

**FIRST SEMESTER, 2023‑2024**

**Course Handout (Part II)**

11-08-2023

In addition to part‑I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

**Course No. :** MATH F311 **Course Title**  : INTRODUCTION TO TOPOLOGY

**Instructor‑in‑Charge** : SHARAN GOPAL

**Name of other Instructor:** Sharan Gopal**,** Hirendra Kumar Garai and Ruddarraju Amrutha

**Scope and Objective of the Course:** A general objective is to introduce the students to concepts of logical thinking in abstract terms using formal and axiomatic methods and to lay the foundations for further studies in abstract mathematics. Specifically, this course on topology is aimed at making the students familiar with most of the basic topological concepts that are used in almost every branch of advanced mathematics courses.

**Text Book:** Munkres, J.R.: Topology, PHI (Second Edition), 2000

**Reference Books:**

1. John L. Kelley, General topology., van Nostrand. Reprinted (1976) by Springer- Verlag

2. L. A. Steen and J. A. Seebach, Counterexamples in topology, Springer, 1978.

**Course Plan:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Lecture No.** | | **Learning Objectives** | | **Topics to be covered** | | | **Chapter in the Text Book** |
|  | 1 | | To give the overview of the course and give the broad perspective of the course | Overview of the course | | - | |
|  | 2 – 3 | | To make the students understand the definition of topological spaces and the how it generalizes the concept of metric spaces | Topological Spaces; Examples | | 12 | |
|  | 4 | | To study the concept of basis and understand how it generates a topology | Basis and subbasis | | 13 | |
|  | 5 | | To study the topology which is defined using an order relation on a set | The order Topology | | 14 | |
|  | 6 | | To study the subspace topology | Subspaces & Subspace Topology | | 16 | |
|  | 7 | | To study the product topology for product of finitely many topological spaces | Finite Products | | 15 | |
|  | 8 – 9 | | To study the topological properties of subsets of a topological space | Closed sets, closure and Interior of a set, limit points, Hausdorff spaces | | 17 | |
|  | 10 – 12 | | To study the continuous functions and homeomorphisms on a topological space | Continuous functions; homeomorphisms | | 18 | |
|  | 13 – 14 | | To study the two different concepts of product topology on arbitrary product of topological spaces and understand why do we prefer product topology to box topology | Product Topology and Box Topology | | 19 | |
|  | 15 – 18 | | To study the metrizable topological spaces and their properties | The Metric topology | | 20-21 | |
|  | 19 – 20 | | To study the quotient topology and understand how this concept is connected with geometry | The Quotient topology | | 22 | |
|  | 21 – 23 | | To study the concept of connectedness for a topological space and understand how a topological space can be broken into pieces that are connected | Connected Spaces, Components and Local connectedness | | 23-25 | |
|  | 24 – 26 | | To study the various notions of compactness in a topological space | Compact Spaces | | 26-28 | |
|  | 27 – 28 | | To study the notion of local compactness | Locally Compact spaces | | 29 | |
|  | 29 – 31 | | To study the countability axioms and understand how countability axioms are well behaved with respect to the operations of taking subspaces or countable products | Countability axioms | | 30 | |
|  | 32 – 34 | | To study the separations axioms and their properties | Separation axioms | | 31 | |
|  | 35 – 36 | | To study the normal topological spaces | Normal spaces; Urysohn’s lemma | | 32-33 | |
|  | 37 – 38 | | To study a theorem that gives us conditions under which a topological space is metrizable | Urysohn Metrization Theorem | | 34 | |
|  | 39 – 40 | | To study the arbitrary product of compact spaces | Tychonoff’s Theorem | 37 | | |

**Evaluation Scheme:**

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| --- | --- | --- | --- | --- | --- |
| **EC No.** | **Evaluation Component** | **Duration** | **Weightage** | **Date, Time** | **Nature of Component** |
| 1. | Quiz 1 | To be announced | 5 % | To be announced | Closed Book |
| 2. | Assignment 1 | To be announced | 10% | To be announced | Open Book |
| 3 | Mid-Semester Test | 90 min | 30% | 10/10 - 11.30 - 1.00PM | Closed Book |
| 4. | Quiz 2 | To be announced | 5 % | To be announced | Closed Book |
| 5. | Assignment 2 | To be announced | 10% | To be announced | Open Book |
| 6. | Comprehensive Examination | 180 min | 40% | 08/12 AN | Closed Book |

**Make-up Policy**: Make-up will be given only for very genuine cases and prior permission has to be obtained from the IC.

**Consultation hours:** To be announced in the class.

**Academic Honesty and Integrity Policy**: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

**Notices:** The notices concerning this course will be displayed on the CMS site only.

**Instructor‑in‑charge**

**MATH F311**