

**Thesis title:**

Experimental and Numerical Investigation of Behaviour of Curved Steel Beam Strengthened with Carbon Fibre Reinforced Polymer

**Abstract:**

Steel hollow sections have increased demand in constructions due to their superior properties such as loading in compression, torsion and bending in all directions, an attractive shape for architectural applications, closed shapes without sharp corners reduces the area to be protected and extends the corrosion protection life, lower drag coefficient and the ability use internal voids in various ways. Hollow sections used in constructions may straight or curved (on plane and in elevations). Curved hollow steel beams have many applications such as curved beams for floor slabs, bridge decks, arches of bridges, curved roof structures and many more. A large number of structures constructed with curves hollow steel sections need to be strengthened due to found structural inadequacy due to design errors, loss of material properties while expose to severe environment, increase in service loads and fatigue cracks due to fatigue loading. Carbon Fibre Reinforced Polymer (CFRP) is a proved material to strengthen steel structures due its properties such as high durability and fatigue endurance, superior strength to weight ratio, cost saving through labor saving, flexibility to form all kind of shapes. A considerable number of researches are carried out to investigate the behaviour and durability of CFRP strengthened straight steel hollow beams, a research gap exists on the behaviour of curved steel hollow sections under different load conditions and environmental conditions. This research is to investigate behaviour of curved steel hollow beams under different loading conditions (axial, bending and torsion) and environmental conditions. Proposed research methodology includes testing of CFRP strengthened curved steel beams (in elevation and on plane) at laboratory level and Finite Element Modeling(FEM) using ABAQUS CAE. The results obtained from FEM will be validated by the results of laboratory tests. Based on both tests and FEM results a set of equations will be developed to analyze and design of curved steel hollow steel beams strengthened with CFRP.