Functional Requirements

Function	User Can Specify the Course
Description	User should have a view to add new course, the view should have the following course contents (name and number of chapters) course name must be unique
Inputs	New Course information and information about course from database
Source	User view and database
Outputs	Even new course Added or Failure message
Destination	User Views and database
Action	Function will get course information and then will validate if this course is existed in the database or not if existed function will return error message for user if not it will add a new course in database and then notify user with new course added it will add also course chapters in chapter table in database
Requirements	Course full information and database existed
Pre-Conditions	Course is existed at most one in the database
Post-Conditions	Course is existed exactly once in the database, and chapters are created
Side Effects	None

Function	User can specify the questions for each chapter
Description	User will select a specific course and then have a view to be able to add questions for every chapter in this course, user have to add exactly two question in each category of the following - Remaindering && Difficult - Remaindering && Simple - Understanding && Difficult - Understanding && Simple - Creativity && Difficult - Creativity && Simple
Inputs	Questions Informations
Source	User Input
Outputs	List of valid questions and its answers
Destination	User Views and Database
Action	User will enter questions information for each category which should contains - question value

	- Question Choices - Correct Answer system will get this data and store it in instance list to be able to handle no duplication in questions and answers and the user will submit this questions to be committed if valid
Requirements	none
Pre-Conditions	Course chapters are already created in database
Post-Conditions	Questions are added to database
Side Effects	none

Function	Design Exam for courses
Description	Teacher can design exam specification and system should generate optimal exam according user specifications using genetic algorithms, user specification are : -number of question per each chapters -number of questions of each of the following - Remaindering - Understanding - Creativity - Difficult - Simple
Inputs	Exam specification
Source	Users views
Outputs	Outputs a view that display generated exam questions
Destination	User Views
Action	User will set exam specification and click generate Exam and then Genetic algorithms will work to generate the best exam according this specification, and then return that exam for user user then can publish as save exam or regenerate new exam
Requirements	Number of total questions of each level equals number of questions per chapter * number of chapters per course
Pre-Conditions	User should have entered exactly 12 question for each chapter
Post-Conditions	none
Side Effects	none

- user can Create-Read-update-delete for each of the following elements
    - Courses
    - Chapters
    - Questions

- user can publish exam or regenerate new exam if exam’s accuracy doesn't match user specification or cancel the generated exam

Non Functional Requirement

- user should not enter two repeated question per chapter
- user should not enter the same answer for one question twice
- user can not add repeated courses

Evaluation Functions for Genetic Algorithms

algorithms get all questions of a specific course in question poll and then generate a population of N(number of chapters in course) samples, where each sample contains M (number of questions per chapter required in exam specifications) to generate an initial population of N*M questions.

Algorithm evaluate each sample according the following criteria

1- number of questions per chapter in each sample, the optimal ratio is
    OR = number of questions per chapter / total exam questions
    total exam questions = number of questions per chapter * number of chapters
    OR = 1 / number of chapters

2- number of question of each level required in exam specification, optimal ratio is
    x in (Understanding – Remaindering – Creativity – Difficult – Simple)
    OR = number of questions in level x (from specification) / total number of questions per exam

3- then have 6 criteria (5 levels + 1 chapters)
    so each sample have evaluation out of 6

4- population (a set of n samples) evaluated from 6 * N

5- algorithms generate a X number of generations (population) and get max generation