**CSIII: Programming Patterns**

**Lab 7 Assignment:**

**Updating Hash Container Implementation**

The project is due in one week: by the beginning of the next lab. Make sure to include your name in comments of the source files.

Use the implementation of “hashmap.h” and “testHashmap.cpp” that we studied and do the following modifications:

* modify the implementation of insert() so that it provides "safe insert", i.e.: returns a pair: <pointer, result>, where
  + pointer is a pointer to the newly inserted value or the old value with the same key
  + result is a boolean value which is true if the element is inserted
* on the basis of your updated insert() implementation, modify the implementation of the overloaded indexing operator [] to eliminate inefficient second invocation of find(). That is, in your implementation, find() should only be invoked once.
* modify the implementation of erase() so that it returns a pair <pointer, result>, where
  + pointer is a pointer to the element past one erased. Note that if the next element in a different bucket, it should still be returned. In case the element with the key specified to erase() does not exist, the value of the returned pointer is unspecified. If erase() removes the last element of the container (the last element of the list of the last bucket), then erase() should return nullptr.
  + result is a boolean value which is true if the element is successfully erased; result is false if the element with the specified key is not present in the container.
* implement void rehash(size\_t n) sets the size the number of buckets in the container to n. Note that the existing elements need to be re-arranged according to their new hash value. Note also that Hash: the object that provides hashing, needs to be updated to contain the new number of buckets. If the parameter n is smaller than the current number of buckets, no actions need to be taken.

Provide test code that declares and populates a container and then demonstrates the operation of the functions you implemented.

**Milestone:** insert() modification.