**Chapter 2**

**MATRICES AND OPERATORS**

**PREFACE**

* 1. Introduction to Matrices and Operators
  2. Accessing parts of a Matrix
  3. Combining matrices
  4. Operator Precedence

* 1. **Introduction to Matrices and Operators**
     + **MATRICES: Special kinds of an ARRAY.**
     + **An ARRAY is a set of numbers arranged in a rectangular pattern; a collection of similar elements in simple terms.**
     + **1D array --> Vector, 2D array and further dimensions --> Matrix**
     + **Ex: >> x\_1D = [1 2 3]**

**x\_1D = 1 2 3**

**>> x\_2D = [1 2 3; 4 5 6]**

**x\_2D = 1 2 3**

**4 5 6**

* 1. There are many inbuilt functions in MATLAB that help us find the properties of a matrix.
  2. Ex: **size(array\_name)** --> prints the size of the matrix i.e, 2 2 if it is a 2\*2 matrix
  3. The hierarchy of variable formats is mentioned below from the smallest to largest:
     + **Scalar --> A single element.**
     + **Vector --> Collection of elements.**
     + **Matrices --> Row-Column representation of values; Matrix format.**
     + **Arrays --> Extends to multiple dimensions; 1D, 2D, 3D and so on..**
  4. **COLON** operator helps us to store the values in incremental fashion to store it in an array.
  5. Ex: >> **x = 1:2:3 --> x = 1 3 ;**
  6. Start at 1, increase at steps of 2 and go no higher than 3 (go no below can be implemented using the minus operator for the second operand).
  7. **Vx = 1:100** stores first 100 numbers in the variable **Vx**.
  8. Other operators include: +, -, \*, / and so on.

* 1. **Accessing parts of a Matrix**
     + **To access an element in any matrix, specify the row and column of the element in parentheses next to the array name in the prompt window.**
     + **Ex: A(3,2) --> accesses the element present in the 3rd row and 4th column of the array.**
     + **You can also access multiple elements by following the specified format:**

**A(1,4) + A(2,4) + A(3,4) + A(4,4)**

* + There are many other ways of accessing the elements or parts of an array. Few of the functions are : **end, logical, linear** and furthermore.

**3. Combining Matrices**

* + - **Matrix combination row wise:**
    - **A1, A2, A3 are the three 2\*2 matrices; [A1 A2 A3] will concatenate the three matrices in a row.**

**>> A1=[1 2 3;4 5 6]**

**A1 =**

**1 2 3**

**4 5 6**

**>> A2=[1 3 5; 3 5 7]**

**A2 =**

**1 3 5**

**3 5 7**

**>> A3=[1 2 4;3 5 6]**

**A3 =**

**1 2 4**

**3 5 6**

**>> [A1 A2 A3]**

**ans =**

**Columns 1 through 7**

**1 2 3 1 3 5 1**

**4 5 6 3 5 7 3**

**Columns 8 through 9**

**2 4**

**5 6**

* + We can combine matrices column wise by adding a **semicolon(;)** between the array names.

**4. Operator Precedence**

* + - The precedence rules for MATLAB operators are shown in this list, ordered from **highest** precedence level to **lowest** precedence level:
      1. Parentheses **()**
      2. Transpose **(.')**, power **(.^)**, complex conjugate transpose **(')**, matrix power **(^)**
      3. Unary plus **(+)**, unary minus **(-)**, logical negation **(~)**
      4. Multiplication **(.\*)**, right division **(./)**, left division **(.\)**, matrix multiplication **(\*)**, matrix right division **(/),** matrix left division **(\)**
      5. Addition **(+)**, subtraction **(-)**
      6. Colon operator **(:)**
      7. Less than **(<)**, less than or equal to **(<=)**, greater than **(>)**, greater than or equal to **(>=)**, equal to **(==)**, not equal to **(~=)**
      8. Element-wise AND **(&)**
      9. Element-wise OR **(|)**
      10. Short-circuit AND **(&&)**
      11. Short-circuit OR **(||)**