P.B. SIDDHARTHA COLLEGE OF ARTS & SCIENCE

Siddhartha Nagar, Vijayawada – 520 010
Reaccredited at 'A+' level by NAAC
Autonomous & ISO 9001:2015 Certified

Title of the Course: TOPOLOGY
Semester : I

Course Code	22MA1T4	Course Delivery Method	Blended Mode
Credits	4	CIA Marks	30
No. of Lecture Hours / Week	4	Semester End Exam Marks	70
Total Number of Lecture Hours	60	Total Marks	100
Year of Introduction : 2020-2021	Year of offering : 2022-2023	Year of Revision: 2022-23	Percentage of Revision :10%

Course Objectives : The main objective of this course is to generalize the concepts of distance, open sets, closed sets in real line and to learn concepts in Metric Spaces, Topological Spaces, compact spaces and connected spaces.

Course Outcomes: After successful completion of this course, students will be able to

CO-NO	COURSE OUTCOME	BTL	PO	PSO
CO1	understand the basic concepts of metricspaces and complete metric spaces.	**K3**	**1**	**1**
CO2	understand the properties of Topological spaces, open bases and open subbases	**K3**	**3**	**1**
CO3	characterize compactspaces and understand Ascolis theorem.	**K3**	**5**	**2**
CO4	differentiate T_1-spaces and Hausdorffspaces.	**K3**	**5**	**1**
CO5	understand the concepts of connectedspaces, components and totally disconnected spaces.	**K3**	**1**	**1**

Mapping of Course Outcomes:

CO-PO-PSO MATRIX										
	CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
22MA1T4	**CO1**	**2**								**3**
	CO2							**2**		**3**
	CO3							**3**		**3**
	CO4	**3**								**3**
	CO5	**2**							**2**	

UNIT-I

Metric Spaces: The Definition and some examples, Open sets, Closed sets, Convergence, Completeness and Baire's theorem. [Sections 9 to 12 of chapter 2 of the Prescribed book]

UNIT-II

Topological spaces : The Definition and some examples, Elementary concepts, Open bases and Open subbases. [Sections 16 to 18 of chapter 3 of the Prescribed book]

UNIT-III

Compactness: Compact spaces, Products of spaces, Tychonoff's theorem and Locally Compact spaces, Compactness for Metric Spaces, Ascoli's theorem.

[Sections 21 to 25 of chapter 4 of the Prescribed book]

UNIT-IV

Separation: T_1 spaces and Hausdorff spaces, Completely regular spaces and normal spaces, Urysohn's Lemma and the Tietze extension theorem.

[Sections 26 to 28 of chapter 5 of the Prescribed book]

UNIT-V

Connectedness: Connected spaces, The components of a space, Totally disconnected spaces. [sections 31 to 33 of chapter 6 of the Prescribed book]

PRESCRIBED BOOK:

1. G.F. Simmons, "**Introduction to Topology and Modern Analysis**", Mc.Graw Hill Book Company , New York International student edition.

REFERENCE BOOKS:

1. James R Munkers, " **Topology**", Second Edition, Pearson Education.
2. John L Kelly, **"General Topology",** Springer, 2005.

Course has Focus on : Foundation

Websites of Interest:
1. www. nptel.ac.in
2. www.epgp.inflibnet.ac.in
3. www.ocw.mit.edu

P B SIDDHARTHA COLLEGE OF ARTS AND SCIENCE::VIJAYAWADA

(An Autonomous college in the jurisdiction of Krishna University)

M. Sc. Mathematics

First Semester

TOPOLOGY –22MA1T4

Time: 3 Hours **Max. Marks : 70**

SECTION-A

Answer all questions **(5X4=20)**

1 a) Define a Metric space and give an example. (CO1, L1)

(OR)

b) Define Convergent sequence and Cauchy sequence in a metric space. (CO1, L1)

2 a) Define Topological space and give an example. (CO2, L1)

(OR)

b) Show that $\bar{A} = A \cup D(A)$. (CO2, L1)

3 a) Define a Compact space and give an example. (CO3, L1)

(OR)

b) State Ascoli's theorem. (CO3, L1)

4 a) Define T_1 space and Hausdorff space. (CO4, L1)

(OR)

b) Define a normal space and a completely regular space. (CO4, L1)

5 a) Define a connected space and totally disconnected space. (CO5, L2)

(OR)

b) Show that every discrete space is totally disconnected. (CO5, L2)

SECTION-B

Answer all questions. All questions carry equal marks. **(5X10=50)**

6 a) Let X be a metric space. Then prove that (i) Any finite intersection of open sets is open. (ii) Each open sphere is an open set. (CO1, L2)

(OR)

b) State and prove the Cantor's intersection theorem. (CO1, L2)

7 a) State and Prove Lindelof's theorem. (CO2, L2)

(OR)

b) Show that every separable metric space is second countable. (CO2, L2)

8 a) State and Prove Tychonoff's Theorem. (CO3, L2)

(OR)

b) Show that every sequentially compact metric space is compact. (CO3, L2)

9 a) State and prove Urysohn's lemma. (CO4, L3)

(OR)

b) Show that every compact Hausdorff space is normal. (CO4, L3)

10 a) Prove that the product of any non-empty class of connected spaces is connected. (CO5, L2)

(OR)

b) Let X be a Hausdorff space. If X has an open base whose sets are also closed, then prove that X is totally disconnected. (CO5, L2)

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