Assignment Guidelines

(1) No late submission of assignment problems will be accepted unless previously arranged with the lecturer.
(2) Each assignment question will be marked as follows:
   0 for totally incorrect solution
   1-9 for partially incorrect/correct solution
   10 for correct solution
(3) Solutions of assignment problems must be neatly laid out and all intermediate and final answers clearly highlighted. The detailed working out of the solution must also be included. Failure to do this will result in misinterpretation of your solution which could lead to it being marked incorrectly.
(4) Solutions MUST BE WRITTEN ON ONE SIDE OF EACH PAGE ONLY. If you fail to follow this advice and write on both sides of each page only one side will be marked.
(5) Solutions should be securely attached in a manila folder with your name, surname underlined, student number, engineering department, subject name, subject code and the assignment number clearly marked on the outside. Each page should be numbered at the bottom. If stapled to the folder, only one staple on the top left hand corner of the page please.
(6) Write every second line so that your work can be easily marked.
(7) Every question should be started on a new page.
(8) Marks may be taken off from the total for poor presentation of solution.
(9) When submissions are identical, the mark of one will be divided by the number of identical submissions and this will be awarded to each.
(10) Assignments are to be submitted by the appropriate submission date and time in the handing – in boxes on Level 3 in ME building (outside Purcell room)
(11) Marked assignments will be handed back approximately ten days after they were submitted, during tutorial sessions.
(12) Assignment solutions will be available some time during the semester. You will be informed when and where they are available.
Assignment 2: Hand in your calculations for Questions 1, 2 & 3 (Note 3 questions are due)

TIME/DATA: 10 am Mon 18 April 2016  PLEASE WRITE YOUR TUTORIAL DAY ON THE COVER (Wed, Thu or Fri)

LOCATION: The handing – in boxes on Level 3 in ME building (outside Purcell room)

LATE PENALTIES will be applied.

This assignment should take each student about four and a half hours to complete.

Question 1

A wheel rolls along a curved surface. In the position shown, its angular velocity and angular accelerations are \( \omega = 3 \text{ rad/s} \) and \( \alpha = 5 \text{ rad/s}^2 \) both clockwise. Determine at this instant

a. The angular acceleration of bar E.

b. The acceleration of pin B on the slider block.
**Question 2**
A uniform 5 kg slender bar $OA$ rotates in the vertical plane with angular velocity of $\omega_0=2$ rad/s and angular acceleration $a_0=4$ rad/s$^2$ when the bar $OA$ is horizontal as shown in the diagram. For the position shown calculate

a. The force under the point of contact $B$ of the 10 kg slender bar $AB$.
b. The reaction force at point $O$ on bar $OA$. 

![Diagram of a uniform slender bar $OA$ with point $B$, $O$, and $A$ labeled, and dimensions given: $0.4$ m, $0.8$ m, and $1.0$ m.]
**Question 3(i)**
A 5 kg uniform square plate is supported by two identical 1.5 kg uniform slender rods $AD$ and $BE$. It is held in the position shown by rope $CF$. Determine immediately after rope $CF$ has been cut
a. The acceleration of the plate.
b. The force exerted on the plate at $B$.

![Diagram of Question 3(i)]

**Question 3(ii)**
The uniform circular disk of 300 mm radius has a mass of 25 kg and is pinned freely at $A$ to the uniform slender bar $OA$ of 8 kg mass. The bar $OA$ and the circular disk are released from rest in the position shown and swing in the vertical plane about the fixed point $O$, calculate
a. The force exerted at $O$ on the bar just after release.
b. The force exerted at $O$ on the bar as bar $OA$ swings through the vertical position $OA'$.

![Diagram of Question 3(ii)]
Question 4

The flexible band $F$ is attached at $E$ to the rotating sector and leads over the guide pulley. If the band is given a constant velocity of 4 m/s as shown, determine the angular acceleration of $BD$ at this instant where $BD$ is perpendicular to $OA$.

Question 5

The compound pendulum of mass $m$ and radius of gyration $k_O$ about $O$ is freely hinged to the trolley, which is given a constant horizontal acceleration $a$ from rest with the pendulum initially at rest, with $\theta = 0$. Determine an expression for the angular acceleration $\ddot{\theta}$ and the $n$- and $t$-components of the force at $O$ as functions of $\theta$. Calculate the maximum value reached by $\theta$ if $a = 0.5g$. 
**Question 6**

The assembly consists from 15.3 kg slender rods and 20.4 kg disk. If the spring is unstretched when $\theta=45^\circ$ and the assembly is released from rest at this position, determine the angular velocity of rod AB at the instant $\theta=0^\circ$. The disk rolls without slipping.

Suggested problems from your text book

Ch 16
58, 67, 75, 108, 120.

Ch 17
98, 102, 109, 116.

Ch 18
18, 29, 42, 55, 66.