



# **SNS COLLEGE OF TECHNOLOGY**

**Coimbatore-35**  
**An Autonomous Institution**

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai



## **DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**19ECT221 – MICROPROCESSORS AND MICROCONTROLLERS**

II YEAR - IV SEM

UNIT 3– 8051 MICROCONTROLLER

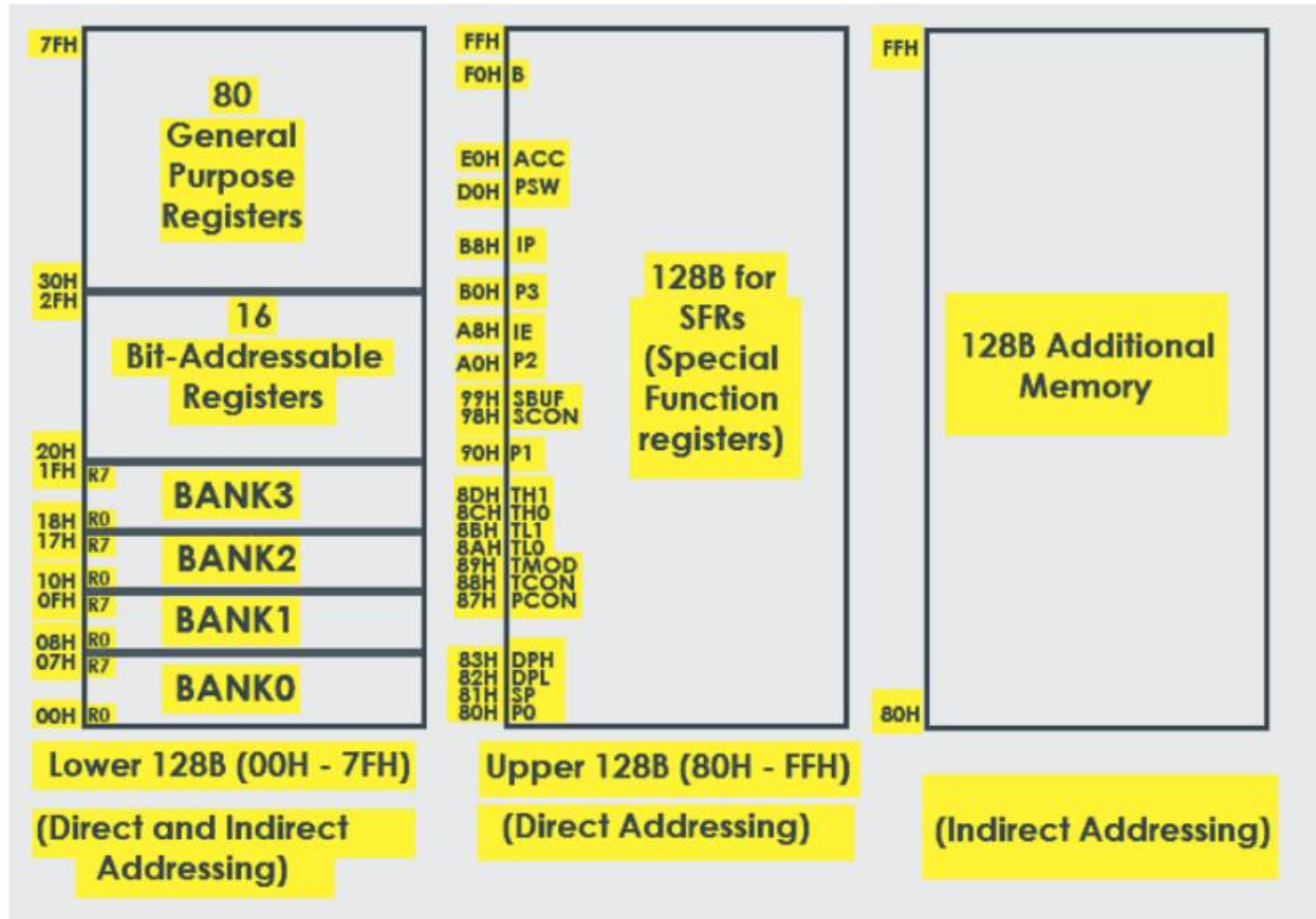


# SPECIAL FUNCTION REGISTERS

- The internal RAM or Data Memory of the 8051 Microcontroller is divided into General Purpose Registers, Bit Addressable Registers, Register Banks and Special Function Registers or SFRs.
- The 8051 Microcontroller Special Function Registers are used to program and control different hardware peripherals like Timers, Serial Port, I/O Ports etc.
- By manipulating the 8051 Microcontroller Special Function Registers (SFRs), you can assess or change the operating mode of the 8051 Microcontroller.



# DATA MEMORY(RAM) OF 8051





# CATEGORY OF SFRs



<i>Name of the Register</i>	<i>Function</i>	<i>Internal RAM Address (HEX)</i>
ACC	Accumulator	E0H
B	B Register (for Arithmetic)	F0H
DPH	Addressing External Memory	83H
DPL	Addressing External Memory	82H
IE	Interrupt Enable Control	A8H
IP	Interrupt Priority	B8H
P0	PORT 0 Latch	80H
P1	PORT 1 Latch	90H
P2	PORT 2 Latch	A0H
P3	PORT 3 Latch	B0H
PCON	Power Control	87H
PSW	Program Status Word	D0H
SCON	Serial Port Control	98H
SBUF	Serial Port Data Buffer	99H
SP	Stack Pointer	81H
TMOD	Timer / Counter Mode Control	89H
TCON	Timer / Counter Control	88H
TL0	Timer 0 LOW Byte	8AH
TH0	Timer 0 HIGH Byte	8CH
TL1	Timer 1 LOW Byte	8BH
TH1	Timer 1 HIGH Byte	8DH



# CATEGORY OF SFRs



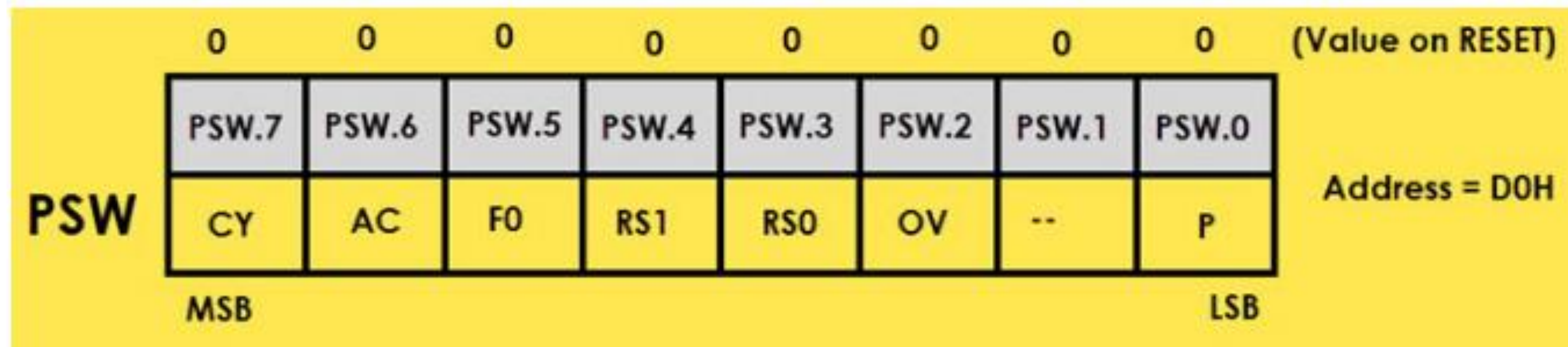
- ***Math or CPU Registers:*** A and B
- ***Status Register:*** PSW (Program Status Word)
- ***Pointer Registers:*** DPTR (Data Pointer – DPL, DPH) and SP (Stack Pointer)
- ***I/O Port Latches:*** P0 (Port 0), P1 (Port 1), P2 (Port 2) and P3 (Port 3)
- ***Peripheral Control Registers:*** PCON, SCON, TCON, TMOD, IE and IP
- ***Peripheral Data Registers:*** TL0, TH0, TL1, TH1 and SBUF



# CATEGORY OF SFRs –Program Status Word



- The PSW or Program Status Word Register is also called as Flag Register and is one of the important SFRs.
- The PSW Register consists of Flag Bits, which help the programmer in checking the condition of the result and also make decisions.
- Flags are 1-bit storage elements that store and indicate the nature of the result that is generated by execution of certain instructions.
- The following image shows the contents of the PSW Register.





# CATEGORY OF SFRs –Program Status Word



BIT	SYMBOL	FLAG NAME			DESCRIPTION
7	C or CY	Carry			Used in Arithmetic, Logic & Boolean Operations
6	AC	Auxiliary Carry			Used in BCD Arithmetic
5	F0	Flag 0			General Purpose User Flag
4	RS1	Register Bank Selection Bit 1			
3	RS0	Register Bank Selection Bit 1			
		RS1	RS0	Bank	
		0	0	Bank 0	
		0	1	Bank 1	
		1	0	Bank 2	
		1	1	Bank 3	
2	OV	Overflow			Used in Arithmetic Operations
1	--	Reserved			May be used as a General Purpose Flag
0	P	Parity			Set to 1 if A has odd # of 1's; otherwise Reset



## CATEGORY OF SFRs -I/O Ports



- The 8051 Microcontroller has four Ports which can be used as Input and/or Output.
- These four ports are P0, P1, P2 and P3.
- The addresses of the Port Registers are as follows: P0 – 80H, P1 – 90H, P2 – A0H and P3 – B0H.
- Each bit in these SFRs corresponds to one physical Pin in the 8051 Microcontroller. All these Port Registers are both Bit Addressable and Byte Addressable. Writing 1 or 0 on a Port Register Bit will reflect as an appropriate voltage (5V and 0V) on the corresponding Pin.
- If a Port Bit is SET (declared as 1), the corresponding Port Pin will be configured as Input and similarly if a Port Bit is CLEARED (declared as 0), the corresponding Port Pin is configured as Output. Upon reset, all the Port Bits are SET (1) and hence, all the Port Pins are configured as Inputs.





# CATEGORY OF SFRs -I/O Ports



	1	1	1	1	1	1	1	1	(Value on RESET)
<b>P0</b>	P0.7	P0.6	P0.5	P0.4	P0.3	P0.2	P0.1	P0.0	Address = 80H
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
<b>P1</b>	1	1	1	1	1	1	1	1	(Value on RESET)
	P1.7	P1.6	P1.5	P1.4	P1.3	P1.2	P1.1	P1.0	Address = 90H
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0		
<b>P2</b>	1	1	1	1	1	1	1	1	(Value on RESET)
	P2.7	P2.6	P2.5	P2.4	P2.3	P2.2	P2.1	P2.0	Address = A0H
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0		
<b>P3</b>	1	1	1	1	1	1	1	1	(Value on RESET)
	P3.7	P3.6	P3.5	P3.4	P3.3	P3.2	P3.1	P3.0	Address = B0H
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0		



# References



<https://www.electronicshub.org/8051-microcontroller-special-function-registers/>

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*Thank You*