WATERLOO | ENGINEERING
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seminar series

PERIDYNAMIC THEORY FOR PREDICTING FAILURE IN SOLIDS

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The classical (local) continuum theory is based on the assumption that a point in a continuum is influenced by the points that are at infinitesimally small distances away from the point of interest. Although this assumption is acceptable at macro scales, its validity is questionable when applied to micro and smaller length scales. Also, the effectiveness of computational techniques such as finite elements in modeling material failure has lagged far behind their capabilities in traditional stress analysis. This difficulty arises because the mathematical foundation on which all such methods are based assumes that the body remains continuous as it deforms. Hence, these methods must treat material failure, especially fracture, as a pathological situation that requires special techniques. The need for a new approach to model failure initiation and its growth becomes more glaring as problems and materials become more complex. These limitations cannot be removed by further attempts to retrofit the standard finite element method. However, a new approach, known as the peridynamic theory, does not suffer from the inapplicability of the classical equations and offers a unique capability to computational modeling of the fracture and failure of materials. The peridynamic theory permits time-dependent analysis at multiple length scales. This new theory will be described and its applications will be demonstrated by considering structures under various loading conditions.

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TIME: **2:30 pm (≤1 h)**

ROOM: **DWE 3517**