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**Soft computing in fibrous materials  
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## Soft computing in fibrous materials engineering

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Soft computing is a cluster of modelling and optimisation techniques which mimic the behaviour of biological systems. Artificial neural network (ANN), fuzzy logic (FL) and genetic algorithms (GA) are three main constituents of soft computing. In recent years, soft computing systems have been successfully used in every discipline of science, technology and engineering. Fibrous materials possess a unique combination of characteristics as they are strong, flexible and light weight. Therefore, fibrous materials are gaining increased attention with time from the materials scientists and engineers, when fibrous materials are used for technical applications, the requirement in terms of functional properties becomes more important than the aesthetics. In certain cases, it becomes imperative to get an idea about the properties of the fibrous materials before their manufacturing. As the fibrous materials have inherent variability, evaluation of their properties by mathematical models often yields a very high prediction error. Soft computing systems present the potential solutions for the modelling and optimisation of fibrous materials. This monograph presents a compendium of researches on the application of soft computing techniques in fibrous materials modelling, optimisation and characterisation.

**Keywords:** artificial neural network; fibrous materials; fuzzy logic; genetic algorithm; soft computing

### 1. Introduction

In manufacturing industries, the quality of finished products is influenced by material properties, design/process parameters and manufacturing practices. Determination of relationship between the quality of finished products and influencing factors is a very complex task, as the relationship is often non-linear and there are interactions between the factors. Moreover, the industrial data are generally imprecise, incomplete and noisy. Worldwide, manufacturing industries are experiencing gradual changes, largely characterised by a shift from mass production to flexible, intelligent and engineered production. The style and the quality requirements of products are changing at a very fast pace in the customer-driven market. Therefore, the industries are required to respond quickly and apply to manufacturing products in required quantity with adequate quality. Manufacturing of material products with certain predefined physical, functional and aesthetic attributes is known as engineered production. Structure-property modelling, process modelling, process optimisation and process control are the integral steps of engineered production. Traditionally, mathematical models and statistical tools have been used, with limited success, to model the industrial processes. Therefore, scientists have relentlessly pursued to develop

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