ERD Report: ERD is drawn using www.draw.io

From the given case study the assumptions made are

1. There is an entity called semester which reopens and closes the courses every quarter duration so that the start date and end date of the courses are represented clearly.
2. A entity called class is assumed since every student has to register to a course and a course can have classes which might exist in different time periods of a day with various teachers taking the classes.
3. An assumption is made that any person who visits the site is considered as a learner since given in the problem statement that he/she can explore, study or enrols in the course. Hence a learner who registers any course is considered as a user.
4. The option of TA, graders are also be known as teachers. Hence an attribute called teacher_role has been employed in the diagram to ensure the role of the teacher.
5. Adding and removing a new payment is not considered in the ERD as it's asked to be considered outside the system.
6. Material is considered two types general and lectures. A lectures can be notes, videos and material, i, e material is considered as a subset of lectures.

The entities in the ERD are Teacher, CourseCreation, Course, Category, Comment, Grade, Material, Assignment, Lecture, Rate, Semester, Class, Learner, Register, User.

There are multivalued attributes in the ERD such as rating which has values from 0-5, certificates eligibility(yes/no) since it's mentioned to have such values in the design, Though not represented diagram, there are other multivalued attributes such as payment options, file types and lecture types. Since it becomes cumbersome to represent all those attributes, the essentials are represented.

Feedback, rating, additional notes, teacher_role, grade_value are few of the attributes that are being created as a process of assumption. Apart from that, the user first name, last name and mail id are not considered as attributes since a user as a learner might have already provided such information earlier and hence those become derived attributes.

Also, there is a scope for inheritance(between learner and user), disjoint and overlap conditions(course, class, semester) as well as specialisation conditions(payment options such as visa/paypal, bitcoin), (material such as syllabus, textbook), (lectures such as videos, notes, and materials), (files such as links) in the case study. The design is represented as a encapsulated version of the above conditions.

Relationships :

Relationships are made on the above assumptions apart from the places where they are clearly represented in the case study using keywords such as multiple or one and only. For example

Teacher- CourseCreation,Class 1:(0-M)

As there can be a single teacher who creates a 0 to any number of courses, who teaches any number of classes, but there cannot be more teachers who creates a single course, or who takes a single class.

Design choices which can be different from other :

1. Instead of considering semester as a separate entity, a design can be made by adding start and end dates to the courses as well. Also, the functionality of a class can be included in the class. Since, this makes the implementation easier, it's represented as such in the above ERD.
2. The interpretation of learners and users can be different from the above design.
3. The cardinality ratio can be different based on their assumptions.
4. The TA's and graders might be considered as separate entities.
5. The lectures, materials and assignments can be considered as a part of the course structure, since the above representation makes the table easier to update, it's considered as such.