



Department of Computer Science and Engineering
National Institute of Technology, Tiruchirappalli

COURSE OUTLINE			
Course Title	Elements of Computing Systems		
Course Code	BS101	No. of Credits	2
Department	CSE	Faculty	Dr. S. Mary Saira Bhanu
Pre-requisites Course Code	nil		
Course Coordinator(s) (if, applicable)	NA		
Other Course Teacher(s)/Tutor(s) E-mail	msb@nitt.edu	Telephone No.	9442970006
Course Type	Core course		

COURSE OVERVIEW
<p>This course deals with designing, developing and building hardware and software systems. It helps the students to understand the working of computers at the hardware level. Also it describes the role of assemblers, compilers and operating systems in program execution.</p>

COURSE OBJECTIVES
<p>To make the student understand the basic blocks of a Computing system To make the student understand the flow of Concept –Program-Input-Processing-Output To introduce the low level language, translators, operating systems</p>

COURSE OUTCOMES								
COs	Aligned Programme Outcome (PO)							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
Ability to trace the Concept-Program-Input-Processing- Output	S		M	S			M	
Ability to generate low level code for simple programs	S		M	S		M	M	
Ability to design simple arithmetic and memory units	S	M	S	S	M	S	M	

S - 75 % M – 60%

COURSE TEACHING AND LEARNING ACTIVITIES			
Sl.No.	Week	Topic	Mode of Delivery
1.	1	Introduction to computing- Languages- High level language – Low level language – Execution of Program – Introduction to Computer Architecture, Stored program concept – Von Neumann model – Processing unit- memory – Input and output – control unit- Tracing of program execution from high level to Hardware level	Chalk and Board, PPT
2.	2	Introduction to Boolean Logic, Boolean Functions, Gate Logic - Overview of HDL – Comparison of Verilog and VHDL - Designing elementary gates using HDL.	Chalk and Board
3.	3	Introduction to Combinational circuit and designing basic gates, multiplexers, demultiplexers, arithmetic circuits using HDL	Chalk and Board
4.	4	Introduction to sequential circuits, Designing elementary flip flops, registers and RAM units	Chalk and Board

5.	Hands on – Download Hardware simulator from www.nand2tetris.org and implement the basic gates, combinational circuits and sequential circuits covered in the class.		
6.	5	Introduction to Low level Language - Data representation- Processor, memory, registers abstractions, machine language, assembly language, Instruction sets, addressing modes	Chalk and Board, PPT
7.	6	Machine language Specification – use of Hack computer – A and C instruction of hack platform- Symbols – input/output handling - If logic and While Logic	Chalk and Board, PPT
8.	7	Introduction to assembly language programming - writing simple programs	Chalk and Board
9.	8	Hack assembler implementation – Parser – code-symbol table – macro assembly - two pass assemblers.	Chalk and Board
10.	Hands on– Download Assembler and CPU emulator from www.nand2tetris.org and test running simple programs and visualize the execution of translated binary code on the hardware.		
11.	9	Introduction to virtual machine - Virtual machine paradigm – Stack machine model - Stack based arithmetic	Chalk and Board, PPT
12.	10	Logical, and memory access operations using stack - Implementation of Virtual machine translator	Chalk and Board, PPT
13.	11	Program control - usage of subroutines Implementation of function call and return	Chalk and Board
14.	Hands on - Running programs on VM emulator		
15.	12	Introduction to compilers – overview of high level language (Jack) – context free grammars – Parsing	Chalk and Board
16.	13	Implementation of Syntax analyzer - Implementation of tokenizer, Parser	Chalk and Board
17.	14	Code generation – Data translation – Handling variables, arrays, objects- Compilation process	Chalk and Board

18.	15	Introduction to OS – Process Management – Implementation of arithmetic operations at the OS level- Memory management – Memory allocation algorithms	Chalk and Board, PPT
19.	16	Input / Output management Graphics output, character output, Keyboard Handling, Implementation of OS using Jack classes.	Chalk and Board

COURSE ASSESSMENT METHODS				
Sl.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Assessment -1	September Fourth week	One hour	20
2.	Assessment - 2	November Third Week	One hour	20
3.	Assessment-3	November fourth week		10
4.	End Semester Examination	December	Three hours	50

Total = 100

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc
<p>Text Book</p> <p>Noam Nisan, Shimon Schocken, “The Elements of Computing Systems: Building a Modern Computer from First Principles”, The MIT Press, 2005</p> <p>Reference Book</p> <p>David Evans, “Introduction to Computing, Explorations in Language, Logic, and Machines”, http://computingbook.org</p> <p>Website: http://www.nand2tetris.org</p>

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

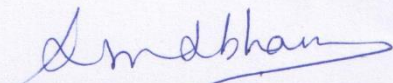
Student Feedback Form collected at the end of the course

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

Attendance: Students having 75% - 100% attendance are eligible for writing the End semester examination. Students having attendance between 65 % and 75% with valid reasons (Medical reasons, on duty) can write the end semester exam after attending extra classes. Students having less than 65 % attendance have to redo the course. Students should not absent for assessments. If the reason for absence is genuine, the student can appear for reassessment. The medical certificate/on duty certificate should be submitted within one week after rejoining.

ADDITIONAL COURSE INFORMATION

FOR SENATE'S CONSIDERATION


(S. MARY SAIRA BHANU)
Course Faculty


(R. LEELA VELUSAMY)
CC-Chairperson & HOD