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Three-Dimensional Instabilities of Laminar Flow in a Rough Channel JERZY M. FLORYAN, University of Western Ontario — Flow in a channel with distributed surface roughness is considered. Results of the linear stability analysis show that the presence of the roughness destabilizes the traveling-wave instability as well as introducing a new instability that manifests itself in the form of streamwise vortices. The critical conditions for the occurrence of both instabilities are given for different classes of roughness shapes. It is shown that these conditions can be predicted with a reasonable accuracy in the case of an arbitrary (but Fourier transformable) roughness by considering only the leading Fourier mode (wavy-wall model). It is argued that the onset of any type of instability can be used to formally define the conditions that determine when the rough wall ceases to behave as hydraulically smooth wall.

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