

How to Draft the Paper

1. Title Selection & Understanding

- **Title:** "IoT-based smart irrigation system for reducing agricultural water usage."
- break the title into parts:
 - *IoT-based* → Internet of Things devices like sensors, ESP32/Arduino, cloud storage.
 - *Smart irrigation system* → An automated watering method that makes decisions without farmer intervention.
 - *Reducing agricultural water usage* → The purpose/benefit (main problem to solve).

Why is this important?

- Agriculture consumes 70% of freshwater globally.
 - India faces **water scarcity** in many regions.
 - Smart irrigation = practical, low-cost solution for farmers.
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2. Abstract (150–200 words)

- An abstract is like a **movie trailer** → it summarizes everything in 1 paragraph.
- It must cover: Problem + Proposed Idea + Method + Expected Result.

Step for Students:

1. Write 1–2 lines on the problem (farmers waste water).
 2. Write 1–2 lines on the solution (IoT system with sensors).
 3. Write 1–2 lines on methodology (ESP32, ThingSpeak cloud).
 4. Write 1–2 lines on expected results (30–40% water saving).
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3. Introduction (2–3 pages)

What to include?

1. **Background:**
 - Explain irrigation in agriculture.
 - Current issue: manual irrigation wastes water.
2. **Problem Statement:**
 - "Farmers lack affordable tools to monitor soil moisture in real time, leading to over-irrigation or under-irrigation."

3. Research Gap:

- Many IoT irrigation studies exist, but few focus on **low-cost, cloud-integrated systems for small Indian farmers**.

4. Objectives:

- To review IoT irrigation methods.
- To design a conceptual IoT irrigation model with sensors + cloud.
- To discuss expected benefits like reduced water use.

5. Scope:

- Only agricultural irrigation (not gardens).
- Only soil moisture sensors (not full weather stations).
- Only design and expected results (no hardware build).

4. Literature Review (2–3 pages)

How students should write it:

- Collect 7–10 papers from **Google Scholar / IEEE Xplore**.
- Read abstracts & note: Author, Year, Method, Findings, Limitations.
- Make a **summary table**:

Author	Year	Method	Findings	Gap
Sharma et al.	2020	Soil moisture + GSM alerts	Saved 25% water	No cloud data storage
Kumar & Reddy	2021	IoT + ThingSpeak	Real-time alerts	Used costly sensors
Lee et al.	2022	Wireless sensor network	Increased crop yield	Complex setup, not affordable

Narrative Writing:

“Sharma et al. [1] implemented a soil-moisture-based system which reduced water usage but lacked real-time cloud monitoring. Kumar and Reddy [2] extended this by using ThingSpeak, though they relied on costly imported sensors. Hence, there is a need for a low-cost, cloud-integrated irrigation system suitable for rural India.”

5. Methodology (Step-by-Step Approach)

- ⚡ Since students cannot implement → **they should propose a design**.

Steps:

1. **System Components:**

- Soil moisture sensor (detects water level in soil).
- Microcontroller (ESP32/Arduino to process data).
- Cloud (ThingSpeak stores data & displays graphs).
- Water pump (automatic ON/OFF).

2. **Working Principle:**

- If soil moisture < threshold (say 30%) → microcontroller switches ON pump.
- If soil moisture > threshold → pump remains OFF.

3. **Block Diagram (Students can draw in MS Word/PowerPoint):**

Soil Sensor → ESP32 → Wi-Fi → ThingSpeak Cloud → Farmer's Mobile → Water Pump

4. **Tools Mentioned (theoretical):**

- Programming: Arduino IDE
- Database/Cloud: ThingSpeak
- Communication: Wi-Fi

6. **Results & Discussion (Expected, not real)**

Since no implementation:

- Students can use **expected results** from literature.
- Example results table:

Study / System	Water Saving	Limitation
Sharma et al. (2020)	25%	No cloud
Kumar & Reddy (2021)	30%	Expensive sensors
Proposed Design	35–40% (expected)	To be tested in real field

Discussion Points:

- Our design combines **low-cost sensors + cloud analytics**.
- It is expected to outperform traditional irrigation and match/exceed previous IoT systems.
- Farmers could save both **water and electricity**.

7. **Conclusion & Future Work (1 page)**

Conclusion:

- IoT smart irrigation reduces wastage.

- The conceptual design could save ~35–40% water.
- It is affordable and scalable.

Future Work:

- Test with real farm datasets.
- Add solar power for pumps.
- Extend to multi-sensor (humidity, temperature, rainfall).
- Mobile app for farmers in regional languages.

8. References

- Use **IEEE style**.
- At least 7–10 references.
- Example format:
 - [1] R. Sharma, “IoT-based irrigation system,” *IEEE Access*, vol. 8, pp. 1234–1240, 2020.
 - [2] K. Kumar and S. Reddy, “Cloud-integrated irrigation monitoring,” *Int. J. Smart Agriculture*, 2021.

 **Key Advice for Students**

1. **Don’t worry about coding or real results.** Focus on concept, review, and design.
2. Use **diagrams, tables, charts from literature** (with citations).
3. Follow **IEEE paper format** strictly.
4. Make it 8–10 pages by expanding:
 - 2 pages intro
 - 2 pages literature
 - 2 pages methodology
 - 1–2 pages results/discussion
 - 1 page conclusion
 - 1 page references