## LectureRequired Lecture # credit: int # name : std::string + LectureRequired() # uid: int # studentNo : std::vector<int> + ~LectureRequired() # studentName : std::vector<std::string> # currentUid : static int + getLectureType() : LectureType # studentScore : std::vector<int> + updateInfo(database : Database &) : void # studentGPA : std::vector<double> + Info()+ printInfo(widthName : int) : void # studentNum : int + printInfo(int, int) : void # totalScore : int + ~Info() + printLectureInfo() : void # totalGPA : double # averageScore : int # averageGPA: double + Lecture() LectureLimited + ~Lecture() + getLecturetype() : Lecturetype + LectureLimited() + getCredit() : int+ ~LectureLimited() + getStudentNo() : std::vector<int> + getLectureType() : LectureType + getStudentName(): std::vector<std::string> + updateInfo(database : Database &) : void + getStudentScore(): std::vector<int> + printInfo(widthName : int) : void + getStudentGPA(): std::vector<double> + printInfo(int, int) : void + getStudentNum(): int + printLectureInfo() : void + getTotalScore(): int + getTotalGPA() : double+ getAverageScore(): int + getAverageGPA(): double LectureOptional + updateInfo(database : Database &) : 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)std::vector<std::string>): void + getLectureType() : LectureType + 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): voidinputStudentName: std::string, in-+ setTotalGPA(inputTotalGPA:double):voidputStudentScore: int, inputStudent- $+\ setAverageScore(inputAverageScore:int):void$ GPA: double, inputStudentPF: bool) $+\ set Average GPA\ (input Average GPA: double):\ void$ + printInfo(widthName : int) : void + addStudent(inputStudentNo : int, inputStudentName : std::string, + printInfo(int, int) : void inputStudentScore: int, inputStudentGPA: double): void+ printLectureInfo(): void + printInfo(widthName : int) : void + printInfo(int, int) : void + printLectureInfo(): void

# DebugMode : static bool + Info(inputName : std::string) + getName(): std::string + getUid() : int+ isDebugMode(): static bool + setName(inputName : std::string) + setDebug(inputDebugMode bool): static void + printInfo(int) : void+ printInfo(int, int) : voidAccount # 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 User + getPermission(): int Admin + getPermission(): int

Info

LinkedList - head : Node<T>\*- current : Node<T>\*- deepCopy(original : const LinkedList<T>&): inline void + LinkedList() + LinkedList(aplist : const LinkedList<T>&) + ~LinkedList() + insert(newNode : Node < T > \*) : void $+ insert\_end(newNode : Node < T > *) : void$ + getFirst() : Node < T > \* $+ \operatorname{getNext}() : inline \operatorname{Node} < T > *$ + find(element : const T &) : bool + retrieve(element : T &): bool + replace(newElement : const T &) : bool + remove(node : Node < T > \*) : bool+ isEmpty() : const bool + makeEmpty(): void + size(): int

## FileException + filename : std::string + mode : std::string + type : std::string + FileException(inputFilename : std::string, in-

putMode : std::string, inputType : std::string) + ~FileException()

# database : Database \*

+ pause(): void

UserInterface

## # currentUser : static Account \* + UserInterface() + ~UserInterface() $+ \operatorname{run}() : \operatorname{bool}$ + login() : Account \* + welcome(): void $+ \operatorname{searchInfo}() : \operatorname{bool}$ + searchStudent(): bool + searchLecture(): bool $+ \operatorname{sortInfo}() : \operatorname{bool}$ + sortStudent() : bool + sortLecture() : bool $+ \operatorname{addInfo}() : \operatorname{bool}$ + addStudent(): bool + addLecture(): bool + deleteInfo() : bool + deleteStudent(): bool + deleteLecture() : bool + modifyInfo() : bool + modifyStudent(): bool + modifyLecture() : bool + load() : bool+ save(): bool + print() : bool+ printStudent(): bool + printLecture() : bool + debug() : bool+ about() : bool+ quit() : void

```
+ 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
```

Database

studentList: LinkedList <Student>

userList: LinkedList <User>

adminList : LinkedList <Admin>

 ${\it requiredList: LinkedList < Lecture Required>}$ 

limitedList : LinkedList <LectureLimited>

optionalList: LinkedList < LectureOptional>

Student # studentNo : int # lectureName : std::vector<std::string> # lectureType : std::vector<LectureType> # lectureScore : std::vector<int> # lectureCredit : std::vector<int> # lectureGPA : std::vector<double> # lecturePF : std::vector<int> # lectureNum : int # lecturePFNum : int # totalScore : int # totalCredit: int # total PFCredit : int # totalGPA : double # averageScore : double # averageGPA : double + Student() + ~Student() + getStudentNo(): 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 + getTotalScore(): int + getTotalCredit(): int + getTotalPFCredit() : int + getTotalGPA() : double+ getAverageScore() : double + getAverageGPA() : double + updateInfo(database : Database &) : void + setStudentNo(inputStudentNo: int): void + 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 + 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