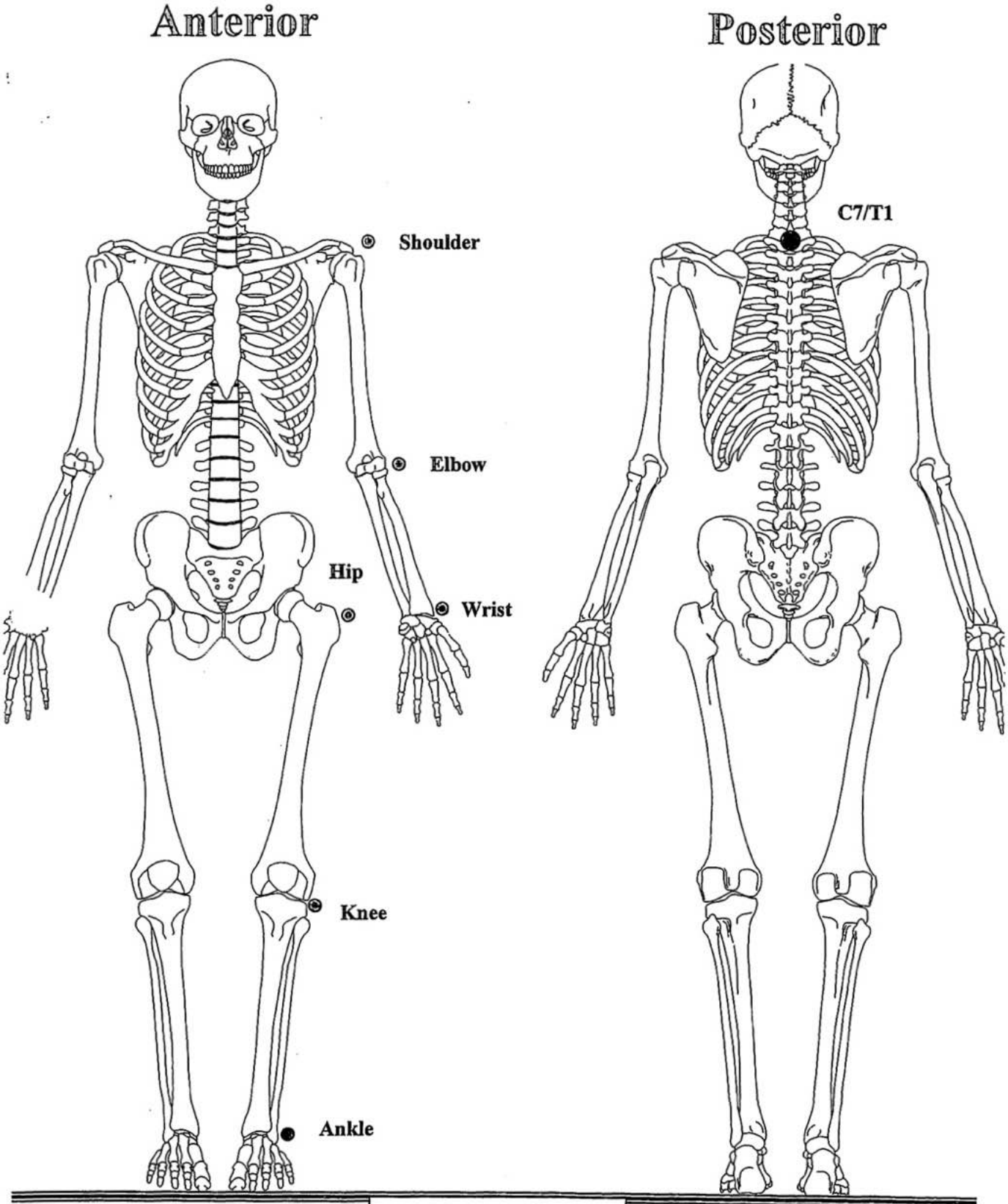
Anterior
Posterior
Shoulder
Elbow
Hip
Wrist
Knee
Ankle
C7/T1

Figure 1-1

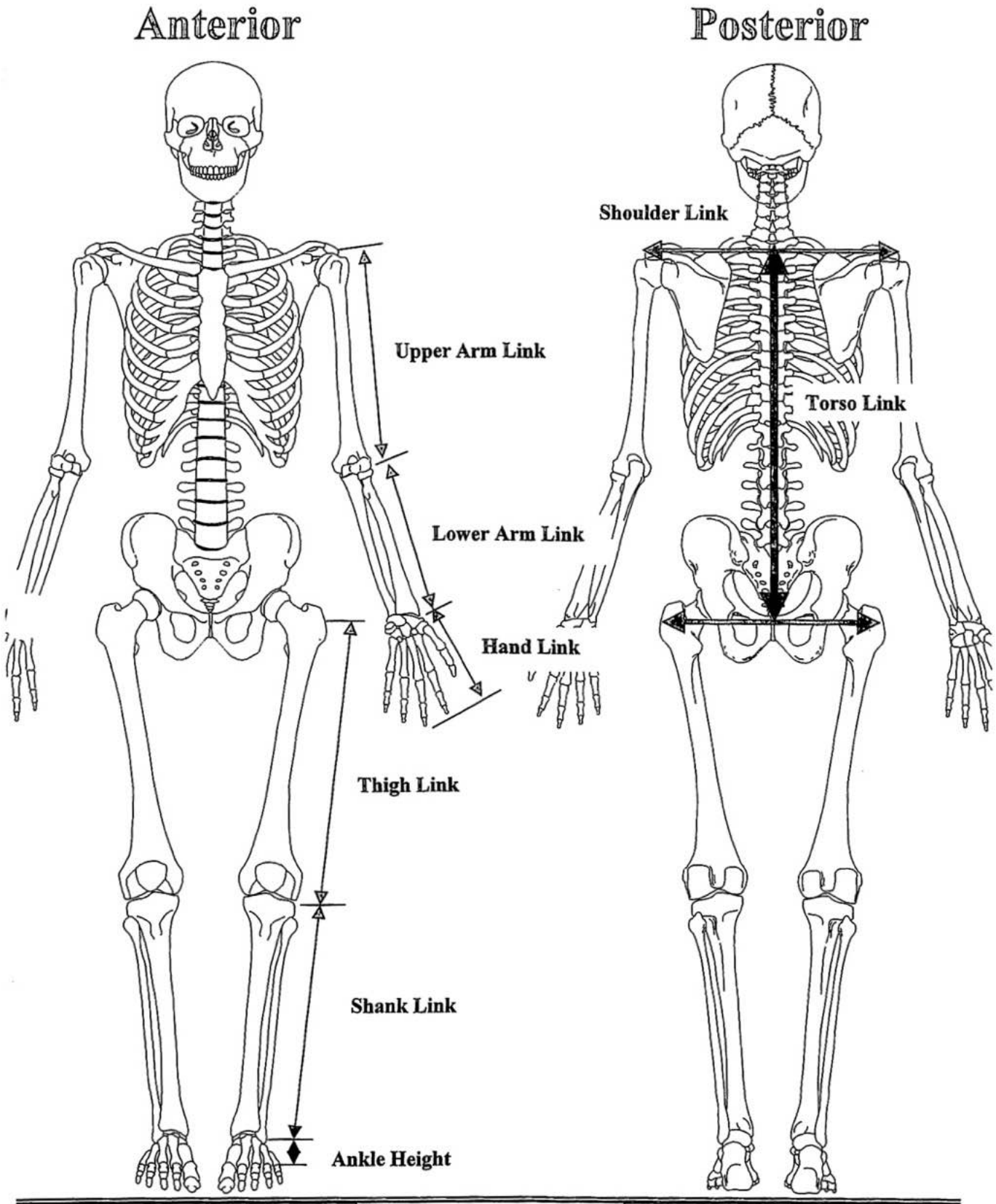
Anterior
Posterior
Shoulder Link
Upper Arm Link
Torso Link
Lower Arm Link
Hand Link
Thigh Link
Shank Link
Ankle Height

Figure 1-2

General Instructions:

1) The project is submitted in a report format.

2) The report is due at the *beginning* of class on the due date.

3) Please write your name on the cover page.

4) The report will be graded on accuracy, completeness, clarity, and other "scientific merits". All data and calculations should be included in your report.

4) **You should have 4 sections in the report**: introduction, materials and methods, results, and discussion and conclusions. You should also have a cover page and a <u>references section if any literature or scientific document is cited</u>.

The following are brief descriptions of what you might include in each section. They are provided for guidance only.

<u>Cover page:</u> Include: Title, course, instructor, date, and author's name.

<u>Introduction:</u> This should include a summary of the problem including the specific questions you will address and why the problem is of interest.

<u>Materials and Methods:</u> What did you use to analyze and solve the problem: software, models, mannequins, subjects, etc? What steps did you take? What **assumptions** did you make? You need to write this section as if you did the experiment and made the measurements on the six subjects.

<u>Results:</u> Results should address the questions you stated in the introduction. Only include data and statistical results, not what you conclude from the data. Lengthy output should be included in Appendices. Tables and/or figures are usually more effective in communicating your findings rather than lists of numbers. Remember, graphs provide an easy way to describe a trend in data.

<u>Discussion and Conclusions:</u> How do you interpret your data/results? What can you conclude relevant to the questions stated in Introduction? How might the **assumptions** you made (and listed in the Materials and Methods) have affected your results and conclusions?

Grading:

Cover Page	3%
Introduction	10%
Materials and Methods	15%
Results	50%
Discussion and Conclusions	15%
Misc. (Clarity, Completeness, Legibility, Grammar, Spelling, etc.)	7%