AIR FLOW REGIMES AND THERMAL COMFORT IN COMPUTERS LABORATORY

By

Eng. Ahmed Saber Abdel-Aziz Galal

A Thesis Submitted to the Faculty of Engineering at Cairo University in Partial Fulfilment of the Requirements for the Degree of MASTER OF SCIENCE

In

MECHANICAL POWER ENGINEERING

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2016

AIR FLOW REGIMES AND THERMAL COMFORT IN COMPUTERS LABORATORY

By

Eng. Ahmed Saber Abdel-Aziz Galal

**A Thesis Submitted to the Faculty of
Engineering at Cairo University in Partial
Fulfilment of the Requirements for the Degree of
MASTER OF SCIENCE**

In

MECHANICAL POWER ENGINEERING

Under Supervision of

Prof. Dr. Essam El-Din Khalil
Professor
Mechanical Power Department
Faculty of Engineering
Cairo University

Dr. Mohamed Aly Ibrahim
Assistant Professor
Mechatronics Department
Faculty of Engineering
October 6 University

Dr. Ahmed El-Degwy Ahmed
Assistant Professor
Mechanical Power Department
Faculty of Engineering
Cairo University

**FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2016**

AIR FLOW REGIMES AND THERMAL COMFORT IN COMPUTERS LABORATORY

By

Eng. Ahmed Saber Abdel-Aziz Galal

A Thesis Submitted to the Faculty of Engineering at Cairo University in Partial Fulfilment of the Requirements for the Degree of MASTER OF SCIENCE

In

MECHANICAL POWER ENGINEERING

Approved by the Examining Committee

Prof. Dr. Essam El-Din Khalil — **Thesis Main Advisor**
Professor of mechanical power engineering

Prof. Dr. Samy Morad Morcos — **Internal Examiner**
Professor of mechanical power engineering

Prof. Dr. Osama Ezzat Abdullatif — **External Examiner**
Head of department of mechanical power engineering at Shoubra, faculty of engineering, Benha university

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
GIZA, EGYPT
2016

Engineer: Ahmed Saber Abdel-Aziz Galal

Date of Birth : 03 / 12 / 1991

Nationality : Egyptian

E-mail: Eng.ahmed.saber79@gmail.com

Phone : (+2) 01063546854

Address : 4 Said Abo Elhamd St. Eleshreen
Faysal, Giza , Egypt

Registration Date: 01/10/2014

Awarding Date : **2016**

Degree : Master of Science

Department : Mechanical Power Engineering

Supervisors :
Prof. Dr. Essam E. Khalil
Dr. Mohamed Ali Ibrahim
Assistant professor of mechatronics department, faculty of engineering, October 6 University
Dr. Ahmed El-Degwy Ahmed El-Degwy

Examiners :
Prof. Dr. Essam El-Din Khalil
Prof. Dr. Samy Morad Morcos
Prof. Dr. Osama Ezzat Abdel-lattif
Head of department of mechanical power engineering at Shoubra, faculty of engineering, Benha university.

Title of Thesis:

AIR FLOW REGIMES AND THERMAL COMFORT IN COMPUTERS LABORATORY

Key Words: **(**Thermal Comfort – Displacement ventilation – ACH)

Summary:

The present study devoted to numerically investigate the indoor air quality and thermal comfort inside an air-conditioned computer laboratory. Two different types of air-conditioning systems are examined; commercial floor (free) mounted air conditioning units and a central air conditioning unit. In both systems, the effect of varying the conditioned air flow rate and the location of the air conditioning units are investigated. Moreover, the results from the different systems are compared in order to achieve the best IAQ and comfort condition for the students inside the computer laboratory. The performance of the air conditioning system is characterized by air flow patterns, temperature, and relative humidity contours as well as the most commonly used comfort parameters PMV and PPD based on Fanger model.

ACKNOWLEDGEMENT

I am heartily thankful to my supervisors, **Prof. Dr. Essam El-Din Khalil, Dr. Mohamed Aly Ibrahim and Dr. Ahmed El-Degwy** who was abundantly helpful and offered invaluable assistance, support and guidance whose encouragement, guidance and support from the initial to the final level enabled me to develop an understanding of the subject of this thesis.

Also, I would like to thank **Dr. Taher Abou-Deif and Dr. Saber Mohamed** for their support and the real help, my parents, my brothers and my sisters. Their insight and wisdom have been invaluable.

I would like to thank the other members of my committee.

Finally, I cannot forget the support of my colleagues in the Mechanical Power Engineering department as well as from my Professors for their encouragement and concern throughout the scope of the work.

TABLE OF CONTENTS

LIST OF TABLES

TABLE DESCRIPTION **PAGE**

LIST OF FIGURES

FIGURE DESCRIPTION **PAGE**