# Thapar Institute of Engineering and Technology

**DEPARTMENT OF CHEMICAL ENGINEERING**

**Sub Code: UCH502 Sub Name: Mass Transfer-I**
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## Tute Sheet-11
## Pressure Vessel

Q1. The thermal design of a heat exchanger to recover heat from a kerosene stream by transfer to a crude oil stream was carried in Chapter 12, Example 12.2. Make a preliminary mechanical design for this exchanger. Base your design on the specification obtained from the CAD design procedure used in the example. All material of construction to be carbon steel (semi-killed or silicon killed). Your design should cover:

(a) choice of design pressure and temperature,
(b) choice of the required corrosion allowances,
(c ) choice of the type of end covers,
(d) determination of the minimum wall thickness for the shell, headers and ends,
(e) a check on the pressure rating of the tubes,
(f) a suggested thickness for the tube sheets detailed stressing is not required,
(g) selection the flange types and dimensions use standard flanges,
(h) design of the exchanger supports

Q2. A jacketed vessel is to be used as a reactor. The vessel has an internal diameter of 2 m and is fitted with a jacket over a straight section 1.5 m long. Both the vessel and jacket walls are 25 mm thick. The spacing between the vessel and jacket is 75 mm. The vessel and jacket are made of carbon steel. The vessel will operate at atmospheric pressure and the jacket will be supplied with steam at 20 bar. Check if the thickness of the vessel and jacket is adequate for this duty. Take the allowable design stress as 100 N/mm2 and the value of Young's modulus at the operating temperature as 180,000 $N/mm^2$.