

## Design and Analysis of Algorithms Final Project

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**Submit:** Data + Source Code + Report (by the teacher's form)

**Deadline:** Submit to Classroom &

Send to email: [hung.buithanhcs@gmail.com](mailto:hung.buithanhcs@gmail.com) (before session 15 two days)

**Demo & Answer the teacher's question:** Session 15

**Grade:** Group Point: 1.5, Personal Point: 8.5

## Library Management System

Your **second assignment in this block** will be using binary search tree data structure for implementing a small Library Management System (LMS) in Python language. LMS manages information about books, readers and book lending items. These information are:  
About a book:

1. bcode (string): the code of the book (this is the **key of the tree** and thus should be unique).
2. title (string): the title of the book.
3. quantity (integer): the number of books with the same code the library has.
4. lendable (integer): the number of books with the same code, which are still lendable.  
Condition:  $\text{lendable} \leq \text{quantity}$ .
5. price (double): The price of the book.

About a reader:

1. rcode (string): the code of the reader (this should be unique for the reader).
2. name (string): the name of the reader.
3. byear (integer): The birth year of the reader (must between 1900 and 2010).

About a lending:

1. bcode (string): the code of the book to be lended.
2. rcode (string): the code of the borrower.
3. state (integer): takes values 0, 1, or 2 only.

0: the book is not given to the reader

1: the book is still at the reader, not given back.

2: the book is given back to the library.

## YOUR TASKS

You should use a binary search tree to store data for books and 2 linked lists, each one is used to store data for readers or book lending items. You should create the data structures from scratch, do not use structures available in java.

On running, your program displays the menu as below:

Books (using Binary Search Tree data structure, and bcode is the key of the tree):

- 1.1. Load data from file
- 1.2. Input & insert data
- 1.3. In-order traverse
- 1.4. Breadth-first traverse
- 1.5. In-order traverse to file
- 1.6. Search by bcode
- 1.7. Delete by bcode by copying
- 1.8. Simply balancing
- 1.9. Count number of books

Reader list (using Binary Search Tree):

- 2.1. Load data from file
- 2.2. Input & add to the end
- 2.3. Display data
- 2.4. Save reader list to file
- 2.5. Search by rcode
- 2.6. Delete by rcode

Lending list (using Binary Search Tree):

- 3.1. Input data
- 3.2. Display lending data
- 3.3. Sort by bcode + rcode