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|--|------------------------|----------|----------|----------|-----------|----------------|
| CS6305 | MICROPROCESSORS | L | T | P | EL | CREDITS |
| | | 3 | - | 4 | 3 | 6 |
| Prerequisites: None | | | | | | |
| OBJECTIVES: <ul style="list-style-type: none">• To learn the architecture of the Intel 8086 microprocessor• To familiarize with assembly language programming and learn to write programs in 8086 assembly• To discuss the various multiprocessor configurations• To understand the functionality and working of different peripheral chips and their interfacing to the processor• To understand the architecture and the salient features of the x86 family of processors• To familiarize with tools for program analysis and performance analysis | | | | | | |
| MODULE I : | | L | T | P | EL | |
| | | 3 | - | 8 | 3 | |
| Intel 8086 Microprocessors – Architecture – Internal operation - Instruction set – Assembler directives and operators – Addressing modes | | | | | | |
| SUGGESTED ACTIVITIES : <ul style="list-style-type: none">• In Class activity for 8086 instructions and addressing modes• EL - Familiarising with the assembler• Practical – 8086 simple programs on the assembler. | | | | | | |
| SUGGESTED EVALUATION METHODS: <ul style="list-style-type: none">• Assignment problems on basic arithmetic operations• Quizzes | | | | | | |
| MODULE II : | | L | T | P | EL | |
| | | 3 | - | 8 | 3 | |
| 8086- Assembly language programming- Stacks - Procedures – Macros – Interrupts and Interrupt service routines – Byte and String manipulation instructions | | | | | | |
| SUGGESTED ACTIVITIES : <ul style="list-style-type: none">• Flipped classroom and activity• EL – Study of BIOS calls for keyboard and video services• Practical – 8086 programs using procedures, macros and string manipulation instructions<ul style="list-style-type: none">- Use of BIOS calls for video and keyboard services | | | | | | |
| SUGGESTED EVALUATION METHODS: <ul style="list-style-type: none">• Assignment problems for using the various string primitives• Quizzes | | | | | | |
| MODULE III : | | L | T | P | EL | |
| | | 3 | - | 4 | 3 | |
| 8086 Signals – Basic Configurations – Minimum mode- Maximum mode – Queue status and Lock Facility - System Bus Timing | | | | | | |

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| SUGGESTED ACTIVITIES : | | | | |
| <ul style="list-style-type: none"> • EL - Minimum mode signals, some timing diagrams • Practical – To continue with 8086 assembly language programming. | | | | |
| SUGGESTED EVALUATION METHODS: | | | | |
| <ul style="list-style-type: none"> • Assignment problems • Quizzes | | | | |
| MODULE IV : | L | T | P | EL |
| | 3 | - | - | 3 |
| System design using 8086: Multiprocessor configurations – Coprocessor – Closely coupled and Loosely coupled configurations | | | | |
| SUGGESTED ACTIVITIES : | | | | |
| <ul style="list-style-type: none"> • Flipped Class room • EL- Basics of Loosely Coupled Configurations | | | | |
| SUGGESTED EVALUATION METHODS: | | | | |
| <ul style="list-style-type: none"> • Assignment problems on different types of configurations • Quizzes | | | | |
| MODULE V : | L | T | P | EL |
| | 3 | - | 4 | 3 |
| Memory interfacing and I/O interfacing – Parallel communication Interface – Programming and Applications. | | | | |
| SUGGESTED ACTIVITIES : | | | | |
| <ul style="list-style-type: none"> • EL – Applications using 8255 • Practical - Implementation of various modes of operations of 8255 and applications | | | | |
| SUGGESTED EVALUATION METHODS: | | | | |
| <ul style="list-style-type: none"> • Assignment problems on memory interfacing and I/O interfacing in different configurations, System design using the 8086 • Quizzes | | | | |
| MODULE VI: | L | T | P | EL |
| | 3 | - | 4 | 3 |
| Serial communication interface – Interrupt controller – DMA controller – programming and applications | | | | |
| SUGGESTED ACTIVITIES : | | | | |
| <ul style="list-style-type: none"> • EL – System design using these devices, Applications • Practical - Implementation of various modes of operations of these devices | | | | |
| SUGGESTED EVALUATION METHODS: | | | | |
| <ul style="list-style-type: none"> • Assignment problems on applications and interfacing • Quizzes | | | | |
| MODULE VII: | L | T | P | EL |
| | 3 | - | 4 | 3 |
| IA 32 and IA 64 architectures - Evolution and salient features - Basic execution environment - System architecture overview - Modes of operation - Protected mode memory management. | | | | |

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| SUGGESTED ACTIVITIES | | | | |
| <ul style="list-style-type: none"> • Flipped Classroom • EL - evolution of the Intel processors • Practical - Study of a typical program debugging tool <ul style="list-style-type: none"> - Create dis-assembly of a simple C program and identify the stack frame and its contents | | | | |
| SUGGESTED EVALUATION METHODS: | | | | |
| <ul style="list-style-type: none"> • Assignment problems • Quizzes • Report on the execution trace | | | | |
| MODULE VIII: | L | T | P | EL |
| | 6 | - | 4 | 3 |
| Paging - Address translation - Protection - Paging MMU cache - Demand paging and virtual memory management - Using segmentation and paging together. Privilege levels - Protection - Defining and changing privilege levels. | | | | |
| SUGGESTED ACTIVITIES : | | | | |
| <ul style="list-style-type: none"> • Flipped classroom • EL - Further explorations with the debugging tool • Practical - Instrumentation and analysis with the tool | | | | |
| SUGGESTED EVALUATION METHODS: | | | | |
| <ul style="list-style-type: none"> • Assignment problems • Quizzes • Report based on the additional features | | | | |
| MODULE IX: | L | T | P | EL |
| | 6 | - | 4 | 3 |
| Multitasking - Task state segments - Scheduling - Changing privilege levels within a task - Communicating among tasks, Handling faults and interrupts. | | | | |
| SUGGESTED ACTIVITIES : | | | | |
| <ul style="list-style-type: none"> • EL – Different types of exceptions and their handling • Practical – Study of a performance analysis tool | | | | |
| SUGGESTED EVALUATION METHODS: | | | | |
| <ul style="list-style-type: none"> • Assignment problems • Quizzes | | | | |
| MODULE X: | L | T | P | EL |
| | 3 | - | 4 | 3 |
| Performance issues - Power and thermal management - Performance monitoring. | | | | |
| SUGGESTED ACTIVITIES : | | | | |
| <ul style="list-style-type: none"> • Flipped Classroom • Practical - Performance monitoring with the tool and reporting the various parameters like the number of instructions, cache misses, context switches, etc. | | | | |
| SUGGESTED EVALUATION METHODS: | | | | |
| <ul style="list-style-type: none"> • Assignment problems • Quizzes • Report on the findings of the performance tool for various scenarios | | | | |

OUTCOMES:

Upon completion of the course, the students will be able to:

- Discuss the architecture of the 8086 processor in detail
- Write assembly language programs in 8086 assembly
- Show how multiple processors can be connected with an 8086 processor
- Show how the various peripheral chips can be interfaced to the processor
- Point out the salient features of the other processors in the x86 family and discuss the various modes of operation of these processors
- Generate CFGs for simple C programs using the dynamic instrumentation tools and generate performance statistics

TEXT BOOKS:

1. Yu – Cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086/8088 Family – Architecture, Programming and Design “, Second Edition, Prentice Hall of India, 2007.
2. Barry B. Brey, “The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions : Architecture, Programming, and Interfacing”, Eighth edition, Pearson Prentice Hall, 2009.

REFERENCES:

1. Peter Abel, “IBM PC Assembly Language and Programming”,Fifth edition, Prentice Hall, 2000.
2. James L. Turley, “Advanced 80386 Programming Techniques”, Osborne McGraw Hill, 1988.
3. Intel® 64 and IA-32 Architectures Software Developer’s Manual, Volume 3B: System Programming Guide, Part 2.

EVALUATION PATTERN:

| Category of Course | Continuous Assessment | Mid – Semester Assessment | End Semester |
|----------------------------------|-----------------------|---------------------------|--------------|
| Theory Integrated with Practical | 15(T) + 25 (P) | 20 | 40 |

CO - PO Mapping:

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CO1 | ✓ | | | | | | | | | | | |
| CO2 | ✓ | ✓ | ✓ | | | | | | | | | |
| CO3 | ✓ | ✓ | ✓ | | | | | | | | | |
| CO4 | ✓ | ✓ | ✓ | | | | | | | | | ✓ |
| CO5 | ✓ | ✓ | ✓ | | | | | | | | | ✓ |
| CO6 | ✓ | ✓ | ✓ | | ✓ | | | | ✓ | | | ✓ |