CONTENTS

		Page
§1.	Multilinear algebra	1
	1. The algebra of scalars 2. Modules 3. Tensor products 4. Multilinear functionals 5. Two notions of tensor field 6. F-linear mappings of tensors 7. Contractions 8. The symmetric tensor algebra 9. The Grassmann algebra. 10. Interior multiplication 11. Free modules of finite type 12. Classical tensor notation 13. Tensor fields on manifolds 14. Tensors and mappings	
§2.	Derivations on scalars	25
	1. Lie products 2. Lie modules 3. Coordinate Lie modules 4. Vector fields and flows	
§3.	Derivations on tensors	37
	1. Algebra derivations 2. Module derivations 3. Lie derivatives 4. F-linear derivations 5. Derivations on modules which are free of finite type	
§4.	The exterior derivative	47
	1. The exterior derivative in local coordinates 2. The exterior derivative considered globally 3. The exterior derivative and interior multi- plication 4. The cohomology ring	
§ 5•	Covariant differentiation	57
	1. Affine connections in the sense of Koszul 2. The covariant derivative 3. Components of affine connections 4. Classical tensor notation for the covariant derivative 5. Affine connections and tensors 6. Torsion 7. Torsion-free affine connections and the exterior derivative 8. Curvature 9. Affine connections on Lie algebras 10. The Bianchi identities 11. Ricci's identity 12. Twisting and turning	
§6.	Holonomy	79
	1. Principal fiber bundles 2. Lie bundles 3. The relation between the two notions of connection	

		Page
§ 7•	Riemannian metrics	89
	1. Pseudo-Riemannian metrics 2. The Riemannian connection 3. Raising and lowering indices 4. The Riemann-Christoffel tensor 5. The codifferential 6. Divergences 7. The Laplace operator 8. The Weitzenböck formula 9. Operators commuting with the Laplacean 10. Hodge theory	
§8 .	Symplectic structures	111
	1. Almost symplectic structures 2. Hamiltonian vector fields and Poisson brackets 3. Symplectic structures in local coordinates 4. Hamiltonian dynamics	
§9 .	Complex structures	117
	1. Complexification 2. Almost complex structures 3. Torsion of an almost complex structure 4. Complex structures in local coordinates 5. Almost complex connections 6. Kähler structures	

TENSOR ANALYSIS BY EDWARD NELSON

PRINCETON UNIVERSITY PRESS

AND THE

UNIVERSITY OF TOKYO PRESS

PRINCETON, NEW JERSEY
1967

Copyright © 1967, by Princeton University Press All Rights Reserved

Published in Japan exclusively by the
University of Tokyo Press;
in other parts of the world by
Princeton University Press

Printed in the United States of America