

	4.5	<b>Study Material :</b> Serial Communication Interface: <b>STM32:</b> <a href="https://controllerstech.com/serial-transmission-in-stm32/#:~:text=Serial%20Transmission%20in%20Stm32&amp;text=UART%20is%20widely%20used%20for,amongst%20which%20communication%20is%20done">https://controllerstech.com/serial-transmission-in-stm32/#:~:text=Serial%20Transmission%20in%20Stm32&amp;text=UART%20is%20widely%20used%20for,amongst%20which%20communication%20is%20done</a> . <b>LPC2148:</b> <a href="https://www.electronicwings.com/arm7/lpc2148-uart0">https://www.electronicwings.com/arm7/lpc2148-uart0</a> <b>MSP430:</b> <a href="https://www.ti.com/lit/ml/slap117/slap117.pdf">https://www.ti.com/lit/ml/slap117/slap117.pdf</a>	
<b>5</b>		<b>Real Time Operating Systems[RTOS]</b>	<b>08</b>
	5.1	Operating system basics , Types of OS , Tasks, process, Threads	
	5.2	Multiprocessing and ,Multitasking , Task scheduling	
	5.3	RTLinux/ Free RTOS and Mbed OS , Implementation with RTOS	
<b>6</b>		<b>Cloud/Web server</b>	<b>08</b>
	6.1	Implementation on web server ,	
	6.2	Thingspeak, AWS cloud platform for IoT based programming and modelling	
	6.3	<b>Exercise : perform ESP8266 interface with microcontroller</b>	
	6.4	<b>Study Material :</b> <b>STM32:</b> <a href="https://circuitdigest.com/microcontroller-projects/interfacing-esp8266-with-stm32f103c8-stm32-to-create-a-webserver">https://circuitdigest.com/microcontroller-projects/interfacing-esp8266-with-stm32f103c8-stm32-to-create-a-webserver</a> <b>LPC2148:</b> <a href="https://circuitdigest.com/microcontroller-projects/iot-based-ARM7-LPC2148-webserver-to-control-an-led">https://circuitdigest.com/microcontroller-projects/iot-based-ARM7-LPC2148-webserver-to-control-an-led</a> <b>MSP430:</b> <a href="https://circuitdigest.com/microcontroller-projects/sending-email-using-msp430-and-esp8266">https://circuitdigest.com/microcontroller-projects/sending-email-using-msp430-and-esp8266</a>	
<b>Total</b>			<b>52</b>

#### **NOTE:**

\* **Advanced Microcontroller:** Like PSoc and PIC may be used as per the student's intellectual ability and strength.

\*\* **Module 5 and 6 (RTOS and Cloud/Web Server):** Can be included by Guide /supervisor /Mentor depending upon need and scope of the project for selected topic and its application.

#### **Textbooks:**

1. Shibu K.V, "Introduction to Embedded Systems", Mc Graw Hill, 2nd edition.
2. Frank Vahid, and Tony Givargis, "Embedded System Design: A unified Hardware/Software Introduction", Wiley Publication.
3. Raj Kamal, "Embedded Systems Architecture, Programming and design", Tata MCgraw-Hill Publication.
4. Dr. K.V.K.K. Prasad, "Embedded Real Time Systems: Concepts, Design & Programming", Dreamtech Publication.
5. Iyer, Gupta, "Embedded real systems Programming", TMH
6. David Simon, "Embedded systems software primer", Pearson
7. Andrew Sloss, Dominic Symes and Chris Wright, "ARM\_System\_Developers\_Guide-Designing\_and\_Optimizing\_System\_Software" Elsevier and Morgan Kaufmann Publishers.
8. Michel J Pont "Embedded C" Pearson

#### **Suggested Software tools:**

1. Tinkercad : <https://www.tinkercad.com/>
2. Proteus software
3. KEIL for ARM LPC 2148
4. **STM32Cube software**