In this chapter we briefly describe the research background and objective of the research. We also describe the organization of this thesis and publications regarding to our PhD work.
1.1 Research Background

In recent decades, the Information and Communication Technology (ICT) has facilitated a convergence between the Open and Distance Learning (ODL), traditional face-to-face and online/distributed (or technology-mediated) learning environments. Blended learning is a new concept which combines teaching methods of both face-to-face and online learning, is an established, rapidly growing instructional model that is proving highly effective in helping the educational institutions to meet challenges of student achievement, limited resources, and the expectations of 21st century learners. Assessment of Student Learning in an academic curriculum is a very challenging factor. Whether it is ODL, traditional face-to-face learning, online learning, e-learning or blended learning environment, the student learning assessment is a very time consuming process. Bicanich, Slivinski and Hardwicke (1997) note that from a study of 400 vocational learners, 75% preferred online testing to paper-based assessment. However, it is a very difficult process to make a fair online evaluation of how well the students have understood the contents. Expert system based online assessment system presented in the following sections is an example of a solution to this issue. The aim of my research work is to apply expert system technology in the online assessment system.

Expert system based online assessment system is a relatively new area of research. The main idea of this research is to design a framework for web based expert system and on top of the framework develop a prototype expert system to assess student learning. The expert system will emulate the behaviour of a teacher in the assessment process. A question database with varying complexity level is designed. Depending upon the student’s academic history and previous assessment records,
the system fetches questions from the question database intelligently and presents to the student. After the completion of the assessment, the expert system grades the student and gives some feedback to show his/her weaknesses in the respective subject.

1.2 Objective

This thesis undertakes a comprehensive study of different assessment techniques and expert system. This research focuses on the application of expert system technology in the online assessment and to develop a prototype that can assists in authoring and storing various questions of different topics of different subjects, assembling questions for the students intelligently and to assess the student by providing some feedback.

The objectives of the thesis can be summarized as follows:

- To study various assessment techniques.
- To investigate expert systems application in online assessment and the review of different expert systems shells that would be appropriate for building such expert systems.
- To introduce an expert system as an effective tool to assess the student learning.
- To design a framework for web-based expert system and to develop an assessment model on top of the framework.
- To develop a prototype system; which will provide fair assessment method for online assessment system.

1.3 Scope of the Thesis

In conjunction with the objectives of the thesis, the scope of the thesis is defined in order to provide a basic guideline that enables the research
to be conducted within a certain range and depth. The following statements summarize the scope of the thesis in accordance with stated objectives:

- The study and survey of different assessment techniques.
- The study and survey of all the components related to web-based assessment system.
- To build a framework that is able to support web-based application and allow the assessment system builds on top of this framework.
- To study expert system technology and to design a framework for online assessment.
- This research will not include developing the student enrolment module and student registration module.

1.4 Thesis Organization

This thesis consists of nine chapters including this introductory one. Overviews of the subsequent eight chapters are described briefly below:

- **Chapter 2: Literature Review**

  This chapter is the literature review of the thesis. In this chapter, reviews are conducted on all the necessary areas that are relevant to the thesis. It presents a review of literature on student modelling and focuses on Computerised Adaptive Testing (CAT) as a recent advent in student modelling. It examines the major student modelling techniques which model domain-specific knowledge of the student. Challenges associated with student modelling are addressed. The study includes all the development paths leading to the core technologies used in the research.
- **Chapter 3: Expert System**

  This chapter gives a comprehensive review of expert systems;

- **Chapter 4: Architecture and System Design of Proposed Expert System: ESOA**

  This chapter focuses on the Architecture, framework and system design of the expert system we have proposed.

- **Chapter 5: Knowledge Acquisition and Representation Issues**

  This chapter discusses different knowledge acquisition and representation techniques used in the design and development of expert system. The issues related to the knowledge acquisition and representations of ESOA are discussed.

- **Chapter 6: Modelling of Inference Engine**

  Inference engine design principles and techniques in expert systems are discussed in chapter 6.

- **Chapter 7: ES Shells: JESS Based Implementation.**

  This chapter discusses different expert system shells used in the design and development of expert system and the selection of the appropriate shell for ESOA and its functionality.

- **Chapter 8: System Development, Implementation & Testing**

  This chapter discuss the prototype design, implementation and testing of ESOA. The prototype expert system is tested and evaluated with some sample data with the student model and a question bank of few subjects.

- **Chapter 9: Conclusion & Future Work**

  This chapter discusses the merits and demerits of ESOA. Here also the future research works in the extension of ESOA are discussed.
1.5 Publications

The following papers were published by the author in collaboration with my supervisor during the course of this thesis:
