

# DEPARTMENT OF MATHEMATICS UNIVERSITY OF JAMMU

NO:-PGD/Maths/24/ 448

Dated: 22-05-2024

## Minutes of the meeting

Minutes of the Departmental Research Monitoring Committee held in the office Chamber of the Head of the Department of Mathematics on 22<sup>nd</sup> of May 2024 at 10:30 am.

### Members Present

1. Prof. Rahul Gupta (Dean Faculty of Mathematical Sciences)
2. Prof. Romesh Kumar (HOD, Mathematics)
3. Prof. K.S. Charak
4. Prof. Parmil Kumar

The committee considered the submission of the Completion Reports of the Research and Seed Grant Projects of Dr. Shallu Sharma and Dr. Tirth Ram, Associate Professors in the Department of Mathematics. The details of both the projects are as follows:

Dr. Shallu Sharma Associate Professor	Dr. Tirth Ram Associate Professor
Title: Existence of Generalized Topological Vector Spaces and Metric Spaces Via Topological Vector Spaces and Topology	Title: Existence Theory for Different Classes of Variational Inclusions and Their Applications
Sanctioned Amount: Rs. 2.00 Lakhs	Sanctioned Amount: Rs. 2.00 Lakhs
Utilized Amount: Rs.172837/-	Utilized Amount: Rs.118,008/-
Unspent Amount: Rs. 27163-	Unspent Amount: Rs.81,992/-

The committee found the reports in order as per the laid down norms.

1. 

2. 

3. 

4. 

**UNIVERSITY OF JAMMU**  
**UNIVERSITY OF JAMMU RESEARCH FUND (UoJRF)**

**Form-V**

**PROJECT COMPLETION REPORT**

**(Submit in duplicate)**

1. **Title of the project:** Existence of Generalized Topological Vector Spaces and Metric Spaces via Topological Vector Spaces and Topology.
2. **Name & Designation of Principal Investigator:** Dr. Shallu Sharma, Associate Professor  
Department of Mathematics, University of Jammu
3. **Name & Designation of Co- Principal Investigator/s:** Nil
4. **Duration of the project:** One year
5. **Sanctioned grant:** Rs. 2,00,000 (Two lakhs)
6. **Date of initiation of the project:** 24/01/2023
7. **Date of closure of the project:** 15/03/2024
8. **Whether the Utilization Certificate and statement of expenditure has been submitted?**  
Yes (If yes, mention the date and append the photocopy of the same)  
Yes. Copy attached.
9. **Approved objectives:** Yes  
To generalize the fundamental theorems from metric space to generalized metric spaces.  
To establish topological properties on generalized metric spaces.  
To investigate generalized continuity on generalized metric spaces.  
To obtain the application of Arzela Ascoli theorem with the help of Arzela Ascoli theorem on quasi cone metric spaces.
10. **Title of the research paper published from out of the current project work (If any, attach reprint)**
  1. On  $M^*$ -irresolute topological rings. (Reprint Attached)
  2. Fixed point theorems in cone metric spaces via c-distance over topological module.  
(Reprint Attached)
11. **Title of the research paper accepted for publication from current research work (If any, attach copy of acceptance letter)** On h-topological Groups (Acceptance letter attached)

12. Report of the completed research project highlighting the deliverables (Attach document- Min. 3000 words) Annexure –I Attached

13. Details of the consumable and non-consumable (including equipment) material procured from current research project grant.

14. Has the non-consumable material (including equipment) been handed over to the concerned department? Yes/No Yes

(If yes, attach a certificate issued by concerned HoD in this regard) Yes. Certificate Attached

15. Has the stock register carrying entries of consumable/ non-consumable (including equipment) handed over to the concerned department? Yes/No Yes

(If yes, attach a certificate issued by concerned HoD in this regard) Certificate Attached

16. Was power point presentation of the current research work made before DRPMC by PI/Co-PI? Yes/No No

(If yes, attach a certificate issued by concerned Dean/ HoD in this regard) (If no, the reasons thereof) Not Required

#### Comments of the concerned DRPMC

Comments attached in the minutes of meeting.

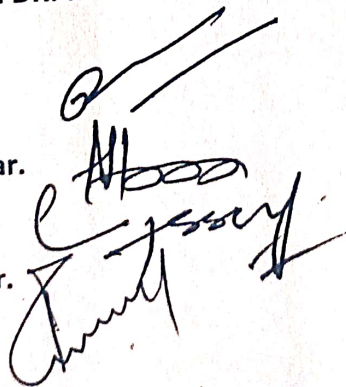
#### Members of the concerned DRPMC

1. Prof. Rahul Gupta.

2. Prof. Romesh Kumar.

3. Prof. K. S. Charak.

4. Prof. Parmil Kumar.





Fwd: [apjm] [Paper ID: apjm-20569] Acceptance Letter Inbox x



Shallu Sharma  
to me

----- Forwarded message -----

From: Editorial Office <apjourmath@gmail.com>  
Date: Wed, 31 Jan 2024, 10:53  
Subject: [apjm] [Paper ID: apjm-20569] Acceptance Letter  
To: Shallu Sharma <shallujamwal09@gmail.com>

Dear Shallu Sharma:

We are pleased to inform you that the following paper has been accepted for publication in Asia Pacific Journal of Mathematics:

Paper Title: ON h-TOPOLOGICAL GROUPS  
Paper ID: apjm-20569.

Please read the author guidelines and download the LaTeX Template at the following address:

<http://apjm.apacific.org/guide-for-authors>.

Your final version should be sent to us by email in TeX file format within one week to the editorial office: [apjm@apacific.org](mailto:apjm@apacific.org).

Article Processing Charge (APC): The APC for this journal is \$475 for all article types.

You can now pay the APC at the following address: <https://apacific.org/article-processing-charge>

Should you have any questions, please feel free to let us know by quoting your Paper ID in all the following procedures and any fut

Thank you for your contribution to Asia Pacific Journal of Mathematics.

---

[Asia Pacific Journal of Mathematics](#)

Reply

Forward



Compose

Inbox 1,284

Starred

Snoozed

Sent

Drafts 236

More

Labels

## Annexure-1


The project "Research and Seed Grant" granted to me was very beneficial for me because I got an opportunity to interact with many Mathematicians working in our area of research during many International and National Conferences, such as

1. "International Conference on Graphs, Networks and Combinatorics, organized by Department of Mathematics, Ramanujan College, University of Delhi Jan 10-12, 2023,
2. Two days International Conference on Science for survival : To explore the unexplored dimensions organized by GCW Udhampur, J&K Feb 10-11, 2023,
3. 2<sup>nd</sup> International Conference on Mathematics in Space and Applied Sciences, organized by Department of Mathematics NSCBM Govt. College, Hamirpur (H.P.) Mar 03-04, 2023,
4. National Conference on Recent Advancements in Mathematics and Applied Sciences organized by Hans Raj Mahila Maha Vidyalaya , Jalandhar April 04, 2023,
5. International Conference on Advancements in Mathematics organized by Thapa Institute of Engineering and Technology Sep 27-30, 2023,
6. International Conference on Analysis and its Applications organized by Jamia Milia Islamia Jan 18-21, 2024, International Conference on Applications of Mathematics at Chaudhary Bansi Lal University , Haryana Jan 19-20, 2024.

Also I worked on Topological Modules and Topological Rings, and research results of which have been published in the following papers:

1. **On  $M^*$ -irresolute topological rings-** The main objective of this paper is to investigate new concepts such as  $M^*$ -irresolute topological rings and  $M^*$ -irresolute topological R-modules via  $M^*$ -open sets. Examples of an  $M^*$ -irresolute topological ring and module have been put forth. Further, we provide several fundamental properties and characterizations of  $M^*$ -irresolute topological rings and  $M^*$ -irresolute topological R-module. Furthermore, we have defined boundedness in these structures and provided a number of results upon them.
2. **Fixed point theorems in cone metric spaces via c-distance over topological module-** The main objective of this paper is to define cone-metric spaces via c-distance over topological module and establish a fixed point theorem.
3. **Some new results in extended cone b-metric space-** This work focuses on the

investigation of certain topological characteristics and contractions of Kannan type in extended cone b-metric spaces. Furthermore, we have added a few more conditions to make a sequence in an extended cone b-metric space a Cauchy sequence. Moreover, the idea of asymptotic regularity has also been utilized to obtain novel outcomes



Dr. Shalu Sharma  
(Principal Investigator)

## On $M^*$ -Irresolute Topological Rings

Shallu Sharma<sup>1,\*</sup>, Naresh Digra<sup>1</sup>, Pooja Saproo<sup>1</sup>, Tsering Landol<sup>2</sup>

<sup>1</sup>Department of Mathematics, University of Jammu, Jammu, India

<sup>2</sup>Department of Mathematics, Cluster University of Jammu, Jammu, India

\*Corresponding author: shallujamwal09@gmail.com

**Abstract.** The main aim of this paper is to introduce and study the new notions namely  $M^*$ -irresolute topological rings and  $M^*$ -irresolute topological  $\mathcal{R}$ -modules by virtue of  $M^*$ -open sets. Examples of an  $M^*$ -irresolute topological ring and module have been put forth. Further, we provide several fundamental properties and characterizations of  $M^*$ -irresolute topological rings and  $M^*$ -irresolute topological  $\mathcal{R}$ -modules. In addition, we shall define boundedness in these two structures and present several results on them.

### 1. Introduction

Although topological rings are useful in many branches of mathematics, they are also fascinating on their own. Since the 1940s, the theory of topological rings has been extensively developed, but primarily within the broader concept of a topological module. L.S. Pontryagin obtained one of the first fundamental results in the theory of topological rings in the classification of locally compact skew fields, which was included in his famous book [14] on topological groups. Some topological ring and module properties have also been noted in books [2, 11]. In-depth study has also been done in the last 50 years in the area of normed and Banach algebras, which constitute one of the most significant classes of topological rings (see, for example [5–8, 13]).

Besides, the theory of topological rings have been thoroughly investigated in a number of review papers and monographs (see, for example [1, 9, 10, 15–18]). In 2016, A. Devika and A. Thilagavathi [4] introduced a new class of sets in topological spaces called  $M^*$ -open sets and studied some of its properties. By continuing the study of  $M^*$ -open sets and topological rings, in this paper we introduce

Received: Jun. 12, 2023.

2020 *Mathematics Subject Classification.* 54H13, 16W80, 16W99.

*Key words and phrases.*  $M^*$ -open sets;  $M^*$ -irresolute topological rings;  $M^*$ -irresolute topological  $\mathcal{R}$ -modules.

## Fixed Point Theorems in Cone Metric Spaces via $c$ -Distance Over Topological Module

Shallu Sharma\*, Pooja Sapru, Iqbal Kour, Naresh Digra

Department of Mathematics, University of Jammu, Jammu, India

\*Corresponding author: shallujamwal09@gmail.com

**Abstract.** In 2011, Wang and Guo introduced  $c$ -distance in cone metric spaces. The idea of cone metric spaces over topological modules was presented by Branga and Olaru in 2020. Combining these two ideas, we introduce cone metric spaces with  $c$ -distance over topological module and establish a fixed point theorem.

### 1. Introduction

Cone metric spaces were first introduced by Huang and Zhang [9]. For detailed study of cone metric spaces, refer [5, 6, 12, 14–16]. Other authors have also established fixed point theorems in cone metric spaces (for instance, [1–3, 10, 11]). Wang and Guo [18] presented cone metric spaces with  $c$ -distance and proved some fixed point theorems. Cone metric spaces over topological module were introduced by Branga and Olaru [4]. In this paper, we present a new concept namely "cone metric spaces with  $c$ -distance over topological module" and prove a fixed point theorem.

### 2. Preliminaries

**Definition 2.1.** [8] Let  $(G, +)$  be a group with partial order relation  $\leq$ . Then  $G$  is said to be a **partially ordered group** if translation in  $G$  is order preserving:

$$x \leq y \Rightarrow z + x + w \leq z + y + w, \forall x, y, w, z \in G$$

**Definition 2.2.** [17] Consider a ring  $(R, +, \cdot)$  and  $1$  be an identity of  $(R, +, \cdot)$  such that  $1 \neq 0$  and  $\leq$  is a partial order on  $R$ . Then  $R$  is called a **partially ordered ring** if:

Received: Mar. 23, 2023.

2020 Mathematics Subject Classification. 37C25; 47H10; 46H25; 47L07.

Key words and phrases. cone metric spaces with  $c$ -distance; topological module; fixed point theorems.



**POST GRADUATE DEPARTMENT OF MATHEMATICS**  
**UNIVERSITY OF JAMMU, JAMMU-180006**

Mr. Sharma  
No. PGD/Math/24/ 758  
Dated: 25.09.24

**UTILIZATION CERTIFICATE**

Title of the project : Existence of Generalized Topological Vector Spaces and Metric Spaces via  
Topological Vector Spaces and Topology  
Sanction Order No: : RA/23/7391-93 dated: 24/01/2023  
Name of PI : Dr. Shallu Sharma  
Department : Mathematics  
Total Research and Seed Grant : 2,00,000 (Two lakhs)

**Statement of Expenditure**

Details of funding requested under heads	Amount Approved	Expenditure Incurred
(a) Hiring of Services/Honorarium for experts	Nil	Nil
(b) Equipment (Repair) or any accessory of needed to the existing equipment	Nil	Nil
(c) Purchase of Minor Equipment	Nil	Nil
(d) AMC's of existing Equipment	Nil	Nil
(e) Consumables/Chemicals/Glassware etc.	Nil	Nil
(f) Contingency	Rs. 40,000	Rs. 38635
(g) Field work	Rs. 80,000	Rs. 54202
(h) Any other item	Rs. 80,000	Rs. 80,000

It is certified that the grant of Rs. 2,00,000/- (Rupees Two Lacs only) received from the University under RUSA for Research and Seed Grant vide Order No. RA/23/7391-93 dated 24/01/2023, and out of which an amount of Rs.1,72,837.00/- (Rupees One Lac Seventy Two Thousand Eight Hundred Thirty Seven only) has been utilized for the purpose for which it was sanctioned and in accordance with the terms and conditions laid down by the University.

Dr. Shallu Sharma (PI)

Deputy Registrar (Grants)  
University of Jammu

Finance Officer  
University of Jammu