20BSM410T					Mathematical Physics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs. / Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To be able to understand deep science concepts on the ground of tensors.
- To be able to apply the Z – Transforms in relevant physical problems.
- To be able to understand the role of Fourier series in periodic systems.
- To study the various aspects and properties of curvilinear co-ordinate system.

UNIT 1 BASICS OF TENSORS **08 Hrs.**

Summation convention, Kronecker delta, Determinant, Four vectors, transformation of coordinates, tensor, symmetric tensor, anti-symmetric tensor, algebra of tensors, contraction.

UNIT 2 Z – TRANSFORMS **10 Hrs.**

Introduction, sequence, representation of a sequence, definition of a z-transform, change of scale, shifting property, Inverse z-transform, solution of difference equations, Multiplication by K, Division by K, Initial value, final value, partial sum, convolution, convolution property of Casual sequence, Transform of Important sequences, Inverse of Z-transform by division

UNIT 3 FOURIER SERIES AND FOURIER TRANSFORM **12 Hrs.**

Application. Summing of Infinite Series. Term-by-Term differentiation and integration of Fourier Series. Parseval's Identity and its applications, Complex Form of Fourier Series, Fourier Transform.

UNIT 4 CURVILINEAR CO-ORDINATE SYSTEM **10 Hrs.**

Coordinate systems, Orthogonal curvilinear co-ordinates, Condition for Orthogonality, Reciprocal sets of two triads of mutually orthogonal vectors, Gradient in terms of orthogonal curvilinear co-ordinates, Divergence in terms of orthogonal curvilinear co-ordinates, Curl in terms of curvilinear coordinates, Laplacian in terms of curvilinear co-ordinates.

40 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Identify the use of tensors theoretically and relate them with the scalars and vectors and why the study evolved.
CO2 – Understand various application of tensors in Physics and other deep scientific phenomena on the basis of the knowledge gained.
CO3 – Explain the Z – Transforms to extract the solutions of engineering problems.
CO4 – Analyze various periodical systems on the ground of Fourier series.
CO5 – Appraise interconnection between rectangular and curvilinear co-ordinate system.
CO6 – Produce the relations of Gradient, Divergence and Curl in curvilinear co-ordinate system.

TEXT / REFERENCE BOOKS

1. J. K. Goyal, and K. P. Gupta, Theory of Relativity (Special & General), 22nd ed., Krishna Prakashan Media (P) Ltd., 2014.
2. G. B. Arfken, H. J. Weber and F. E., Harris, Mathematical Methods for Physicists, 4th ed., Elsevier, 2005.
3. H. K. Dass, Advanced Engineering Mathematics, 1st ed. (Reprint), S. Chand, 2009.
4. Mary L Boas, Mathematical Methods in Physical Science, 3rd ed., John Wiley & Sons, 2005.
5. B. D. Gupta, Mathematical Physics, 4th ed., Vikas Publishing House Pvt. Ltd., 2018
6. D. Spellman, M. Spiegel and S. Lipschutz, Vector Analysis, 2nd ed., Schaum's Outline Series, 2009.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs.**
Part A: 6 questions of 4 marks each	24 Marks
Part B: 6 questions of 8 marks each	48 Marks
Part C: 2 questions of 14 marks each	28 Marks