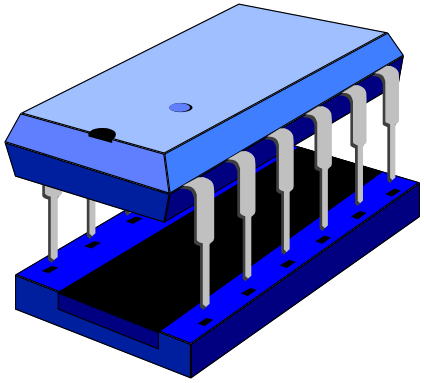
# COMPUTER ARCHITECTURE



Assignment Project Exam Help

Introduction

https://powcoder.com

Add WeChat powcoder

**Bernhard Kainz** (with thanks to **A. Gopalan, N. Dulay** and **E. Edwards**)

b.kainz@imperial.ac.uk

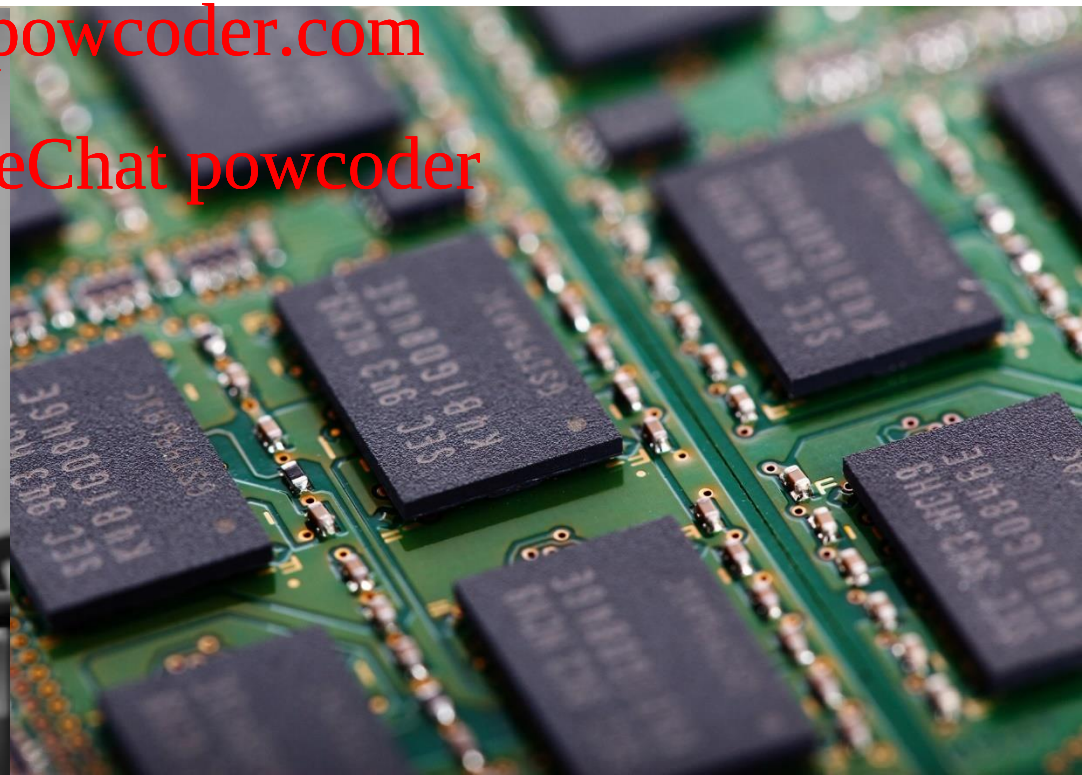
# Course Aims

- To understand the elements and functional principles of a computer

Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

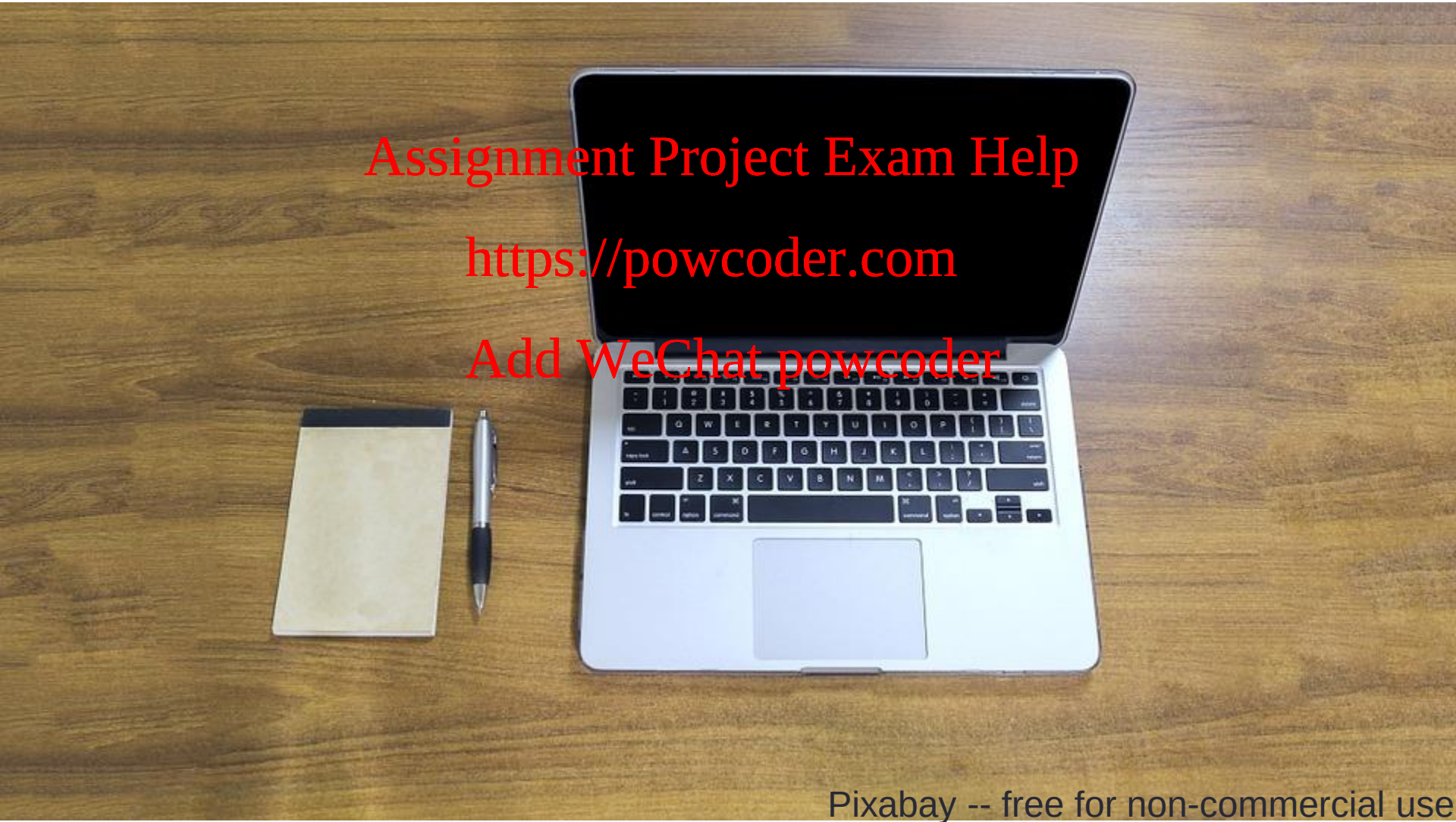


# Learning Outcomes

- At the end of this course you should:
  - Know the basic the elements of a computer and understand how these elements link together
  - Know the different forms of memory organisation
  - Understand the basics of logic and number representation
  - Comprehend the different levels of programs
  - Understand the structure of the Toy and Pentium processor
  - Be able to write assembler programs

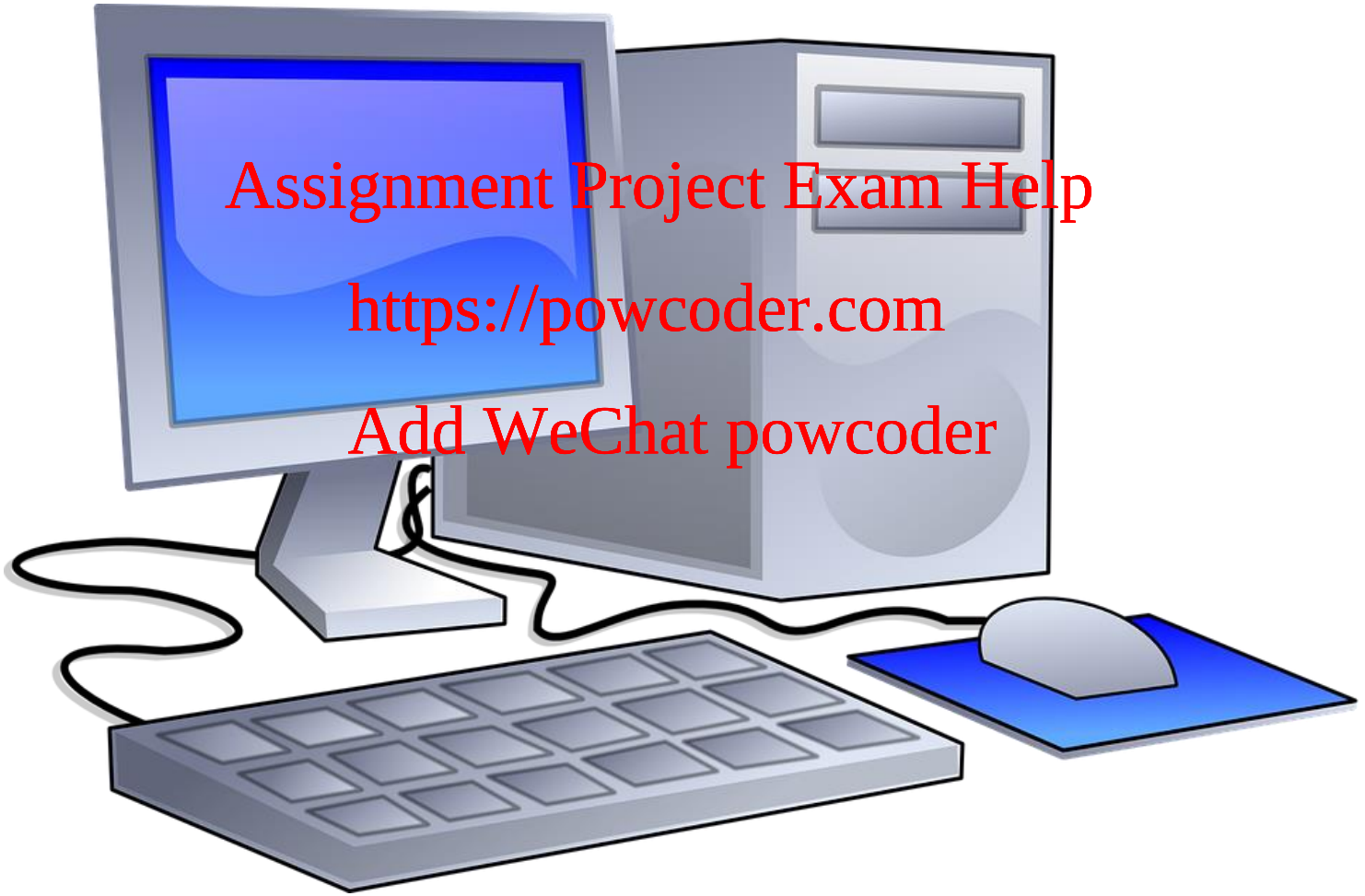
Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

# What is a computer?




Pixabay -- free for non-commercial use

# What is a computer?



Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

wikipedia -- free for non-commercial use

# What is a computer?

Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

wikipedia -- free for non-commercial use

# What is a computer?

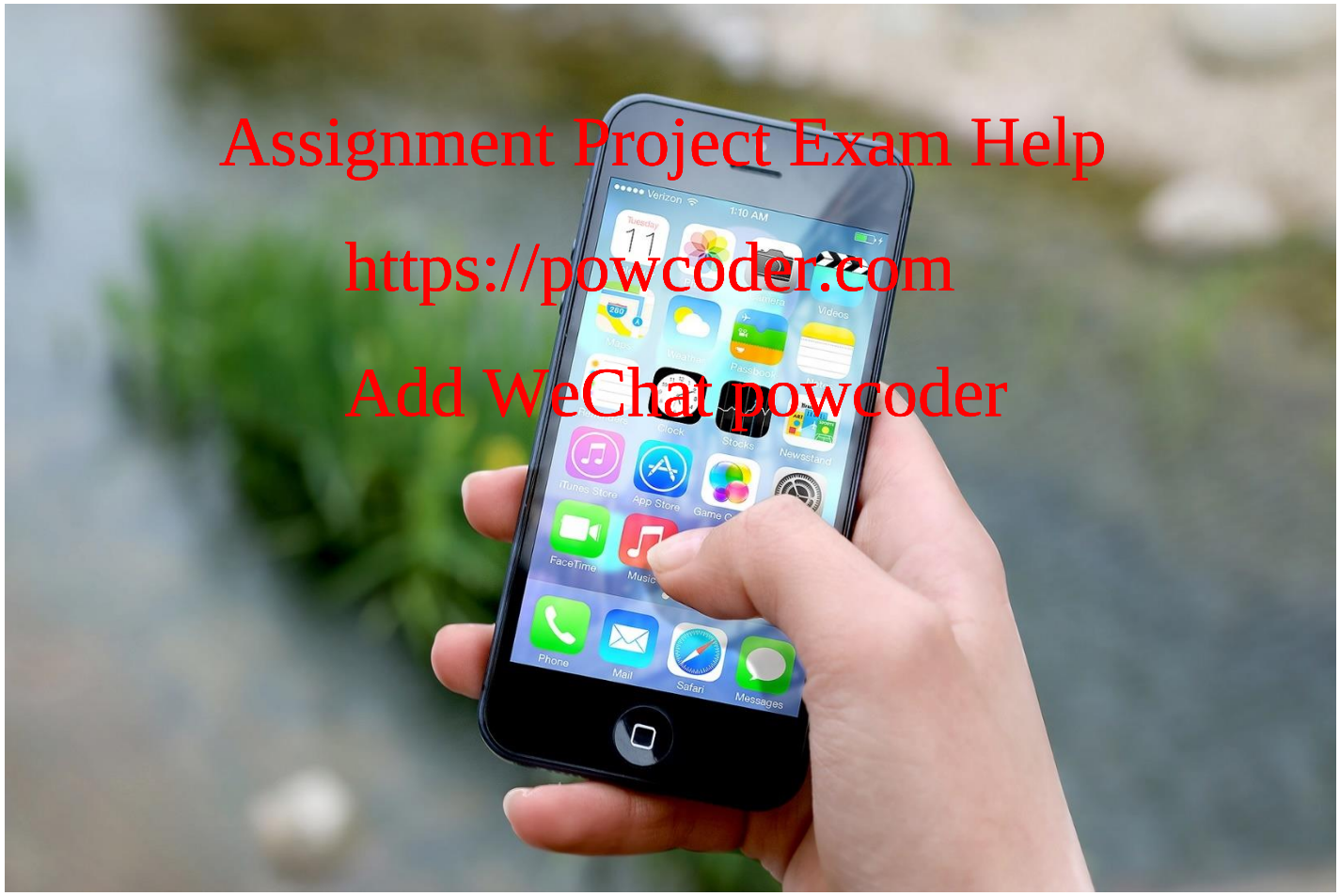
Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

wikipedia -- free for non-commercial use

# What is a computer?




flickr -- free for non-commercial use

# What is a computer?

Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

# What is a computer?

Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

wikipedia -- free for non-commercial use

# What is a computer?

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

flickr -- free for non-commercial use

# What is a computer?

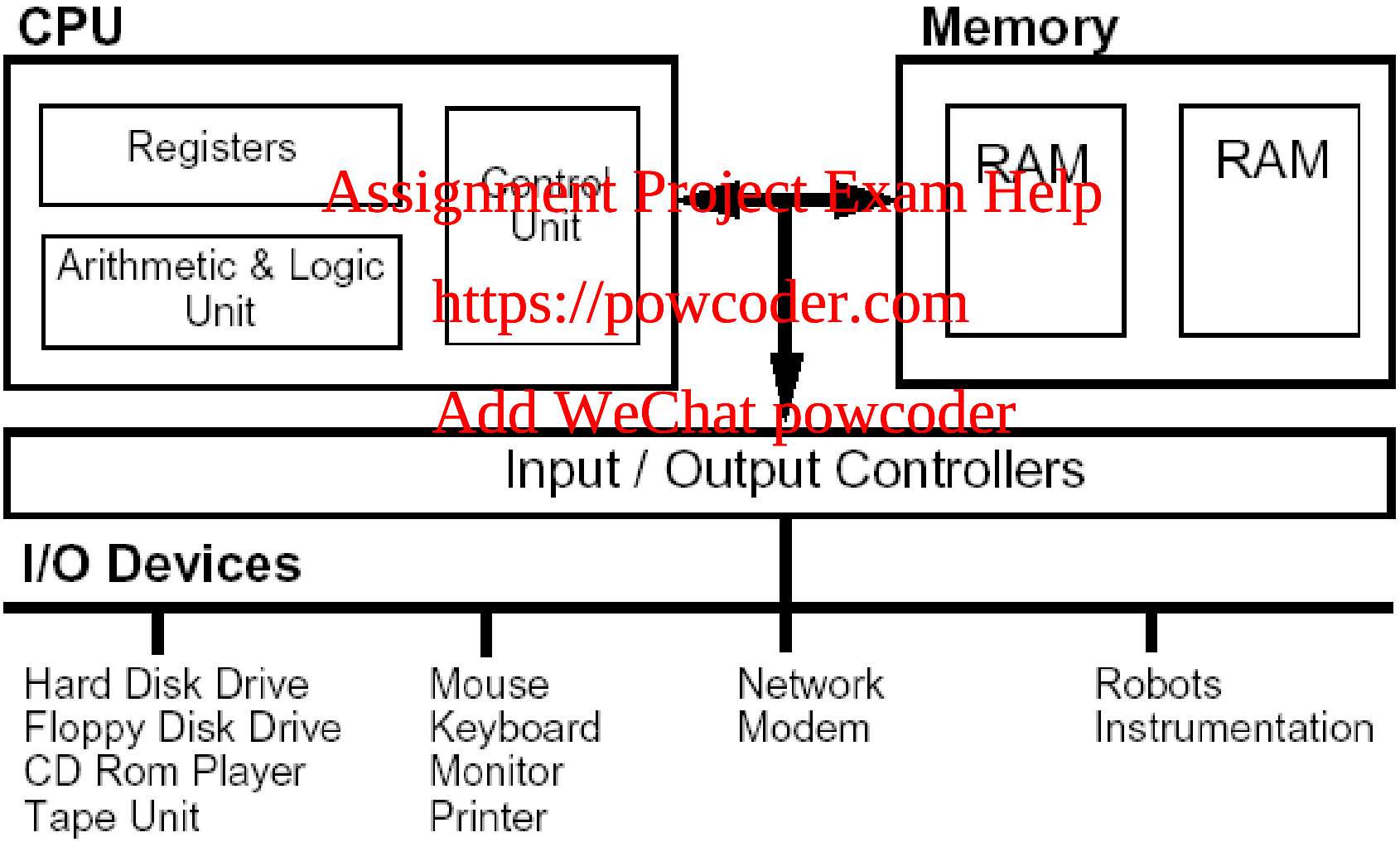
Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

wikipedia -- free for non-commercial use

# What is a computer?

flickr -- free for non-commercial use

# What is a computer?




Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

# What is a computer?

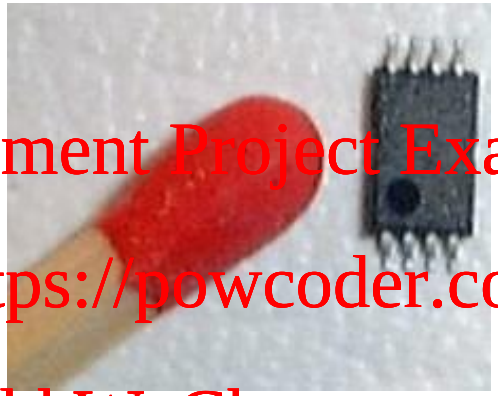
Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

Nvidia -- free for non-commercial use

# Downsizing



Assignment Project Exam Help

https://powcoder.com

Add WeChat powcoder

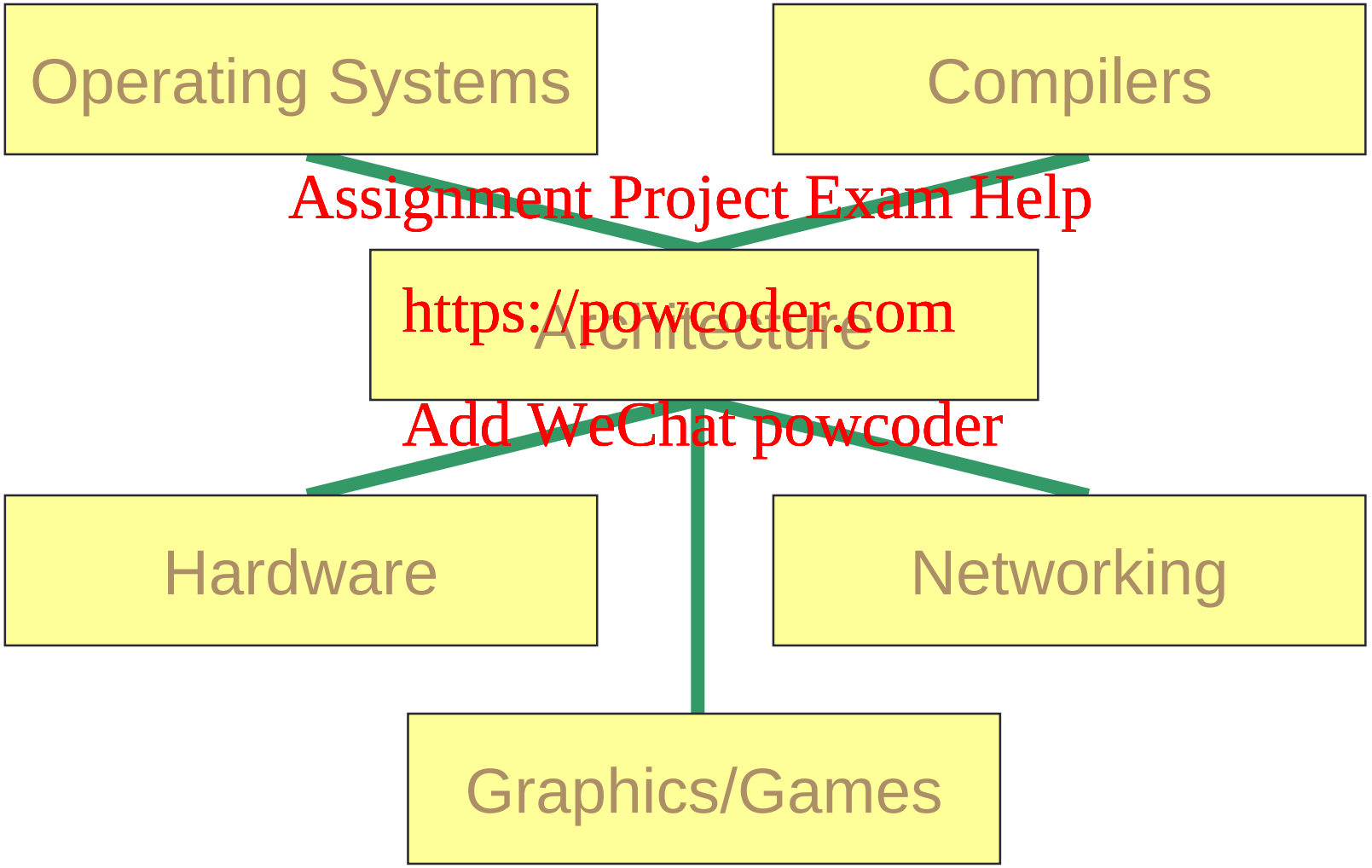
Matchbox computer

Web Server

UC Berkeley Mote

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

# Why ?




Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

# Computer Architects - What do they do?

- **Instruction Set** Design
- **CPU** Design
- **I/O Interface** Design
- **Bus design**
- **Motherboard** design
- ....

- **Emulation & testing** of the Architecture in Software
- **Implementation and testing** of the Architecture in Silicon
- **Performance** Evaluation

- Requirements with input from:

  **Higher Management**,
  **Compiler writers**,
  **Operating System developers**,
  **Sales and marketing**,
  **Existing and potential Customers**

- **Cost/profitability** analysis

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

# Computer Architecture - Who needs to know?

- **Students** of Computer Architecture!
- **Lecturers** of Computer Architecture !!
- Operating System Developers
- Compiler Writers
- **Repair and Maintenance Technicians**
- **Third Party Vendors** e.g. Peripheral makers, Memory suppliers, Add-on card Suppliers (e.g. Co-processors, Graphics Accelerators)
- Sales and Marketing
- **Patent Office Workers**
- Reverse Engineers/Hackers

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

# Course Outline

*Part 1*

Boolean Algebra and Logic

Basic Circuits and Memory

CPU Design

Main Memory Organisation

Data Representation & Binary Arithmetic

Floating Point Representation

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

*Part 2*

CPU Organisation & Representation

Pentium CPU and Programming

Input/Output Control

# Recommended Reading

## Structured Computer Organisation (5th ed.)

- Andrew S. Tannenbaum, Prentice-Hall International
- Easy to read, also covers 2nd & 3rd year topics

Assignment Project Exam Help

## Computer Organisation & Architecture (9th ed.)

https://powcoder.com

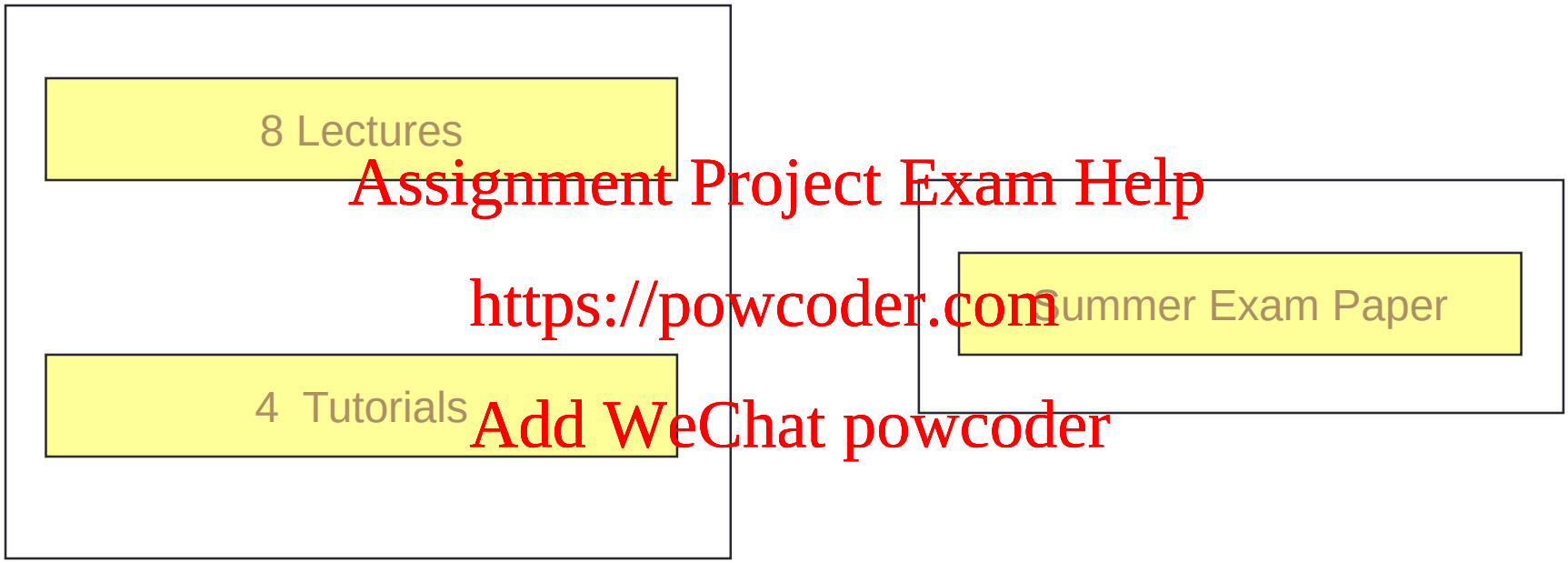
- William Stallings, Prentice-Hall International
- Detailed, academic, also covers 2nd and 3rd year topics

Add WeChat powcoder

## Guide to Assembly Language Programming in Linux

- Sivarama Dandamudi, Springer
- Good introduction to Intel assembly programming

# Workload (Architecture – Part 1)




Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder

- Lecture notes and Tutorials available from CATe
- Questions and discussions on Piazza
- Coursework on paper, 2 weeks time

# Schedule

| Date | Topic | Lecture/Tutorial | Time and Room |
|---|---|---|---|
| October $20^{th}$ | Introduction + Boolean Algebra and Logic | Lecture | 11:00 - 12:00, 145 |
| | Boolean Algebra and Logic | Tutorial | 12:00 - 13:00, 145 |
| October $23^{rd}$ | Basic Circuits and Memory | Lecture | 14:00 - 15:00, 311 |
| | Chip Design | Lecture | 15:00 - 16:00, 311 |
| October $25^{th}$ | Memory Organisation | Lecture | 11:00 - 12:00, 145 |
| | Memory Organisation | Tutorial | 12:00 - 13:00, 145 |
| October $27^{th}$ | Data Representation + Binary Arithmetic | Lecture | 11:00 - 12:00, 145 |
| | Data Representation + Binary Arithmetic | Tutorial | 12:00 - 13:00, 145 |
| October $30^{th}$ | Floating Point Numbers | Lecture | 14:00 - 15:00, 311 |
| | Floating Point Numbers | Lecture | 15:00 - 16:00, 311 |
| October $31^{st}$ | Floating Point Numbers | Tutorial | 14:00 - 15:00, 144 |
| | Coursework released - Deadline November $16^{th}$ | | |
| November $1^{st}$ | Tricks and Revision | Lecture | 11:00 - 12:00, 145 |

Assignment Project Exam Help
https://powcoder.com
Add WeChat powcoder