LectureRequired Lecture # credit : int + LectureRequired() # studentNo : std::vector<int> + ~LectureRequired() # studentName : std::vector<std::string> + getLectureType() : LectureType # studentScore : std::vector<int> + updateInfo(database : Database &) : void # studentGPA : std::vector<double> + printInfo(widthName : int) : void # studentNum : int + printInfo(int, int) : void # totalScore : int + printLectureInfo() : void # totalGPA : double # averageScore : int # averageGPA : double + Lecture() LectureLimited + ~Lecture() + getLecturetype() : Lecturetype + LectureLimited() + getCredit() : int+ ~LectureLimited() + getStudentNo() : std::vector < int > 0+ getLectureType() : LectureType + getStudentName(): std::vector<std::string> + updateInfo(database : Database &) : void + printInfo(widthName : int) : void - getStudentScore(): std::vector<int> + getStudentGPA(): std::vector<double> $+ \operatorname{printInfo(int, int)} : \operatorname{void}$ + getStudentNum() : int+ printLectureInfo() : void + getTotalScore() : int+ getTotalGPA() : double+ getAverageScore() : int+ getAverageGPA() : doubleLectureOptional $+ updateInfo(database : Database \mathcal{E}) : void$ # studentPF : std::vector<int> + setName(inputName : std::string) : void # studentPFNum(): int + setCredit(inputCredit: int): void + LectureOptional() + setStudentNo(inputStudentNo : std::vector<int>) : void + ~LectureOptional() + setStudentName(inputStudentName)+ getLectureType() : LectureType std::vector<std::string>): void + getStudentPF(): std::vector<int> + setStudentScore(inputStudentScore : std::vector<int>) : void + getStudentPFNum(): int + setStudentGPA(inputStudentGPA : std::vector<double>) : void + updateInfo(database : Database &) : void + setStudentNum(inputStudentNum: int): void+ addStudent(inputStudentNo : int, + setTotalScore(inputTotalScore : int) : void inputStudentName: std::string, in-+ setTotalGPA(inputTotalGPA : double) : void putStudentScore: int, inputStudent-+ setAverageScore(inputAverageScore: int): voidGPA: double, inputStudentPF: bool)+ setAverageGPA(inputAverageGPA : double) : void + printInfo(widthName : int) : void + addStudent(inputStudentNo : int, inputStudentName : std::string, + printInfo(int, int) : void inputStudentScore: int, inputStudentGPA: double): void

+ printInfo(widthName:int):void

+ printInfo(int, int) : void

+ printLectureInfo(): void

+ printLectureInfo() : void

```
# name : std::string
   # uid : int
   # currentUid : static int
   # DebugMode : static bool
   + Info(inputName : std::string)
   + ~Info()
   + getName(): std::string
    + getUid() : int
    + isDebugMode() : static bool
    + setName(inputName : std::string)
    + setDebug(inputDebugMode
    : bool) : static void
    + printInfo(int) : void
   + printInfo(int, int) : void
                 Account
   # password : std::string
   + Account()
   + Account(inputName : std::string,
   inputPassword: std::string)
   + ~Account()
   + getPassword(): std::string
   + setName(inputName
    : std::string) : void
    +\ setPassword (inputPassword
    : std::string) : void
   + getPermission() : int
   + printInfo(int) : void
   + printInfo(int, int) : void
                {f User}
+ getPermission(): int
                     Admin
      + getPermission() : int
```

```
Student
# studentNo : int
# lectureName : std::vector<std::string>
# lectureType : std::vector<LectureType>
# lectureScore : std::vector<int>
# lectureCredit : std::vector<int>
                                                                               + LinkedList()
# lectureGPA : std::vector<double>
# lecturePF : std::vector<int>
                                                                                + ~LinkedList()
# lectureNum : int
# lecturePFNum : int
# totalScore : int
# totalCredit : int
# totalPFCredit : int
# totalGPA : double
# averageScore : double
# averageGPA : double
+ Student()
+ ~Student()
+ getStudentNo(): int
                                                                               + \operatorname{size}() : \operatorname{int}
+ getName(): std::string
+ getLectureName() : std::vector<std::string>
+ getLectureType() : std::vector<LectureType>
+ getLectureScore() : std::vector<int>
+ getLectureCredit() : std::vector<int>
+ getLectureGPA() : std::vector<double>
+ getLecturePF() : std::vector<int>
+ getLectureNum(): int
+ getLecturePFNum(): int
                                                                                + ~FileException()
+ getTotalScore(): int
+ getTotalCredit(): int
+ getTotalPFCredit(): int
+ getTotalGPA() : double
 + getAverageScore() : double
+ getAverageGPA(): double
                                                                               + UserInterface()
+ updateInfo(database : Database &) : void
                                                                               + ~UserInterface()
+ setStudentNo(inputStudentNo : int) : void
                                                                               + \operatorname{run}() : \operatorname{bool}
+ setName(inputName : std::string) : void
+ setLectureName(inputLectureName : std::vector<std::string>) : void
+ setLectureType(inputLectureType : std::vector<LectureType>) : void
+ setLectureScore(inputLectureScore : std::vector<int>) : void
 + setLectureCredit(inputLectureCredit : std::vector<int>) : void
 + setLectureGPA(inputLectureGPA : std::vector<double>) : void
                                                                               + \operatorname{sortInfo}() : \operatorname{bool}
 + setLecturePF(inputLecturePF : std::vector<int>) : void
 + setLectureNum(inputLectureNum : int) : void
+ setLecturePFNum(inputLecturePFNum : int) : void
+ setTotalScore(inputTotalScore : int) : void
+ setTotalCredit(inputTotalCredit : int) : void
+ setTotalPFCredit(inputTotalPFCredit: int): void
+ setTotalGPA(inputTotalGPA : double) : void
+ setAverageScore(inputAverageScore : double) : void
+ setAverageGPA(inputAverageGPA : double) : void
+ printInfo(int) : void
+ printInfo(widthStudentNo: int, widthName: int): void
+ printStudentInfo(): void
                                                                                + load() : bool
                                                                               + save(): bool
                                                                               + print() : bool
```

```
{f LinkedList}
 - head : Node<T>*
- current : Node < T > *
 - deepCopy(original : const
LinkedList < T > \&): inline void
+ LinkedList(aplist : const LinkedList<T>&)
+ insert(newNode : Node < T > *) : void
+ insert\_end(newNode : Node < T > *) : void
+ getFirst() : Node < T > *
+ getNext() : inline Node < T > *
+ find(element : const T &) : bool
+ retrieve(element : T &): bool
+ replace(newElement : const T &) : bool
+ \text{ remove(node : Node} < T > *) : bool
+ isEmpty() : const bool
+ \text{ makeEmpty}() : \text{ void}
                  FileException
+ filename : std::string
+ mode : std::string
+ type : std::string
+ FileException(inputFilename : std::string, in-
putMode : std::string, inputType : std::string)
                  UserInterface
# database : Database *
# currentUser : static Account *
+ login() : Account *
+ \text{ welcome}() : \text{ void}
+ searchInfo(): bool
+ searchStudent(): bool
+ searchLecture() : bool
+ sortStudent() : bool
+ sortLecture() : bool
+ addInfo(): bool
+ addStudent() : bool
+ addLecture() : bool
+ deleteInfo(): bool
+ deleteStudent() : bool
+ deleteLecture() : bool
+  modifyInfo() : bool
+ modifyStudent(): bool
+ modifyLecture() : bool
+ printStudent(): bool
+ printLecture() : bool
+ debug(): bool
```

+ about(): bool

+ quit() : void

+ pause() : void

```
Database
 - studentList : LinkedList <Student>
 - requiredList : LinkedList <LectureRequired>
 - limitedList : LinkedList <LectureLimited>
 - optionalList : LinkedList <LectureOptional>
 - userList : LinkedList <User>
 - adminList : LinkedList < Admin>
 + Database()
+ ~Database()
+ getStudentListSize(): int
+ getRequiredListSize(): int
+ getLimitedListSize(): int
+ getOptionalListSize() : int
+ load() : void
+ save(): void
+ loadStudent(filename : const std::string &) : void
+ loadRequired(filename : const std::string &) : void
+ loadLimited(filename : const std::string &) : void
+ loadOptional(filename : const std::string &) : void
 + saveStudent(filename : const std::string &) : void
 + saveRequired(filename : const std::string &) : void
 + saveLimited(filename : const std::string &) : void
 + saveOptional(filename : const std::string &) : void
 + encrypt(filename : const std::string &) : void
 + encrypt_key(filename : const std::string &, keyFilename : const std::string &) : void
+ key_gen(filename : const std::string &) : void
 + timeStampToString(timeStamp : const time_t &) : std::string
 + deleteStudent(name : const std::string &) : bool
+ deleteStudent(studentNo : int) : bool
 + deleteRequired(name : const std::string &) : bool
 + deleteLimited(name : const std::string &) : bool
 + deleteOptional(name : const std::string &) : bool
+ addStudent(): void
+ addRequired(name : const std::string &, credit : int) : void
+ addLimited(name : const std::string &, credit : int) : void
+ addOptional(name : const std::string &, credit : int) : void
+ addStudentToLecture(name : const std::string &, type : Lecturetype, stu : Student &) : void
+ modifyStudent(name : const std::string &) : bool
+ modifyStudent(studentNo : int) : bool
+ modifyRequired(name : const std::string &) : bool
+ modifyLimited(name : const std::string &) : bool
+ modifyOptional(name : const std::string &) : bool
+ queryStudent(name : const std::string &, display : bool) : int
 + queryStudent(studentNo : int, display : bool) : int
+ queryLecture(name : const std::string &, display : bool) : int
+ queryRequired(name : const std::string &, display : bool) : int
+ queryLimited(name : const std::string &, display : bool) : int
+ queryOptional(name : const std::string &, display : bool) : int
+ findStudent(name : const std::string &) : Student *
+ findStudent(studentNo L int) : Student *
+ findLecture(name : const std::string &) : Lecture *
+ findRequired(name : const std::string &) : LectureRequired *
+ findLimited(name : const std::string &) : LectureLimited *
+ findOptional(name : const std::string &) : LectureOptional *
 + sortStudent(direction : int, keycol : int) : void
 + sortLecture(type : LectureType, direction : int, keycol : int) : void
+ sortStudentCustom(head : Student **, length : int, direction : int, keycol : int) : void
 + sortLectureCustom(head: Lecture **, length: int, direction: int, keycol: int): void
+ compareStudent(a: Student *, b: Student *, direction: int, keycol: int): double
+ compareLecture(a: Lecture *, b: Lecture *, direction: int, keycol: int): double
+ printStudent(): void
+ printStudent(studentNo : int) : void
+ printStudent(name : const std::string &) : void
+ printLecture(): void
+ printLecture(type : LectureType) : void
+ printLecture(name : const std::string &) : void
+ calculateGPA(score : int) : double
+ updateStudent(): void
+ updateLecture() : void
+ login(username : std::string, password : std::string) : Account *
+ registerUser(username : std::string, password : std::string, permission : int) : Account *
+ loadAccount(userFilename : const std::string &, adminFilename : const std::string &) : void
```

+ saveAccount(userFilename : const std::string &, adminFilename : const std::string &) : void