SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

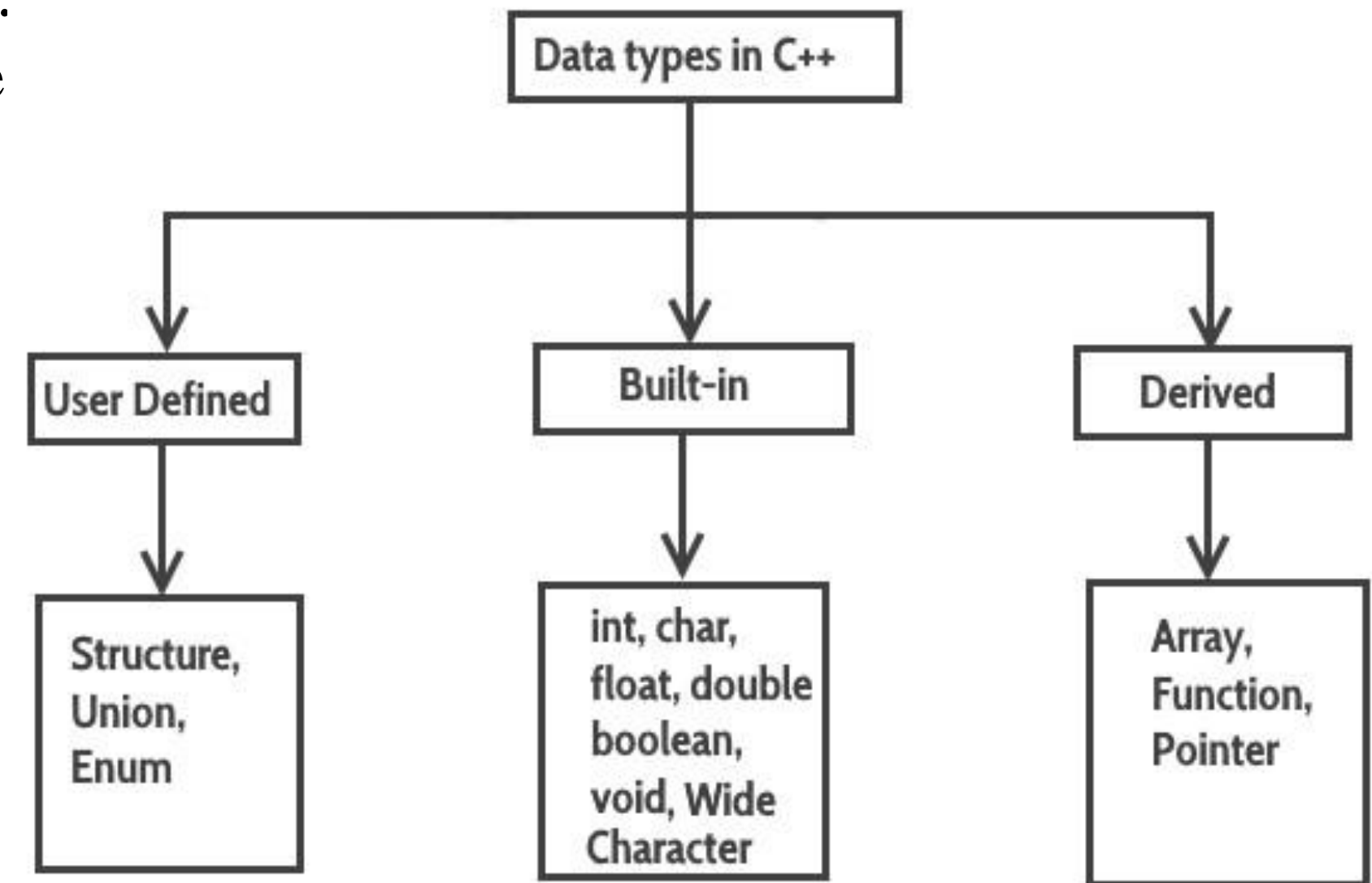# 23ITT101-PROGRAMMING IN C AND DATA STRUCTURES
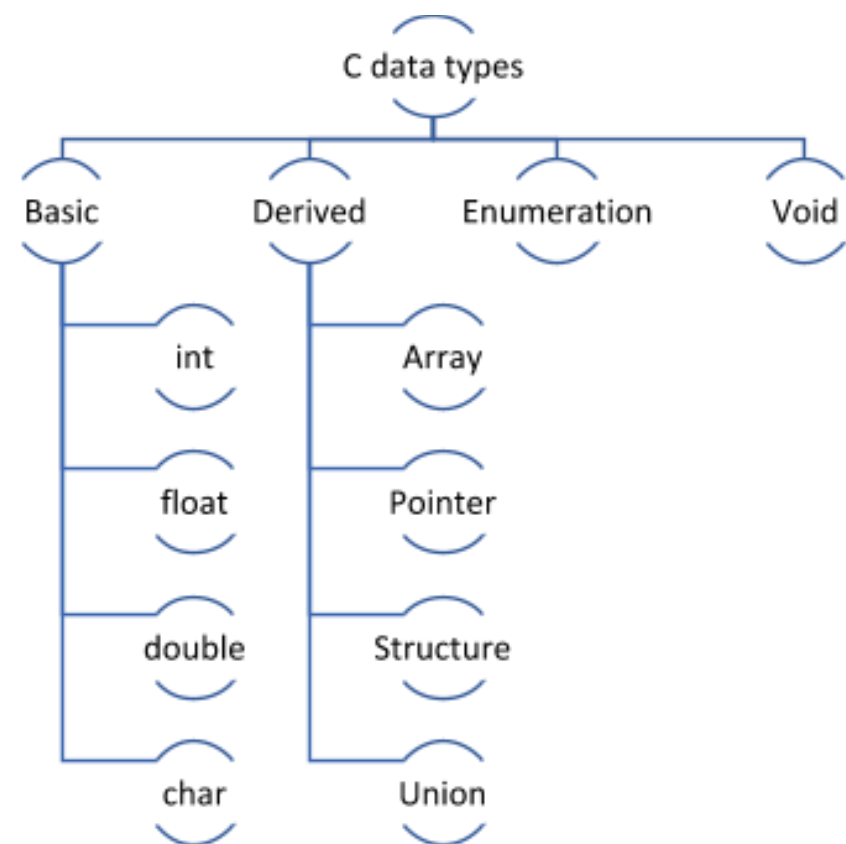## I YEAR - II SEM

UNIT 1 – INTRODUCTION TO C

TOPIC 6 –Data Types

DATA TYPES

➢C language is rich in its data types.

➢The variety of data types available allow the programmer to select the type appropriate to the needs of the application as well as the machine.

➢ANSI C supports three classes of data types:

     1. Primary (or fundamental) data type

     2. Derived data types

     3. User-defined data types

C data types

Basic — int, float, double, char
Derived — Array, Pointer, Structure, Union
Enumeration
Void

Data types in C++

User Defined	Built-in	Derived
Structure, Union, Enum	int, char, float, double boolean, void, Wide Character	Array, Function, Pointer

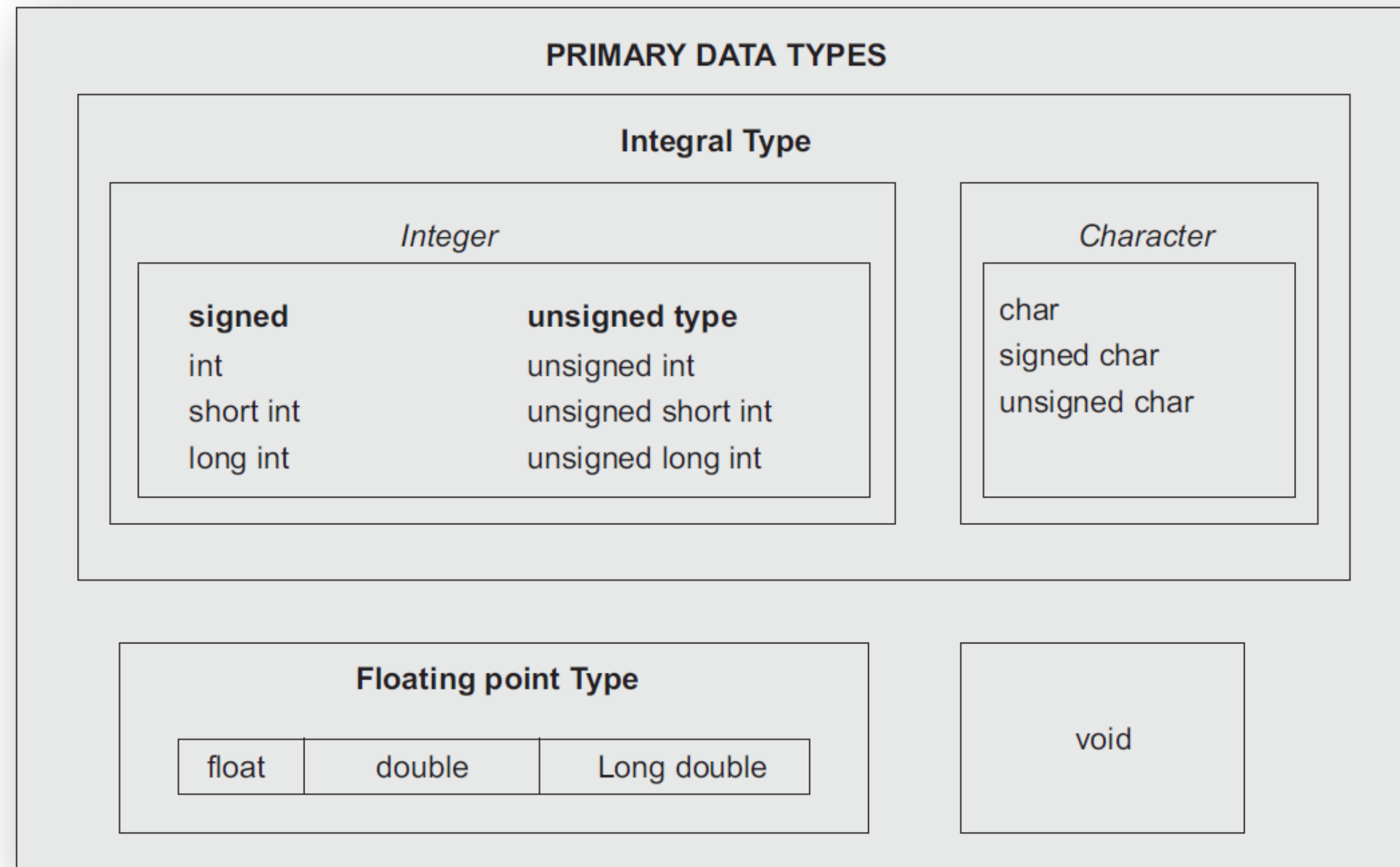# PRIMARY/ FUNDAMENTAL/ BUILT-IN/ BASIC DATA TYPES

➤ All C compilers support <u>five</u> fundamental data types, namely:
1. Integer (int)
2. Character (char)
3. Floating Point (float)
4. Double-precision floating point (double)
5. Empty data type (void).

➤ Many of them also offer extended data types such as long int and long double

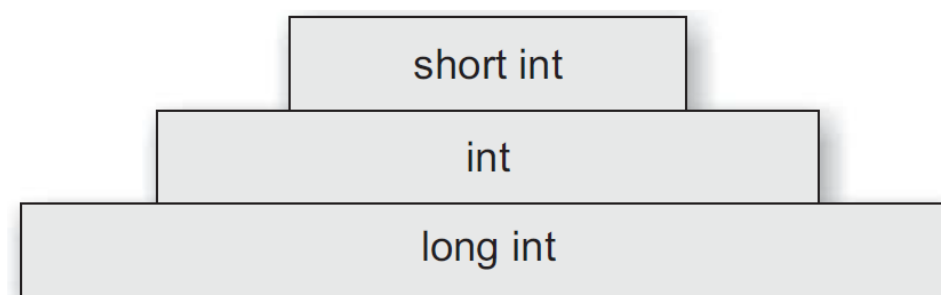| DATA TYPE	TYPE OF DATA	MEMORY	RANGE
int	Integer	2 Bytes	− 32,768 to 32,767
char	character	1 Byte	− 128 to 128
float	Floating point number	4 bytes	3.4e − 38 to 3.4e+38
double	Floating point number with higher precision	8 bytes	1.7e − 308 to 1.7e+ 308

PRIMARY DATA TYPES

Integral Type

Integer

signed	unsigned type
int	unsigned int
short int	unsigned short int
long int	unsigned long int

Character

char
signed char
unsigned char

Floating point Type

float	double	Long double

void

INTEGER DATA TYPE

➢Integers are whole numbers with a range of values supported by a particular machine.

➢Generally, integers occupy one word of storage, and since the word sizes of machines vary (typically, 16 or 32 bits)

➢The size of an integer that can be stored depends on the computer.

➢If we use a <u>16 bit</u> word length, the size of the integer value is limited to the range –32768 to +32767.

➢C has three classes of integer storage (both signed and unsigned forms), namely:

➢short int

➢Int

➢long int.

short int
int
long int

Integer types

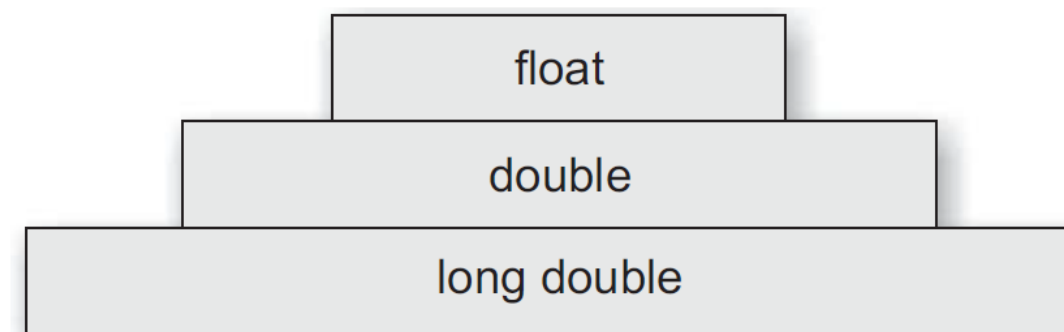| Signed Integer	Unsigned Integer
It represents both positive and negative integers	It represents only positive integers
The data type qualifier is **signed int or int.** Variables are defined as: signed int a; Int b;	The data type qualifier is **unsigned int or unsigned** Variables are defined as: unsigned int a; unsigned b;
By default all int are signed	Unsigned int have to be declared explicitly
It reserves 16-bit (2 bytes) in memory	It reserves 16-bit (2 bytes) in memory
Range -2^{15} to $+2^{15}$ i.e. -32,768 to 32,767	Range from 0 to $+2^{16}$ i.e. 0 to 65,535
Its conversion character is **d**	Its conversion character is **u**

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FLOATING POINT DATA TYPE

➤ Floating point (or real) numbers are stored in 32 bits (on all 16 bit and 32 bit machines), with 6 digits of precision.

➤ Floating point numbers are defined in C by the keyword **float**.

➤ When the accuracy provided by a float number is not sufficient, the type **double** can be used to define the number.

➤ A **double** data type number uses 64 bits giving a precision of 14 digits.

➤ These are known as double precision numbers.

➤ Double type represents the same data type that float represents, but with a greater precision.

➤ To extend the precision further, we may use **long double** which uses 80 bits.

float
double
long double

Floating-point types

CHARACTER & VOID DATA TYPE

➢ **Character Data Type**:
  • A single character can be defined as a character(**char**) type data.
  • Characters are usually stored in 8 bits (one byte) of internal storage.
  • The qualifier signed or unsigned may be explicitly applied to char.
  • Unsigned chars have values between 0 and 255, signed chars have values from –128 to 127.

➢ **Void Data Type:**
  • The void type has no values.
  • This is usually used to specify the type of functions.
  • The type of a function is said to be void when it does not return any value to the calling function.

DATA TYPES & CONTROL STRING

Entire Data types in c:

Data type	Size(bytes)	Range	Format string
Char	1	128 to 127	%c
Unsigned char	1	0 to 255	%c
Short or int	2	-32,768 to 32,767	%i or %d
Unsigned int	2	0 to 65535	%u
Long	4	-2147483648 to 2147483647	%ld
Unsigned long	4	0 to 4294967295	%lu
Float	4	3.4 e-38 to 3.4 e+38	%f or %g
Double	8	1.7 e-308 to 1.7 e+308	%lf
Long Double	10	3.4 e-4932 to 1.1 e+4932	%lf