DEPARTMENT OF MATHEMATICS

Semester : IX **Integrated M.Sc. Mathematics** **Academic Year : 2019-20**

Subject : 060090901 Higher Transcendental Functions

Teaching Schedule

Course Objectives: To understand the fundamentals concept of transcendental function and its application.

Course outcomes: Upon completion of the course, students shall be able to
CO1: analyze the properties of hypergeometric functions.
CO2: understand properties of generating function.
CO3: basic theory of orthogonal polynomials.
CO4: explain the applications and the usefulness of special functions:
CO5: demonstrate their understanding of how physical phenomena are modeled using special function:

Unit	Sub Unit	No. of Lect.(s)	Topics	Reference Chapter/ Additional Reading	Teaching Methodology to be used	Active Learning Activities	Evaluation Parameter
Unit 1: Hypergeometric Functions							
[15]	1.1	2	Hypergeometric equation	CH#2 Special Functions Andrews, G.E., R. Askey and R. Roy	Chalk & Talk	**For Slow Learner:** Students must write some theorems given by teacher after completion of unit **For Active Learner:** Student will find the application related to theorems after completion of Unit.	Assignment-1
	1.2	3	Hypergeometric function				
	1.3	3	Integral representation				
	1.4	3	Differentiation of Hyper geometric function				
	1.5	4	Confluent Hyper geometric function and its integral representation				
Unit 2: Theory of Generating Functions							
[15]	2.1	4	Generating functions of the form G(2xt-t2), etØ(t), A(t)exp[-xt/(1-t)](1-t)-q⊗[4xt/(1-t)]	CH#8 Special Functions E.D.Rainville	Chalk & Talk	**For Slow Learner:** Students must write some theorems given by teacher after completion of unit	Unit Test -1 & Assignment-2

	2.2	4	Boas and Buck Type			**For Active Learner:** Student will find the application related to theorems after completion of Unit.	
	2.3	3	Pure recurrence relations				
	2.4	4	Appell, Sheffer and 0-type characterizations of polynomial sets				
Unit 3: Orthogonal Polynomials							
[15]	3.1	1	Introduction	CH#5 Special Functions Andrews, G.E., R. Askey and R. Roy	Chalk & Talk	**For Slow Learner:** Students must write some theorems given by teacher after completion of unit **For Active Learner:** Student will find the application related to theorems after completion of Unit.	Unit Test -2 Assignment-3
	3.2	3	The moment functional and orthogonality				
	3.3	2	Existence of OPS				
	3.4	3	The fundamental recurrence formula				
	3.5	3	Zeros, Gauss quadrature, Kernel polynomials				
	3.6	3	Symmetric moment functional, certain related recurrence relations				
Unit 4: Basic Hypergeometric Series & their Applications							
[15]	4.1	3	Introduction to Basic Hyper geometric series	CH#10 Special Functions Andrews, G.E., R. Askey and R. Roy	Chalk & Talk	**For Slow Learner:** Students must write some theorems given by teacher after completion of unit **For Active Learner:** Student will find the application related to theorems after completion of Unit.	Internal Examination Assignment-4
	4.2	6	q-analogue of orthogonal polynomials				
	4.3	6	q-Gamma and q-Beta functions				

Text books:

1. Andrews, G.E., R. Askey and R. Roy, "Special Functions", Cambridge Univ. Press, 1990.

Reference books:

1. Bailey W.N.,"Generalized Hyper geometric series" Stechert-Hafner Service Agency, New York and London, 1964.
2. Copson E.T.,"introduction to the theory of functions of a complex variable", The English Language Book Society, London, 1978.
3. Chihara, T.S., "Introduction to orthogonal polynomials", Gordon and Breach Science Publishers Inc., New York, 1978.
4. Saxena R.K., Mathai A.M., Hans J. Haubold, "The H-functions, Theory and Applications", Springer, 2010.

Course Objectives and Course Outcomes Mapping:

- To understand the fundamentals concept of transcendental function and its application - CO1, CO2, CO3, CO4, CO5.

Course Units and Course Outcomes Mapping:

Unit No.	Unit	Course Outcomes				
		CO1	CO2	CO3	CO4	CO5
1	Hypergeometric Functions	✓				
2	Theory of Generating Functions		✓			
3	Orthogonal Polynomials			✓		
4	Basic Hypergeometric Series & their Applications	✓			✓	✓

Programme Outcomes (PO)

PO1: Knowledge

Provides knowledge about the fundamentals of pure, applied and computing mathematics and its applications to students that creates the opportunities in industries and research centers.

PO2: Core Competence

Creates competency in science and mathematics to formulate, analyses and solve problem and/or also to pursue advanced study or research.

PO3: Breadth

Trains students having good knowledge in unearth core of academia and industry by the roots of mathematics.

PO4: Evaluation

Imparts in students to raise trial and error-based curiosity and problem-solving functionality with research based advanced tutorial for higher level decision makings tools.

Programme Outcomes and Course Outcomes Mapping:

Programme Outcomes	Course Outcomes				
	CO1	CO2	CO3	CO4	CO5
PO1	✓	✓			
PO2		✓	✓	✓	
PO3			✓	✓	✓
PO4				✓	✓