Higher Technical Institute MECHANICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

COMPUTER AIDED DESIGN TECHNIQUES IN MECHANICAL DESIGN

BY DEMETRIS PENTARAS M/864

WINE 199

HIGHER TECHNICAL INSTITUTE

MECHANICAL ENGINEERING COURSE

DIPLOMA PROJECT

COMPUTER AIDED DESIGN TECHNIQUES IN MECHANICAL DESIGN

M/864

DEMETRIS PENTARAS

JUNE 1999



COMPUTER AIDED DESIGN TECHNIQUES

IN MECHANICAL DESIGN

by

Demetris Pentaras

Project Report

Submitted to

the Department of Mechanical Engineering

of the Higher Technical Institute

Nicosia Cyprus

in partial fulfilment of the requirements

for the diploma of

TECHNICIAN ENGINEERING

in

MECHANICAL ENGINEERING

June 1999



I dedicate this project to my parents.

\

CONTENTS

<u>CH</u> /	APTER 1 Design		1
	O		ĩ
1.1	Overview		1
1.2	Design Sources		2
1.3	Design Concepts	_	2
1.4	The Design Process		3
1.5	Stage 1-Identification of Problem		4
1.6	Stage 2-Concepts and Ideas		6
1.7	Stage 3-Compromise Solutions		7
1.8	Stage 4-Models and Prototypes		9
1.9	Stage 5-Production or Working Drawings		10
<u>CH</u>	APTER 2 Computer-Aided Design (CAD)		12
2.1	Overview		12
2.2	Computer System and Components		13
2.3	Computer Types		14
2.4	Computer-Aided Drafting		16
2.5	CAD System Configurations		17
2.6	Central Processing Unit		18
2.7	Display Devices		19
2.8	Input Devices		21
2.9	Output Devices		23
2.10	Data Storage Devices		26

2.11	CAD Software	27
2.12	Common Core Cad Software	27
2.13	CAD Capability Checklist	28
2.14	Drawing with CAD Software	29
2.15	Using a Cad System	29
<u>CHA</u>	<u>APTER 3</u> Microsoft Excel for Engineers	33
3.1	Overview	31
3.2	Using Excel in Engineering Applications	31
3.2.1	Evaluating Numeric Precision and Accuracy	32
3.2.2	A Brief Review of Cell Referencing	32
3.2.3	Using Operators in Calculations	33
3.2.4	Spreadsheet Functions	34
3.3	Engineering Tables	34
3.3.1	The Table Command's Single-Input Table	34
3.4	Easy Plotting	38
<u>CHA</u>	PTER 4 The Mechanical Desktop 3.0 Software	40
4.1	The Mechanical Desktop Advantage	40
4.2	Technical Specifications of the Mechanical Desktop 3.0	41
	Software	
4.2.1	Parametric, Feature-Based Solid Modeling	41
4.2.2	Associative Drafting and Sketching	42
4.2.3	Comprehensive, 3D NURBS-Based Modeling	42
4.2.4	Assembly Modeling	44
4.2.5	Design Analysis	45
4.2.6	General Functionality	45

4.2.7	System Requirements	46
<u>CHA</u>	APTER 5 Creation of a 3D Assembly Model b the Aid of the Mechanical Desktop 3.	y 47 0
5.1	Assembly Modelling	47
5.2	The 3D Assembly Model of a Machine Vise	48
5.3	The Mass Property Analysis of the Machine Vise	48
<u>CHA</u>	PTER 6 Conclusions	51

<u>COMPUTER AIDED DESIGN TECHNIQUES IN</u> <u>MECHANICAL DESIGN</u>

SUMMARY

The purpose of this project is to present the various phases of design, to investigate areas where computers may be utilised in the design process and to design on a computer a mechanical component.

Emphasis is given to the Computer Aided Design Techniques in Mechanical Design and to the creation of a 3D assembly model. A 3D assembly model of a Machine Vise was created by the aid of Mechanical Desktop 3.0 Software.

ACKNOWLEDGEMENTS

I would like to express my deep thanks to my project supervisor Mr. Paraskevas Demetriou for his advice, time and help through the whole period of the project construction and organization.

I would also like to thank my parents for their support during the preparation of this project.

Demetris Pentaras