Degenerative diseases like osteoarthritis affect millions of people worldwide. Hybrid hydrogels are promising in tissue engineering applications as scaffolds for supporting native cartilage damaged from arthritis. Such gels can be designed and synthesized to be biocompatible and have outstanding mechanical properties, approaching the remarkable behavior associated with native cartilage tissue. However, further improvement in promoting tissue regeneration is needed. Previous work has shown that (poly)peptide-polymer conjugates can be tailored to promote cellular interactions. Integrating peptides into hybrid hydrogels in a controlled manner remains a formidable challenge. This is particularly true in gels that exhibit stimuli-responsive behavior (e.g., triggered gelation) and are thus amenable to relevant processing such as injection. This must be achieved while maintaining the necessary mechanical properties to support normal tissue function. This contribution focuses on hydrogel design using an adaptable hybrid, dual network synthetic scaffold whereby the building blocks are functionalized for specific attachment to peptides. The mechanical properties will be tuned to match those of native cartilage tissue. These results may pave the way toward dynamic materials which can be used to probe cellular interactions.