1.	Record Nr.	UNINA9910835062303321
	Autore	Ochsner Andreas
	Titolo	A Numerical Approach to the Simplified Laminate Theory of Composite Materials : The Composite Laminate Analysis Tool—CLAT 1D / / by Andreas Öchsner, Resam Makvandi
	Pubbl/distr/stampa	Cham : , : Springer Nature Switzerland : , : Imprint : Springer, , 2024
	ISBN	9783031479847 303147984X
	Edizione	[1st ed. 2024.]
	Descrizione fisica	1 online resource (158 pages)
	Collana	Advanced Structured Materials, , 1869-8441 ; ; 202
	Altri autori (Persone)	MakvandiResam
	Disciplina	531.7
	Soggetti	Continuum mechanics Composite materials Mathematics - Data processing Continuum Mechanics Composites Computational Mathematics and Numerical Analysis
	Lingua di pubblicazione	Inglese
	Formato	Materiale a stampa
	Livello bibliografico	Monografia
	Nota di contenuto	Introduction -- Simplified Laminate Theory -- Composite Laminate Analysis Tool – CLAT 1D -- Application Examples -- Source Codes -- Index.
	Sommario/riassunto	A typical approach to treat composite materials, which are composed of layered unidirectional lamina, is the so-called classical laminate theory (CLT). This theory is based on the theory for plane elasticity elements and classical (shear-rigid) plate elements under the assumption of orthotropic constitutive equations. The solution of the fundamental equations of the classical laminate theory is connected with extensive matrix operations and many problems require in addition iteration loops. This two-dimensional approach and the underlying advanced continuum mechanical modeling might be very challenging for some students, particularly at universities of applied sciences. Thus, a reduced approach, the so-called simplified classical laminate theory (SCLT), has been recently proposed. The idea was to use solely isotropic one-dimensional elements, i.e., a superposition of bar and

beam elements, to introduce the major calculation steps of the classical laminate theory. Understanding this simplified theory is much easier and the final step it to highlight the differences when moving to the general two-dimensional case. This monograph first provides a systematic and thorough introduction to the simplified laminate theory based on the theory for bars and classical beam plate elements. The focus is on stacking of isotropic layers to simplified laminates. In addition to the elastic behavior, failure is investigated based on the maximum stress, maximum strain, Tsai-Hill, and the Tsai-Wu criteria. We provide a Python-based computational tool, the so-called Composite Laminate Analysis Tool (CLAT 1D) to easily solve some standard questions from the context of fiber reinforced composites. The tool runs in any standard web browser and offers a user-friendly interface with many post-processing options. The functionality comprises stress and strain analysis of simplified lamina and laminates and the failure analysis based on different criteria.