FreeRTOS Basics Study Checklist

Topic	Key API / Macro	Description / Purpose	Example Use
RTOS Fundamentals	—	Understand RTOS vs bare-metal, scheduler, and tick	Learn about context switching, tick r
Create Task	xTaskCreate()	Creates a new task	xTaskCreate(Task1, 'T1', 128, NULL
Delete Task	vTaskDelete()	Deletes a running or other task	vTaskDelete(NULL);
Start Scheduler	vTaskStartScheduler()	Starts the RTOS scheduler	Called after task creation
Delay Task	vTaskDelay(), vTaskDelayUntil()	Delays task by ticks / periodic timing	vTaskDelay(1000 / portTICK_PERIO
Task Priority	—	Controls which task runs first	Higher priority → preempts lower or
Queue Create	xQueueCreate()	Creates a queue for task communication	xQueue = xQueueCreate(5, sizeof(i
Queue Send / Receive	xQueueSend(), xQueueReceive()	Send/receive data between tasks	xQueueSend(xQueue, &data, portM
Semaphore Create	xSemaphoreCreateBinary(), xSemaphoreCreateCounting()	Synchronize tasks/ISR	xSemaphoreGiveFromISR();
Mutex Create	xSemaphoreCreateMutex()	Protect shared resources	xSemaphoreTake(xMutex, portMAX
Task Notification	xTaskNotifyGive(), ulTaskNotifyTake()	Lightweight task signaling	ISR notifies a waiting task
Software Timer	xTimerCreate(), xTimerStart()	Runs function periodically / once	xTimerCreate('Tmr', 1000, pdTRUE
Idle Hook	vApplicationIdleHook()	Runs when CPU idle	Background task or low-power mod
Tick Hook	vApplicationTickHook()	Executes every system tick	Small monitoring/logging functions
Malloc Failed Hook	vApplicationMallocFailedHook()	Called if memory allocation fails	Debug heap problems
Task List / Stats	vTaskList(), vTaskGetRunTimeStats()	Status of tasks & CPU usage	Debug performance
Stack Usage	uxTaskGetStackHighWaterMark()	Checks remaining stack space	Prevent overflow
Heap Management	heap_1.c – heap_5.c	Different memory allocators	Use heap_4.c commonly
Configuration File	FreeRTOSConfig.h	Adjust kernel parameters	configUSE_PREEMPTION, configT
ISR Communication	xQueueSendFromISR(), xSemaphoreGiveFromISR()	Safely send data/signals from interrupt	ISR to task communication

Recommended Practice Order: Create LED tasks → UART task → Queue demo → Semaphore → Timer → View vTaskList()