

INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
PROFORMA FOR NEW COURSE

1.	Title of the Course	Computer System Design Laboratory
2.	Course Number	CS4191
3.	Status of the Course	Core
4.	Structure of Credits	0-0-3-2
5.	Offered To	UG
6.	New Course/Modification to	New
7.	To be Offered by	Department of Computer Science and Engineering
8.	To take effect from	July 2018
9.	Prerequisite	Nil
10.	Whether approved by the Department	Yes
11.	Course Objective: To provide hands-on experience on design and integration of key components of a computer system and to prototype the design on FPGA board.	
12.	Course Content: Digital component design using Verilog HDL: Structural, Behavioral and Dataflow modeling; Processor design and High-level synthesis: Multi-cycle data and control path design, Five-stage pipeline processor design, Memory system design and synthesis, Test-bench and simulation on the gate-level netlist, Synthesis and bit-stream generation for target FPGA board, Simulation-based verification of the processor; Assembly programming and machine-code generation, Execution of machine code on the processor, and Verification of output; System integration: Installation of cross-compiler on a host machine, Cross-compiling high-level language to machine code and execute it on processor, Building virtual machine (VM) on a prototyped processor, Building operating system on a prototyped processor, Integrating assembler and compiler with the built-system, System testing.	
13.	Text book(s): 1. Nisan N and Schocken S, <i>The Element of Computing Systems: Building a Modern Computer from First Principles</i> , MIT Press (2008). 2. Patterson D and Hennessy J L, <i>Computer Organization and Design: Hardware/Software Interface RISC-V Edition</i> , Morgan Kaufmann (2019).	
14.	Reference(s): 1. Wentzlaff Parallel Research Group, <i>OpenPiton: an Open Source Research Processor</i> , Princeton University (2018).	