

Indian Institute of Technology Mandi
February-June 2015 Semester
CS202: Advanced Data Structure and Algorithms
Programming Assignment 3

Last date of submission: 6th April, 2015 – 10:00 PM

Implement the Dictionary data structure using hash table and suitable hash function using C++ programming language. This data structure should be implemented using the data from one of the following class of application.

1. **Student Record** {Reg. number, Name, Address, Branch, Semester, CGPI up to that semester, Email, Phone ...}
2. **Inventory Record** {Item number, Item Name, Manufacturing Company, number of that item in the stock, unit price, Address of manufacturing company, ...}
3. **Employee Record** {Employee ID, Name, Address, Position, Monthly salary, Email, Phone ...}
4. **Library-Book Record** {Book-ISBN number, Book Title, Author1, Author2, Author3, Publisher Name, Price, Number of Books, ...}
5. **Hospital-Patient Record** {Patient ID, Patient Name, Address, Phone, Disease, Attending Doctor Name, ...}
6. **Bank-Account-Transaction Record** {Transaction ID, Date of Transaction, From/To Account number, Debit, Credit, Total Balance ...}

The mapping of students to the class of application is uploaded separately in the Moodle.

1. The dictionary ADT must use the object of record (student record or inventory record etc.) class as instance of the dictionary. The dictionary class must at least have following interfaces (functions): search, insert, delete and display a record, other than constructors and destructors. You are free to add additional functions for the efficient implementations.
2. You must maintain a file to store the records. The file is populated with records while inserting the record into the dictionary for the first time.
3. Search operation can be invoked in two ways:
 - a. *When the program is first started, file is already populated with records and search is the first operation performed:* First read the records from file and insert into the dictionary. Then search for the key and display the key and associated information in the dictionary.
 - b. *Dictionary is already in the memory:* Simple search for the key and display the key and associated information in the dictionary.
4. Delete operation can be invoked in two ways:
 - a. *When the program is first started, file is already populated with records and delete is the first operation performed:* First read the records from file and insert into the dictionary. Then search for the key, and then delete that key as

well as associated information from the hash table and display the key and associated information in the dictionary. Also delete that record from the file.

- b. *Dictionary is already in the memory*: Simple search for the key , and then delete that key as well as associated information from the hash table and display the key and associated information in the dictionary. Also delete that record from the file.
5. Your program must include (i) **chaining**, (ii) **linear probing** and (iii) **double hashing** as collision resolution techniques. Each one is invoked by giving a proper choice in the program.
6. Hashing is implemented using Linear List ADT. Use the sequential linear list and linked linear list class to represent ADT wherever necessary.
7. The Linear List ADT must have **at least** following interfaces (functions) apart from constructors and destructors: isEmpty, length, find, search, delete, insert, get an element.
8. All the techniques are implemented with a provision for rehashing while hash table is full during (ii) and (iii), and length of the list at a slot of table is more than half the size of hash table.