TEACHING PLAN: Sequences and Series and Trigonometry

SCHOOL: (SOBAS) SCHOOL OF BASIC AND APPLIED SCIENCE		ACADEMIC SESSION: 2023 - 2024			FOR STUDENTS' BATCH: B.Sc 2^{nd} Sem.
1	Course No.	MA-102			
2	Course Title	**Sequences and Series and Trigonometry**			
3	Credits	**2**			
4	Learning Hours	Per week two lectures Total hours; 28			
5	Course Objective	1. Analyze boundedness in real numbers, identify sets' properties, and understand open and closed sets. 2. Explore foundational theorems like Bolzano-Weierstrass and Heine-Borel for compactness criteria. 3. Master sequence theory, including convergence principles and divergence analysis of infinite series. 4. Develop proficiency in trigonometric functions, De Moivre's theorem, and logarithmic properties.			
6	Course Outcomes	1. Comprehend boundedness, sets, and open/closed sets in real numbers. 2. Apply Bolzano-Weierstrass and Heine-Borel theorems to analyze sets. 3. Understand sequences, convergence, and divergence of series. 4. Master trigonometric functions, De Moivre's theorem, and logarithmic properties.			
7	Outline syllabus:				
7.01	Paper Code	Unit	Introduction	Page Numbers[1]	Lectures
7.02	Unit I	(a)	Boundedness of the set of real numbers; least upper bound, greatest lower bound of a set,	1.1 to 1.11	1,2
		(b)	neighborhoods, interior points, isolated points, limit points, open sets, closed set, interior of a set,	2.1 to 2.15	3,4
		(c)	closure of a set in real numbers and their properties. Bolzano-Weiestrass theorem, Open covers, Compact sets and Heine-Borel Theorem.	3.1 to 3.16	5,6,7
7.03	Unit II	(a)	Sequence: Real Sequences and their convergence, Theorem on limits of sequence, Bounded and monotonic sequences, Cauchy's sequence, Cauchy general principle of convergence, .	**3.17 to 3.30**	**8,9,10**
		(b)	Subsequences, Sub-sequential limits. Infinite series: Convergence and divergence of Infinite Series, Comparison Tests of positive terms Infinite series: Cauchy's general principle of Convergence of series,	**3.31 to 3.35**	**11,12**
		(c)	Convergence and divergence of geometric series, Hyper Harmonic series or p-series. D-Alembert's ratio test, Raabe's test, Logarithmic test, Cauchy's Nth root test	**4.1 to 4.50**	**13,14**
7.04	Unit III	(a)	De Moivre's Theorem and its Applications.	**5.1 to 5.13**	**15,16**
		(b)	Expansion of trigonometrical functions.	**6.1 to 6.25**	**17,18, 19**

		(c	Direct circular and hyperbolic functions and their properties.	**6.26 to 6.30**	**20,21**
7.05	**MA 303 Unit IV**	(a)	Inverse circular and hyperbolic functions and their properties	**7.1 to 7.17**	**22,23**
		(b)	Logarithm of a complex quantity. Gregory's series	**7.18 to 7.30**	**24,25, 26**
		(c)	Summation of Trigonometry series.	**8.1 to 8.13**	**27,28**

8	**Course Evaluation**	
8.1	**Attendance**	5%
8.2	**Homework**	4 Assignments, 5%
8.3	**Quizzes**	2Quizzes, 5%
8.4	**Projects**	1 Project, 5%
8.5	**Presentation**	1 Presentation, 5%
8.2	**MTE**	20%
8.3	**End-term examination: 60%**	
9	**Text Books & References**	
9.1	**Text book**	1. Sequences and Series and Trigonometry, Jeevansons publication Sequences and Series and Trigonometry, Wiley Eastern Ltd., New Delhi
9.2	**References**	
9.3	**Video References**	

QUESTION BANK

Unit -I

Q.1

Show that set of all rational number is not a closed set and also it is not an open set

OR

Q.2

Show that every non empty open set is union of open interval

Unit - II

Q.3 Show that the series $\sum_{n-1}^{\infty} \frac{1}{n(n+1)}$ convergence to 1

OR

Q.4 Show that the series $\sum_{n-1}^{\infty} \frac{1}{n(n+2)}$ converges to $\frac{3}{4}$

Unit - III

Q.5 Using the Cauchy root test discuss the convergence

$\sum_{n=1}^{\infty} (n^{1+1/n})^{-n}$

OR

Q.6 Test for convergence

$\sum_{n=1}^{\infty} \frac{2^{n-1}}{3^{n+1}}$

Unit -IV

Q.7 Using Cauchy integral test ,Discuss the convergence

$\sum_{n=1}^{\infty} \frac{1}{2n+1}$

OR

Q.8 Show that the series $\sum_{n=1}^{\infty} \frac{sinnx}{n^p}$,P> 0 converges for all real x