NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF MECHANICAL ENGINEERING
MECHATRONICS ENGINEERING PROGRAM

MT418 – DIGITAL SIGNAL PROCESSORS

I. GENERAL INFORMATION

CODE	: MT418 Digital Signal Processors
SEMESTER	: 8
CREDITS	: 4
HOURS PER WEEK	: 4 (Theory – Laboratories)
PRERREQUISITOS	: MB 158 Complex Variable and Fourier Analysis. MT 417 Digital Signal Processing
CONDITION	: Compulsory

II. COURSE SUMMARY

The course is of a practical theoretical nature which will provide participants with knowledge on the architecture of processors, microcontrollers and DSPs used for the implementation of automation and control systems. Detailed review of the components and their functionalities, organization of memory, instructions, external pins, connection circuits, interrupt system, digital inputs / outputs, analogue digital converter, PWM, comparators, timers, etc. C ++ programming of the system components to perform the various functions required for process control and automation.

III. COMPETENCES

The student:

1. Understands the digital signal processor architecture.
2. Develop the real-time operating system process manager program for a microcontroller.
3. Develop the memory manager program of a real-time operating system for a microcontroller.
4. It develops the administrator program of input and output of a real-time operating system for a microcontroller.

IV. LEARNING UNITS

1. FUNDAMENTALS OF REAL-TIME OPERATING SYSTEMS / 12 HOURS

Introduction to Computational Systems / Real Time Systems / Basic Elements / Memory processor / Input and Output Modules / Interconnection between elements / Processor Registers / Instruction Cycle / Real-Time Operating System Structure / Elements / Evolution / Processes Series / Batch process /

Batch system with multiprogramming / Time sharing systems / Real-time operating system kernel / Command interpreter, interpreter implementation algorithms.

2. PROCESS MANAGEMENT / 24 HOURS

Definition of processes / States of a process / Process description / Process block / Process control / Process planning / FIFO Process planning algorithms, round robin, priority / Techniques and algorithms for implementing single user operating systems, multiuser operating system / Process Interchange Algorithm / Real-Time Process Planning Algorithms / Multitasking Real-Time Operating System implementing Techniques and Algorithms / Process Scheduling / Concurrency Problems. Communication between processes. Synchronization of processes.

3. MEMORY ADMINISTRATION / 12 HOURS

Memory management. Preliminary concepts. Direction and content of memory / Memory management techniques / Real-Time Multiprogramming / Memory Allocation Algorithms / Memory Allocation Algorithms Implementation Techniques and Algorithms / Virtual Memory Multiprogramming / Pure Paging / Memory Allocation Algorithms / Pure Segmentation / Mixed Systems /

4. ADMINISTRATION OF STORAGE DEVICES / 8 HOURS

File Management / File Operations / Request Planning Algorithms / File Management Elements / Access Methods: sequential, direct. Methods of assignment: contiguous, linked, and indexed. / Protected files.

V. LABORATORIES AND PRACTICAL EXPERIENCES

Lab 1: Development of the kernel program of the operating system for a microcontroller.

Lab 2: Development of the program manager of a multitasking operating system for a microcontroller.

Lab 3: Development of the program manager interface of a multitasking operating system for a microcontroller.

Lab 4: Development of the real-time process scheduling program.

Lab 5: Development of the program manager of a multitasking real-time operating system for a microcontroller.

VI. METHODOLOGY

The course is developed in theory and laboratory sessions. In the theory sessions, the teacher presents the concepts, algorithms and techniques of development

of the computer programs. In the laboratory sessions the student develops the program of each component of the operating system in real time multitasking for a microcontroller, combining applications in the personal computer and applications for the microcontroller. In the sixth week the student must present and present the project of the multitasking operating system and in the fourteenth week must present and expose the project of the operating system in real time multitasking.

VII. EVALUATION FORMULA

Evaluation system 'D'. Calculation of the final score: FS = (M1 + M2 + M3 + M4)/4
M1: Monograph 1, M2: Monograph 2, M3: Monograph 3, M4: Monograph 4.

VIII. BIBLIOGRAPHY

1. James L. Peterson(1993) Operating system concepts. Spain, Reverte Ed.
2. Tanenbaum, Andrew S (1993) Modern Operating Systems. Mexico, Prentice Hall Hispanoamericana.
3. Phillip A. Laplante. Real-Time System Design and Analysis - An Engineers Handbook, Third Edition.pdf