Savitribai Phule Pune University
Second Year of Computer Engineering (2015 Course)
210253: Microprocessor

Teaching Scheme: TH: 04 Hours/Week	Credit 04	Examination Scheme: In-Sem(online): 50 Marks End-Sem(paper): 50 Marks

Prerequisite: Digital Electronics and Logic Design

Course Objectives:
- To learn the architecture and programmer's model of advanced processor
- To understand the system level features and processes of advanced processor
- To acquaint the learner with application instruction set and logic to build assembly language programs.
- To understand debugging and testing techniques confined to 80386 DX

Course Outcomes:

On completion of the course, student will be able to–
- To apply the assembly language programming to develop small real life embedded application.
- To understand the architecture of the advanced processor thoroughly to use the resources for programming
- To understand the higher processor architectures descended from 80386 architecture

Course Contents

Unit I	80386DX- Basic Programming Model and Applications Instruction Set	09 Hours

Memory Organization and Segmentation- Global Descriptor Table, Local Descriptor Table, Interrupt Descriptor Table, Data Types, Registers, Instruction Format, Operand Selection, Interrupts and Exceptions
Applications Instruction Set- Data Movement Instructions, Binary Arithmetic Instructions, Decimal Arithmetic Instructions, Logical Instructions, Control Transfer Instructions, String and Character Transfer Instructions, Instructions for Block Structured Language, Flag Control Instructions, Coprocessor Interface Instructions, Segment Register Instructions, Miscellaneous Instructions.

Unit II	Systems Architecture and Memory Management	09 Hours

Systems Architecture- Systems Registers, Systems Instructions.
Memory Management- Segment Translation, Page Translation, Combining Segment and Page Translation.

Unit III	Protection and Multitasking	09 Hours

Protection- Need of Protection, Overview of 80386DX Protection Mechanisms, Segment Level Protection, Page Level Protection, Combining Segment and Page Level Protection.
Multitasking- Task State Segment, TSS Descriptor, Task Register, Task Gate Descriptor, Task Switching, Task Linking, Task Address Space.

Unit IV	Input-Output, Exceptions and Interrupts	09 Hours

Input-Output- I/O Addressing, I/O Instructions, Protection and I/O
Exceptions and Interrupts- Identifying Interrupts, Enabling and Disabling Interrupts, Priority among Simultaneous Interrupts and Exceptions, Interrupt Descriptor Table (IDT), IDT Descriptors, Interrupt Tasks and Interrupt Procedures, Error Code, and Exception Conditions.

Unit V	Initialization of 80386DX, Debugging and Virtual 8086 Mode	09 Hours

Initialization- Processor State after Reset, Software Initialization for Real Address Mode, Switching to Protected Mode, Software Initialization for Protected Mode, Initialization Example, TLB Testing
Debugging- Debugging Features of the Architecture, Debug Registers, Debug Exceptions, Breakpoint Exception
Virtual 8086 Mode- Executing 8086 Code, Structure of V86 Stack, Entering and Leaving Virtual 8086 Mode.

Unit VI	80386DX Signals, Bus Cycles and 80387 Coprocessor	09 Hours

80386DX Signals- Signal Diagram, Description of Signals **80386DX Bus Cycles-** System Clock, Bus States, Pipelined and Non-pipelined Bus Cycles.
80387 NDP- Control Register bits for Coprocessor support, 80387 Register Stack, Data Types, Load and Store Instructions, Trigonometric and Transcendental Instructions, Interfacing signals of 80386DX with 80387.

Books:

Text:
1. Intel 80386 Programmer's Reference Manual 1986, Intel Corporation, Order no.: 231630-011, December 1995.
2. James Turley, ―Advanced 80386 Programming Techniques", McGraw-Hill, ISBN: 10: 0078813425, 13: 978-0078813429.
3. Intel 387DX Math coprocessor, Order no.: 240448-005, March1992.

References:
1. Chris H. Pappas, William H. Murray, ―80386 Microprocessor Handbooks", McGraw-Hill Osborne Media, ISBN-10: 0078812429, 13: 978-0078812422.
2. Walter A. Triebel, ―The 80386Dx Microprocessor: Hardware", Software, and Interfacing, Pearson Education, ISBN: 0137877307, 9780137877300.
3. Brey, Barry B, ―8086/8088, 80286, 80386 and 80486 Assembly Language Programming", Prentice Hall, ISBN: 13: 9780023142475.
4. Mohammad Rafiquzzaman, ―Microprocessors: Theory and Applications: Intel and Motorola", Prentice Hall, ISBN:-10:0966498011, 13:978:0966498011.
5. K. Bhurchandi, A. Ray, ―Advanced Microprocessors and Peripherals", McGraw Hill Education, Third Edition, ISBN: 978-1-25-900613-5.
6. Introduction to 64 bit Intel Assembly Language Programming for Linux, 2nd Edition, Ray Seyfarth, ISBN10: 1478119209, ISBN-13: 9781478119203, 2012.
7. Assembly Language Step-by-step: Programming with Linux, 3rd Edition, Jeff Duntemann, Wiley ISBN:-10 0470497025, ISBN-13: 978-0470497029, 2009.