REVISED SYLLABUS ACCORDING TO CBCS NEP2020 SECOND-YEAR OF MASTER OF SCIENCE IN PHYSICS

COURSE TITLE:- LAB COURSE – 01
SEMESTER - IV
W.E.F. 2024 - 2025

RECOMMENDED BY THE BOARD OF STUDIES IN PHYSICS
AND
APPROVED BY THE ACADEMIC COUNCIL

Devrukh Shikshan Prasarak Mandal's
Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and
Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh.
Tal.Sangmeshwar, Dist. Ratnagiri-415804, Maharashtra, India

Academic Council Item No: **dated 19 April 2024**

Name of the Implementing Institute	:	Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal. Sangmeshwar, Dist. Ratnagiri-415804,
Name of the Parent University	:	University of Mumbai
Name of the Programme	:	Master of Science
Name of the Department	:	Physics
Name of the Class	:	Second Year
Semester	:	Forth
No. of Credits	:	02
Title of the Course	:	Lab Course – 01
Course Code	:	S612PHP
Name of the Vertical in adherence to NEP 2020	:	Major
Eligibility for Admission	:	Any student admitted to Second year of M.Sc, degree programme in adherence to Rules and Regulations of the University of Mumbai and Government of Maharashtra.
Passing Marks	:	40%
Mode of Assessment	:	Summative
Level	:	PG
Pattern of Marks Distribution for SEE and CIA	:	100% SEE
Status	:	NEP-CBCS
To be implemented from Academic Year	:	2024 - 2025

Syllabus for First Year of Master of Science in Physics

(With effect from the academic year 2024 - 2025)

SEMESTER - IV **Paper – Physics Paper – IV**

Course Title: Lab Course – 01 **No. of Credits - 02**

Type of Vertical: Major **COURSE CODE: S612PHP**

Learning Outcomes Based on BLOOM's Taxonomy:

After completing the course, the learner will be able to…

Course Learning Outcome No.	Blooms Taxonomy	Course Learning Outcome
CLO-01	Understand	Identify and test various electronic components
CLO-02	Apply	Setup Zephyr RTOS for the Nucleo board
CLO-03	Apply	Implement Communication, multithreading and sensor integration.
CLO-04	Apply	Demonstrate deadlock condition and how to prevent it
CLO-05	Analysed	Troubleshoot simple circuits
CLO-06	Design	Design a PCB for simple circuits

Syllabus for First Year of Master of Science in Physics
(With effect from the academic year 2024 - 2025)

SEMESTER - IV **Paper – Physics Paper – IV**
Course Title: Lab Course – 01 **No. of Credits - 02**
Type of Vertical: Major **COURSE CODE: S612PHP**

COURSE CONTENT

Practicals

Communication Protocol :
Implement UART communication between the Nucleo ST board and a computer.
Create a program that sends following "hello" packet over UART
{
uint8_t command_id;
uint8_t checksum;
uint8_t message[10];
}
Python program running on the PC shall send "OK" is checksum if correct. If checksum is wrong then it shall send "NOTOK"

Sensor Integration:
Integrate a sensor (e.g., temperature, humidity, accelerometer) with the Nucleo ST board.
Develop a firmware application that reads data from the sensor and displays it via UART communication.
Ensure proper initialization and configuration of the sensor.

Multithreading

Thread Creation and Termination:
Implement a program that creates multiple threads, each performing a specific task (e.g., counting, printing messages).
Ensure proper thread creation and termination mechanisms are in place.
Use synchronization primitives such as mutexes or semaphores to coordinate access to shared resources.

Producer-Consumer Problem:
Implement a solution to the classic producer-consumer problem using multithreading.
Create two types of threads: producers and consumers.
Producers generate data items and add them to a shared buffer, while consumers remove items from the buffer and process them.
Ensure proper synchronization to prevent race conditions using mutex and buffer overflow/underflow.

Thread Synchronization with Condition Variables:
Implement a program that demonstrates the use of condition variables for thread synchronization.
Create a scenario where multiple threads must wait for a specific condition to be satisfied before proceeding. Use condition variables to signal when the condition is met and to block/unblock threads accordingly.
Thread Pool Implementation:
Implement a thread pool mechanism for efficient task execution using multithreading.
Create a pool of worker threads that can execute tasks submitted by a main thread.
Ensure proper task scheduling and load balancing among worker threads.

Parallel Matrix Multiplication:
Implement parallel matrix multiplication using multithreading.
Divide the matrices into smaller blocks and assign each block multiplication to a separate thread.
Utilize synchronization mechanisms to ensure correct computation and aggregation of results.

Parallel Sorting Algorithms:
Implement parallel versions of sorting algorithms (e.g., merge sort, quicksort) using multithreading.
Divide the array into smaller segments and assign each segment to a separate thread for sorting.
Use synchronization mechanisms to merge sorted segments efficiently.

Deadlock Detection and Avoidance:
Create a scenario involving multiple threads and resources where deadlock may occur.
Implement deadlock detection and avoidance mechanisms to prevent or recover from deadlock situations.

Practicals related to Electronics Design

Component Identification and Testing & Breadboarding of Circuits

Noise and Signal Integrity Testing
Students will set up circuits with various noise sources and measure signal integrity using oscilloscopes. They will analyze the effects of noise and explore techniques for noise reduction.

PCB Design and Layout
Students will use PCB design software to create schematics and layout designs for circuits e.g. 555 timer based LED flasher.

Soldering Techniques and PCB Assembly
Develop skills in through-hole and surface mount soldering. Students will practice soldering components onto PCBs using through-hole and surface mount soldering techniques. They will learn proper soldering techniques and methods for solder joint inspection.

Study of Signal Processing and Filtering Circuits

Troubleshooting and Debugging Circuits
Students will diagnose and troubleshoot common circuit problems such as open circuits, short circuits, and incorrect component values. They will use multimeters, oscilloscopes, and other tools to identify and resolve issues.

Access to the Course

The course is available for all the students admitted for Master of Science in Physics.

Methods of Assessment

The assessment pattern would be 100% Semester End Examination (SEE). The structure of the SEE would be as recommended by the Board of Studies and approved by the Board of Examination and the Academic Council of the college.

Pattern of Evaluation

The Examination/Evaluation pattern shall be framed by the Board of Examination with its final approval from the Academic Council of the College.