

# GUJARAT TECHNOLOGICAL UNIVERSITY

## Advanced Computer Architecture 3715201 Semester I

**Type of course: Core**

**Prerequisite:**

1. Computer organization

**Rationale:**

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	PA (V) ESE	PA (I)	
4	2	0	5	70	30	30	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment;

**Content:**

Sr. No.	Content	Total Hrs	% Weightage
<b>1</b>	<b>Introduction &amp; Performance measurement in computer architecture</b> Basic concepts of computer organization. The stored program model. Classes of computer architecture. Processor vs. System architecture. Elements of computer systems – processors, memories, I/Os, disks, buses etc. Goals of computer architecture – performance, throughput, latency, power, cost. Processor performance vs. system performance. Comparison of various platforms in terms of performance and efficiency	<b>8</b>	15
<b>2</b>	<b>Processor Architecture</b> Internal elements and architecture of processors. Instruction execution. Instruction set architectures, CISC vs. RISC architectures. Bus architecture. Multi-Processor architecture. Memories and Caches. Cache coherency. Pipelining and data path elements	<b>8</b>	15
<b>3</b>	<b>System and System on Chip architecture</b> System architecture elements. H/W component selection and datasheet analysis. Bill of Materials. IP selection and System on Chip integration. Standard interfaces and I/Os. Analog and mixed signal element integration. Reset and clocking elements. Multi-processor system	<b>9</b>	20
<b>4</b>	<b>Special processor/system architects</b> An Overview of ARM, AVR, Intel’s 8051, Texas instruments MSP430 and microchip’s PIC microcontroller architecture and also its comparison	<b>9</b>	20

	to choose the controller based on the particular application and also the overview of latest architectures of Intel, ARM, TI, SPARC and Power PC architectures as modern SOC architectural elements. Detailed study and need for DSP and Multimedia processors.		

### Reference Books:

1. V.C. Hamacher, Z.G. Vranesic, S.G. Zaky. "Computer Organization". 5th Edition. "Peter", 2003.
2. David A. Patterson and John L. Hennessy. Computer Organization and Design, Revised Printing, Third Edition, Third Edition: The Hardware/Software Interface (The Morgan Kaufmann Series in Computer. Series in Computer Architecture and Design). Morgan Kaufmann; 3rd Edition. 2007.
3. Andrew S. Tanenbaum. Structured Computer Organization Prentice Hall; 5th Edition. 2005.
4. W. Stallings. "Computer Organization and Architecture. Designing and Performance". 7th Edition. Prentice Hall. 2005.
5. J.L. Hennessy, D.A. Patterson. "Computer architecture: A Quantitative Approach", 4th Edition. Morgan Kaufmann, 2006.
6. UltraSPARC T1™ Supplement to the UltraSPARC Architecture 2005. Sun Microsystems. 2006
7. OpenSPARC™ T2 Core Micro architecture Specification. Sun Microsystems. 2008

### Course Outcome:

After learning the course the students should be able to:

1. Understand about the performance measurement in Computer Architecture.
2. Analyse about the RISC and CISC processor architecture and cache coherency.
3. Analyse the system architecture elements and System on chip Architecture.
4. Understand about the overview of ARM, AVR, and Intel's 8051 architecture along with their latest architecture.
5. Analyse about the microprocessor systems and SIMD computer organizations.

### List of Experiments: (with Open Ended Problems)

1. Create a process and create child process and get ID of both.
2. Create a 3 Thread (i.e T1, T2, T3) get ID and stop the Thread respectively
3. Write a program to SLEEP the process for 6 sec.
4. Write a program on inter process communication.
5. Write a program to handle Error in the program.
6. Write a program to get information of files in the folder.
7. Program to make 8051 to store the data in Internal memory (RAM)
8. Write a program to generate a Square wave at P2.3 pin having same duty cycle.
9. Generate square using PWM tech in 8051.

10. Make port 0.20 pin as a input in ARM microcontroller

**List of Open Source Software/learning website:**

1. Virtual machine
2. Linux-fedora or opensuse 11.3.