DEPARTMENT OF MATHEMATICS,

UNIVERSITY OF KARACHI,

Course Outline

MATH 507: APPLICABLE DIFFERENTIAL GEOMETRY - I

Course contents:

Notation, conventions and recapitulations of vector space theory. Affine spaces and subspaces, hyperplanes. Affine coordinate transformations. Affine maps. Smooth curves and functions on affine spaces. Tangent vectors; directional derivatives and derivations. Tangent space. Transition to Euclidean space and Frenet-Serret formulae. Cotangent space; co-vectors or 1-forms. Curvilinear coordinates; coordinate transformations. Induced maps. Parallelism and covariant derivatives. Vector and co-vector fields; lie derivative. General tensor: tensor algebra. Construction of new tensors from given tensor. Exterior algebra. Tensor fields and form fields. Calculus of forms: exterior derivatives. Lie derivatives. Closed and exact forms.

Books Recommended:

1. Crampin, M. and Pirani, F. A. E., Applicable Differential Geometry, CUP, 1986.
2. Goetz, A., Introduction to Differential Geometry; Addison Wesley, 1970.
3. Milman, R. and Parker, G., Elements of Differential Geometry; Prentice Hall Inc., 1977.
4. O' Neill, B., Elementary Differential Geometry; Academic Press, 1995.
5. Chorlton, F., Vector and Tensor Methods, Ellis Horwood, 1976.
6. Sharma, S. C., Complex Integration, First Edition, Discovery Publishing House, New Delhi, 2007.