# Engineering 1D04
**Assignment III**

The following is due at the **BEGINNING** of the tutorial (JHE/317-319) the week of
Feb 3 to 7, 2003:

1) The pseudo-code for the given problem. This must be typed, not hand-written. Make sure that you keep a copy of the pseudo-code so that you can use it to develop your C code. You will also need a copy to hand-in as an appendix for the next assignment.
2) Answers to the question(s) provided at the end of this assignment.

NOTE: Please include your tutorial number on every assignment. Also, remember that at the top of the first page of every assignment the following must be included:

"This assignment represents my own work"

followed by your signature, and your e-mail address. You need to include this information, or your assignment mark will be ZERO. Late assignments should be taken to the Drop-In-Centre (ITB/101). Late assignments will not be accepted after 4:30 on the day of your tutorial.

## Problem

A skier of unknown mass *m* starts from rest at the top *C* of a hill A. The height *h* of the hill A is known. A skier slides downhill and then continues his/her movement along the bottom *DE* of the hill and further uphill (hill B) (Figure 3). The run *CD* (hill A) has an average elevation angle of $\alpha$ and length *L*. The value of *L* is known. The run *EF* (hill B) has an average elevation angle $\beta$ that is known.

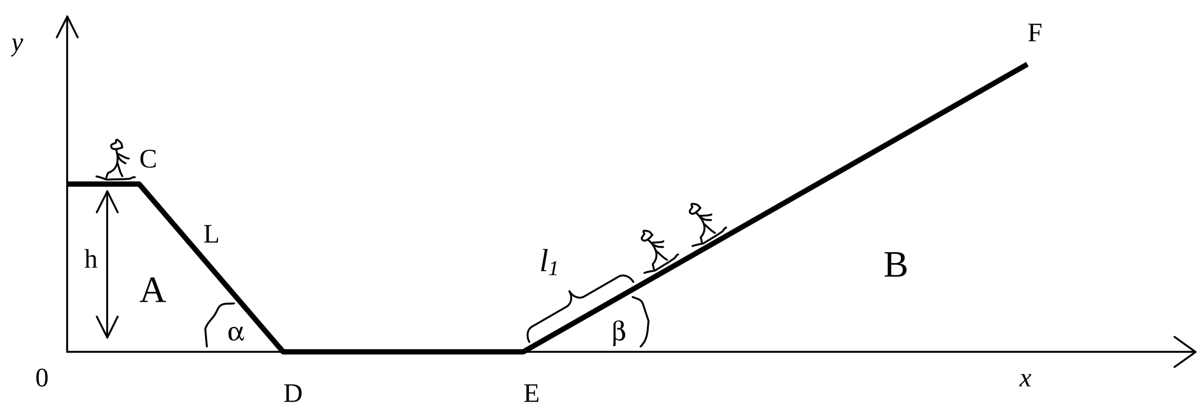


Figure 3

Write data declarations and a pseudo-code for a program to compute and output the following:

i) the angle $\alpha$ of slope *CD* (hill A);
ii) the mass of a skier if his/her potential energy $E_{SKIER}$ at the point C ( the top of the hill A) is known;
iii) the velocity $v$ of a skier at the bottom of the run *CD;*
iv) the potential energy $E_P$ of a skier at two arbitrary locations $l_1$ and $l_2$ along the slope EF (Figure 3);
v) the distance $l_F$ that a skier can run up the hill B using the kinetic energy he or she gained from sliding down the hill A;
vi) a message stating if both chosen distances ($l_1$ and $l_2$) are not attainable by the skier, otherwise, no message.

Neglect the influence of any friction in your calculations. Take into account that the total energy of a closed system is constant.
The potential and kinetic energies of a body of mass $m$ are given by

$E_P = mgh$ and $E_K = \frac{1}{2}mv^2$

respectively.

**Notes**

- Define acceleration due to gravity $g$ and the potential energy $E_{SKIER}$ of a skier at the top of a hill A as constants in your pseudo-code.
- Read values for $h$, $L$, $\beta$, $l_1$ and $l_2$ . Unlike in Assignment I and II, you are now required to check the validity of the input data. You may assume that the user will always enter real numbers (i.e. the user will not enter chars or strings), but the problem definition constrains the valid ranges for the input data. The physics of the problem requires that the input numbers be greater than zero. For each of the input data values, read in the user input. If the input is less than or equal to zero, inform the user and re-prompt for the data. To allow for any number of incorrect data entries, these steps should be placed within a conditional loop. Each of the input variables must be in a separate loop.
- Actual values for the variables are not necessary for this assignment. In the next assignment (Assignment IV) you will be given example values for the variables, which you can use for your calculations.

**Questions**

Besides writing the pseudo-code, also provide short answers for the following questions:

1) We have neglected the influence of any friction in our calculations. What is the reason for making this assumption? Can you give an example of a problem where neglecting friction would not be a good assumption to make calculations?

2) What is problem solving?