Gautam Buddha University; Greater Noida

School of Engineering (Mechanical Engineering)

Degree	Course Name	Course Code	Marks:100
M. Tech. in Design Engg.	Engineering Fracture Mechanics	MED510	SM+MT+ET 25+25+50
Semester	**Credits**	**L-T-P**	**Exam.**
II	3	3-0-0	3 Hours

Unit – I

Introduction: History and overview of fracture mechanics; LEFM; Griffith energy balance; Instability and R curves; Stress analysis of a crack; Crack tip plasticity; Plain strain fracture Vs friction; Mixed mode fracture ; Interaction of multiple crack. **(08 Hours)**

Unit – II

Elastic Plastic Fracture Mechanics: CTOD; J contour integral; Relationships between J and CTOD; Crack growth resistance curves; J controlled fracture; Crack tip constraints under large scale yielding; Scaling model for cleavage fracture; Limitations of two parameter fracture mechanics. **(08 Hours)**

Unit – III

Dynamic and Time Dependent Fracture: Dynamic fracture and crack arrest; Creep crack growth; Viscoelastic fracture mechanics; Transition from linear to nonlinear behavior. **(07 Hours)**

Unit – IV

Fracture Mechanics in Metals and Nonmetals: Ductile fracture; Cleavage; Ductile- brittle transition; Intergranular fracture; Yielding and fracture in polymers; Fiber reinforced plastic; Ceramic and ceramic composites; Fracture toughness testing of metals and non-metals. **(08 Hours)**

Unit – V

Fatigue Crack Propagation: Similititude in fatigue; Crack closure; Fatigue threshold; Variable amplitude loading and retardation; Growth of short crack; Micro mechanism of fatigue. **(07 Hours)**

Unit – VI

Computational Fracture Mechanics: FEM; BEM; Traditional methods in computational fracture mechanics; Energy domain integral ; Mesh design; Convergence study. **(07 Hours)**

Recommended Books:

1. Elementary Engineering Fracture Mechanics; David and Bruck; Norelco; 1982.
2. Fracture and Fatigue Control in Structure; S. T. Rolfe and J. M. Barson; Prentice Hall; 1968.
3. Fracture Mechanics Fundamentals and Applications; T. L. Anderson; 3rd edition CRC Press; 2005
4. Fracture of Structural Materials by AS Tetelman and A. J. Mc Evily; John Wiley and Sons; 1967.
5. Fracture Mechanics; T. L. Anderson; Taylor and Francis; 3rd Edition.
6. Fracture Mechanics; Prashant Kumar; Mc Graw Hill; 2005.
7. Elastic Plastic Fracture Mechanics; V. Z. Parton; Taylor and Francis; 1992.
8. Deformation and Fracture Mechanics of Engineering Materials; R. W. Hertzberg; Willey Publisher; 1989.