🧭 Objective:

> **Master NumPy arrays and functions** as they relate to:

- Signal generation
- Manipulation (slicing, interleaving)
- Statistical operations
- Practical SDR workflows (IQ data, filtering, vector math)

🔁 Learning Plan — NumPy Power with Signal Context

✅ Step 1: Core Array Operations (today)

- Array creation, shape, dtype
- Slicing & indexing (1D & 2D)
- `reshape`, `ravel`, `transpose`, `flatten`
- `np.linspace`, `np.arange`, and `np.zeros`, `np.ones`
- Difference between `view` and `copy`

✅ Step 2: Array Math & Broadcasting

- Element-wise math
- Broadcasting rules
- Vectorized operations (no for-loops!)
- Dot product, matrix multiplication
- Applying math functions (`np.sin`, `np.exp`, `np.abs`, etc.)

✅ Step 3: Random Number Utilities

- `np.random.uniform`, `np.random.normal`
- Seeding for reproducibility
- Simulating test signals (I/Q, noise, bit streams)

✅ Step 4: Aggregation & Statistics

- `np.mean`, `np.std`, `np.var`
- `np.min`, `np.max`, `np.percentile`
- Axis-wise aggregation (e.g., per row or column)

✅ Step 5: Masking, Filtering, and Conditions

- Boolean indexing
- Filtering with conditions
- `np.where`, `np.select`

✅ Step 6: File I/O and Data Reshaping

- Saving and loading `.npy`, `.txt`, `.bin`
- `astype`, `view` for bit-level manipulation
- Preparing IQ arrays for SDR formats

🔧 How We'll Do It

- Every section will include:
  i. **Concept**
  ii. **Simple example**
  iii. **Mini DSP/SDR connection**
  iv. **Hands-on practice**
