Chapter: III
Design and Development of Model
Section A: Designing and Development Concepts

3.1 Introduction
Design and development are closely associated to each other. Both the concepts are the part of system development life cycle. Design concept includes design tools, guidelines, principles, techniques, etc. Development includes the study and use of various models can be used for system development like waterfall model or classical model, prototype model and spiral model. All these models are differing to each other in some aspects and they have been evolved as per the requirements of the system. System developer can select any one of the model as per the requirement specifications. All the above mentioned development models follow the fundamental concepts of SDLC (System Development Life Cycle). This life cycle includes phases i.e. system analysis, design, coding, testing, implementation and maintenance. The proposed system may be manual, semi-computerized or fully computerized. The system analyst has to study the system and related problems properly. In the analysis process the data is from internal and external sources. System flow, data flow, input, process, output, type of problem, user requirements, cost, etc. have to be studied in a standard formats. System development process is a critical task where an analyst has to understand the existing system along with new requirements and its development process. This chapter is divided into 6 major parts i.e. 1) Basics of System 2) Design Approach 3) Development Process Model 4) Architecture of E-Learning Model 5) Development Tools 6) Testing & Implementation.

3.2.1 Concept of System
“The term “System” is derived from the Greek word systema. It means an organized relationship among functioning units or components. System is a combination of resources or functional units working together to accomplish a given task. The term “working together” in a system definition is very important as all the components are interrelated and interdependent and cannot exist independently. As the definition says, these components interact with each other to accomplish a given task which is actually the objectives of the system. The components that comprises a system the
outcomes or the outputs of the system, the outcomes or the outputs of the system, the resources required to make the system functional.”  

A system is an orderly grouping of independent components linked together according to a plan to achieve specific objectives. The word component may refer to physical or logical parts used to create a system. Each component is a part of entire system. System is a collection of various components where all the components work together towards certain predefined objectives to be achieved. System can be categories into two categories i.e. Natural System, Man-made System. Natural system includes systems which are created by nature. Man-made system includes those systems that are developed for particular application. The man made system requires frequent updations.

Each application worth of life is a system. It is the basic framework for a particular function.

“The definition of a good system various with the systems environment In some systems the performance is the key measure of a good system while in other cases the ability to change fast is a key measure of a good system. In some cases the user friendliness could be measure of good system. In all the cases, however the correctness of the result is a common measure, making them reliable & dependable for the business operations”.  

“The word ‘System’ is used in data life very frequently in describing the subjects, such as the traffic system, education system, business system, etc. The system provides a meaningful framework for describing and understanding the feature and function of the subject”.  

3.2.2 Characteristics of System

1) Organization
2) Interaction
3) Interdependence
4) Integration
5) Central Objectives
1) Organization: It is a structured arrangement of required components at different levels starts from top management to lower management.

![Figure 3.1: System Layers](image)

Above figure 3.1 shows the layers of an organization. Each layer performs specific task and defines relationship with authority structure. It specifies the formal flow of communication and formalizes the chain of command shown in above figure.

2) Interaction:
Interaction refers to the manner in which each component functions with other components of the system. For example, purchasing must interact with production, advertising with sales and payroll with personnel. In a computer system, the central processing unit must interact with the input device to solve a problem. The main memory holds programs and data that the arithmetic unit uses for computations. The interrelationship between these components enables the computer to perform perfectly.

3) Interdependence:
All the components of the system are co-ordinate and linked together according to a plan. One sub-system depends on the input of another sub-system for proper functioning i.e. output of one sub-system is required as input for another sub-system.
4) Integration:
Integration means how a system is tied together. That is parts of the system work together within the system even through each part perform unique operations.

5) Central objectives:
A system must work according to central objectives which have already been defined. If a system is not working properly then there may be variances in the desired output and it may affect the overall process and productivity.

3.2.3 Elements of the System
1) Input & Output:
Input means raw material which is given to the system through certain input devices for the purpose of processing. Output is an outcome of process data. It also refers to product.

2) Process:
The processor is the element of a system that involves the actual transformation of input into output. It is the operational component of a system. Processor may modify the inputs totally or partially. It means that as the output specifications change so does the processing.
3) Control:
The control element guides the system. It is very important for decision making process. In an organizational content, management as a decision making body controls the inflow handling and outflow of the activities that affect the business. In a computer system the operating system and accompanying software influences the behavior of the system. Output specifications determine what and how much input is needed to keep the system in balance.

4) Feedback:
After receiving output from the system that output is compared with the standards which have been defined. Feedback may be positive or negative.

5) Environment:
It determines the internal and external sources which are used in system processing.

6) Boundaries and Limitations:
A system should define its boundaries or limitations. It should not cross the limits of the defined objectives. For example A teller system in a commercial bank is restricted to the deposit and withdrawals and related activities of customers checking and saving accounts. It may exclude other activities of the bank.

3.2.4 Types of system

1) Open / Closed System:
Open system always requires an interaction with human being. Without the interaction these systems do not works. Whereas closed system may work without interaction with system.

2) Physical / Abstract system:
Physical system is also referred as tangible system which can be physically touched. Abstract system is also referred as in-tangible system.
3) Deterministic / Probabilistic system:

Deterministic system can predict the overall operations of the system. Whereas probabilistic system cannot predict the conditions accurately. E.g. Weather system.

4) Manual / Computerized system:

Manual system performs all the operations with human efforts and computerized system performs the operations through the use of software, hardware and other computer related tools and techniques. These software provided lots of facility in the operations of data i.e. data accepting from user, converting that data into meaningful information by applying certain procedures, etc. It gives user friendliness, quick job operations, not accepting wrong data, variety of reports, etc.

3.3.1 Design Approach

Design approaches deals with the process of design of the proposed system by using procedures and process.

“System Design is a process of applying various techniques and principles for the purpose of defining a device, a process or a system in sufficient detail to permit its physical realization”. 4

The system design is the most important step which describes all the components and their relationships. It defines the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements.

“Design is the most creative and challenging phase of the System Development Life Cycle. The term design describes a final system and the process by which it is developed. It refers to the technical specifications that will be applied in implementing the candidate system. It also includes the construction of programs and program testing. The first step is determine how the output is to be produced and in what format”. 5
System design phase is one of the most challenging phases in the system development life cycle. It provides a complete blueprint of the proposed system. It explores the data flow, system flow, programming flow, user interface design, programming approach, database design, etc. It means that system design focuses on all the functional points which are useful in system development process. Improper system design may lead to problems and impact the quality of the product.

“System design process in terms of the configuration, procurement, and design and integration phases of the life cycle. It describes purpose, activities, roles, inputs, output techniques, and steps”.  

The system design exhibits the layout and architecture of the system. The designing part can be categorized into two major categories: 1) Physical design and 2) Logical design. Physical design includes the study and designing of forms, layouts, screens, database schema, menus, user interface, data design, process design, etc. Logical design includes the study of data flow, system flow, and all the required logic which is required to carry the task.

“A meaningful representation of something to be built is known as design. In software engineering, design focuses on four major areas: Data, Architecture, Interface, and Component”.  

System design may include various approaches to designing the system like structured design, object-oriented design, etc. Structured design is implemented through programming languages like PASCAL, C, etc. Object-oriented design is used in C++, JAVA, Dot Net, CORBA, etc. Software development processes are mostly done by using object-oriented design concepts.

“System design is the evaluation of alternative solutions and the specifications of a detailed computer-based solution”.  

System design evaluation is one of the importance parts conducted before actual programming or coding of the proposed system. This evaluation process is conducted to find out the weakness of the design. At the same time, it is useful to find whether
the drawn designs are working as per the standards norms are not. In case of any problem the designs can be restudied. The details preparing to all components and their structure are coupled in interfaced.

“The traditional software development methods are the structured analysis and design by Ross; the requirement driven by Alford & the structured analysis & structure design by Yourdon. All these methods deal with functions & data separately”.

The requirement specification is a crucial phase of design and development of software system.

System design is conducted under the supervision of system analyst. It is process of planning a new business system or one to replace or complement an existing system. But before this planning can be done, we must thoroughly understand the old system and determine how computers can best be used to make its operation more effective. System analysis, then, is the process of gathering and interpreting facts, diagnosing problems, and using the information to recommend improvements to the system.

“A software design begins with the requirements model. This design model is then further described into the data structure, system architecture, interface representation and component level detail. When we work through these areas we obtain the design specifications for our software. We apply software design to every software we build irrespective of the process model being used. Software design begins after the requirement have been analyzed and specified. Code generation and testing are the activities that follow software design. Thus design is the activity which lies between the requirements analysis and coding”.

Organizations are complex systems that consist of interrelated and interlocking subsystems. Changes in one part of the system have both anticipated and unanticipated consequences in other parts of the system. The systems approval is a way of thinking about the analysis and design of computer based applications. It provides a framework for visualizing the organizational and environmental factors that operate on a system.
System design is a solution that how to approach for the creation of new system. System design goes through major two phase’s logical design and physical design development. Logical design reviews the current physical systems data flow, files, system flow, etc. It determines the format, content and frequency of reports including terminal specifications and locations. Physical design includes various activities like database design, input and output media, network design, etc. All the design principles are used to create software as a part of system. System includes various components which are used to perform the predefined objectives.

“Software design sits at the technical kernel of the software engineering process and is applied in software development”  

The physical design relates to the actual input and output processes of the system. It includes input requirement, output requirement, storage requirement, processing requirements, backup and recovery and overall control over the system.

“The design of real time computing system is the most challenging and complex task that can be undertaken by software engineering”.  

System design is second phase in system development life cycle. It is crucial phase on which next phases are completely dependent. Any mistake in design phase may create problem in the system. So, the appropriate guidelines have to be followed for designing of the system.

3.3.2 Design Layers
Broadly design process can be categorized into two major categories i.e. 1) Physical Design 2) Logical Design. Design of a system is divided into layers like data design, architectural design, interface design and component level design. For successful completion of design task, these are important phases that are to be followed.
1) Data Design:
In this phase data structure is analyzed. Data flow, system flow, entity relationship diagrams and data dictionary is used for understanding the use of data in the proposed system. Data may come from internal or external sources. If the data flow is not done properly then system development may not achieve the standardized objectives.

2) Architectural Design:
It specifies the interaction of the subsystem and other required components used in system. Architectural design defines the relationships between the major structural elements of the system. It studies all the factors like network, client and server, internet and networking protocols, relational database, types of users i.e. administrator, super user, database administrator, designers, native users, etc.

3) Interface Design:
Interface design describes how the system communicates with itself and the other elements of the system as well as the humans who use the system. For the purpose of interface design, the data and control flow diagrams developed during the analysis modeling are useful.
4) Component Level Design:
   It transforms the structural elements of the software architecture into a
   procedural description of the system components. Design in the way in which
   the customer requirements can be accurately translated into the software
   product. Design is a foundation of all the software engineering and support
   activities that follow. The accurate and good design is the key to achieve a
   quality system.

3.3.3 Design Guidelines
A good design can be achieved by applications of fundamental design principles,
 systemic methods and proper review.

   1) A design should exhibit an architectural structure which can be implemented
      in an evolutionary fashion.
   2) The design should be modular.
   3) The design should contain distinct representation of data, architecture,
      interface as well as components.
   4) The data structures should be appropriate to the object which is to be
      implemented.
   5) A good design should lead to components which exhibit independent
      functional characteristics.
   6) The interface should reduce complexity between modules.

3.3.4 Design Principles

“A design is characterized by external and internal quality factors. External quality
 factors are those properties of the software which are directly observed by the user i.e.
 speed, usability, correctness, etc. Internal quality factors are important from the point
 of view of software engineers”. 13

Software design is both a process and a model. The sequence of the steps which
 describes all the aspects of the software to be built is the process. The design model
 begins by first representing the totality of the software to be built. Some of the basic
 principles proposed for software design include:
1) A design process should suffer from tunnel vision i.e. a good designer should consider alternative approaches. Every alternative should be judged on the basis of the requirements of the problem. The available resources and the design concepts.

2) The design should be traceable to the analysis mode. It is necessary to have a means of tracking how the design model satisfies the requirements presented through the model.

3) The design should not be reinvented. It means the design time should be effectively utilized in representing truly new ideas and integrating those patterns which already exist.

4) The structure of design should solve the problems of the customer.

5) The design should be structured to accommodate the change.

6) The design should not use lot of programming code otherwise it increases the software size and of any changes to be done again code is to be changed. So this approach becomes time consuming. So, it recommended making use of fourth generations programming tools for effective design of the software like ASP.Net, Java, Visual Basic, etc. These programming tools are also called as front end software in which screens, layouts etc can be designed effectively in quick time.

7) The design should be reviewed to minimize conceptual errors.
3.3.5 Design Methodologies
Following are the major design methodologies that are accepted during system analysis and design for the system i.e. 1) Structured Design 2) Object Oriented Design

3.3.5.1 Structured Design
Structured design is a data flow based methodology. The approach begins with a system. Specifications that identifies inputs and outputs and describes the functional aspects of the system. The system specifications then are used as a basis for the graphical representation i.e. Data Flow Diagram and other graphical notations. The next step in the definition of the modules and their relationships to one another in a form called as structured chart using a data dictionary and other structured tools. Structured design partitions a program into small, independent modules. They are arranged in a hierarchy that approximates a model of the business area and organized in a top down manner.

Thus structured design is an attempt to minimize complexity and make a problem manageable by subdividing it into smaller segments which is called modularization or decomposition. In this way structuring minimizes intuitive reasoning and promotes maintainable provable systems.

![Structured Design Method](image)

**Figure 3.4: The Structured Design Method**

Figure no. 3.4 shows the process of structured design method. A design is said to be top down if it consists of a hierarchy of modules with each model having single entry and a single exit sub routine. The following are the advantages of this approach.
1) Critical interface are tested.

2) Early versions of the design, though incomplete are useful enough to resemble the real system.

3) Structuring the design provides controls and improves morale.

4) The procedural characteristics define the order that determines processing.

5) So structured design arises from the hierarchical view of the applications rather from the procedural view. The top level shows the most important division of the work.

### 3.3.5.2 Functional Decomposition

The decomposition tool for structural design is the hierarchy or structure chart. It is a graphic tool for representing hierarchy and it has three elements.

1) The Module: It is represented by a rectangle with a name.

![Figure No. 3.5: A is Module](image)

A module is a collection of programmes. Module is very useful to separate the programs as per the requirements. It provides the modularity where you can find out relative programs at one place. For example HR module, Marketing module, Fees payment module, etc.

2) Connection: It is represented by a vector lining two modules.

![Figure No. 3.6: Connection](image)
In above displayed figure no. 3.6 the connection among the modules is defined. There are three different modules i.e. A, B, C are connected to each other.

3) Coupling: It is represented by an arrow with a circular tail.

![Diagram showing coupling between modules A, B, and C]

**Figure No. 3.7: Coupling**

In figure no. 3.7 the functional decomposition approach cohesion and coupling is shown. The cohesion refers to the relationship among elements within a module and coupling refers to the number of connectors between callings of the module. The figure shows the connectivity and strongly coupled modules.

### 3.3.5.3 Object Oriented Design

We live in a world of objects, these objects exists in the nature, in human made entities in business and in the product that we use. They can be categorized, described, organized, combined, manipulated and recreated. Therefore, object oriented approach is best suitable methodology being used for the computer software development in various fields i.e. industry, agriculture, medicine, aircraft, entertainment, educational products, etc.

Now a days object oriented technologies are replacing traditional software design and development methods. Because object oriented approach provides benefits at both the management and technical level. Object oriented methodologies lead to reuse existing programs and leads to a faster software development with quality standards. Object oriented designing is differs from the Structured Analysis Designing. The difference is the Object oriented views the system and then models it in terms of an item called object whereas the functions & the data are defined at its lowest level where changes
rarely occur. The Object oriented views the functions and the data as one integrated. It reflects the requirements directly into the object”. 14

The OOPS help in integrating and coupling the objects smoothly. Object is a run time entity which provides access to the properties of the class. Through which the class data can be accessed. It also contains the memory allocation for the properties of the class.

“Object oriented programming is a method of implementation in which programs are organized as co-operative collection of object, each of which represents an instance of some class and whose classes are all members of a hierarchy of classes untitled and inheritance relationship” 15

Class is a collection of data types and its related methods. It provides the concept of data encapsulation where the data and its methods are tied together. The data and methods of the class only can be accessed through an object of the same class.

“The modern methodology is Object Oriented Designing where the function and data definitions are viewed together as an object.” 16

In today’s programming environment there is a strong use of object oriented programming concepts. OOPS has given tremendous benefits to the software development industry. It has not only helped to the users but also to the software developers.

3.3.5.4 Concepts of Object Oriented Approach

1) Object:
   It is a basic run time entities in an object oriented system. They represent a person, a place, a bank account etc. The memory allocation and real access to the properties is done through an object.
2) Class:
   It is a collection of objects of similar type. E.g. mango, apple, etc.

3) Data Abstraction and Encapsulation:
   Data encapsulation means binding the properties of the class together. Data abstraction means the act of representing essential features without including the background or details.

4) Inheritance:
   It is very useful for reusability of the structure. It allows making use of one class property from another class. There are types of inheritance like single, multiple, multilevel, hybrid, etc.

![Figure No. 3.8: Property of Inheritance](image)

Figure no. 8 shows the process of inheritance. There is a main class called bird class. It is derived into sub classes i.e. flying birds and non flying birds. Flying bird derived into another subclass and same with non flying bird class.
5) Polymorphism:
Using the concept for multiple uses is called polymorphism. So it allows to many operations of different instances on the same class.

![Figure No. 3.9: Concept of Polymorphism](image)

6) Message Passing: Objects are interacting with each other. A message stimulates some behavior is accomplished when an operation is executed.

### 3.3.5.5 System Design Components

![Figure No. 3.10: System Design Components](image)

Input design includes the design of all input specifications to the proposed system. It studies factors from user point of view that how user is going to enter the data and in what way user will understand the input issues to the system. Because wrong input generates negative feedback. Output design includes the report generation techniques. Report is a summary of entire process that has taken place in the system. Reports are outcomes of the system. Output design focuses vital issues like color, logo, font size, alignment, header and footer section, watermarks, bar-coding for authentication purpose. Database is one of the major components of any system. Because it stores all the data that user input and hold the information or reports after processing it.
Database includes multiple file or tables in which the entire details of the system are stored. Database provides necessary services to the user whenever it is required. The services like database users, user rights and privileges, authentication, database recovery and backup, database administrator, centralization of database, maintaining relationships between one or more tables, etc.

Hardware is referred as physical component that requires proper design because it provides a platform on which the other components can be linked to each other and communicate as per the demand.

Network is collection of more than one computer where you can pass the message from one place to another place. Networking can be in major three categories i.e. LAN (Local Area Network), MAN (Metropolitan Area Network), WAN (Wide Area Network). Networking services can be connection oriented or wireless basis. Networking issues are to be designed because through software users are communicating from any place any time. That is why networking protocols have to be used properly in the system design.

3.3.5.6 Designing Techniques

The system design is divided into two main sections i.e. 1) Logical design 2) Physical design. But both designs are required to be done for any type of system. You just cannot isolate any technique.

Following figure shows the various parts of logical design. For logical design system analyst can make use of graphical tools like DFD (Data Flow Diagram), Structure Chart, System Flow Diagram, Activity Chart, etc.

There two major parts of system design i.e. 1) Logical Design 2) Physical design. Both the design techniques are important in system design they cannot be isolated from each other.
The figure no. 3.11 shows the various parts of physical design. Physical design studies about database design, transaction processing, real time user interface, availability of hardware and networking infrastructure, etc. For database design ERD (Entity Relationship Diagram) are used to find out the relations of attribute and entity. User interface design includes the design patterns of devices which can be connected to the System through which user can input and process the system. For example, railway reservation system makes use of various devices for user interface i.e. mobile phone, personal computer, laptop, tabs, smart phones, terminals, etc. The designs and internal setting of these all devices may be differing to each other. So, system must be capable enough to accept the request from various devices and respond them in a proper way so that user will be benefited.

Figure No. 3.12 shows the various parts of physical design. Each of them are used for specific task which plays an important role in system design. All these components are interrelated to each other. Physical design includes procedure, transaction, entity relationship diagram, user interface design, etc.
3.4.1 Development Process Model
The development models are the various processes or methodologies that are being selected for the development of the project depending on the project’s aims and goals. There are many development life cycle models that have been developed in order to achieve different required objectives. The models specify the various stages of the process and the order in which they are carried out i.e. waterfall mode, prototype model, spiral model, etc. 17

3.4.2 Waterfall / Classical Model
The Waterfall Model was first Process Model to be introduced. It is also referred to as a linear-sequential life cycle model. It is very simple to understand and use. In a waterfall model, each phase must be completed before the next phase can begin and there is no overlapping in the phases. In this model process begins only if the previous phase is complete. In waterfall model phases do not overlap.

In the figure no. 3.13 the process of waterfall model is presented. It is also referred to as a linear sequential model or classical model. The steps involved in this model executed one after another in a sequence from top down. So it is easy to understand the entire software development process.
1) Analysis:
In this phase primary data is collected through the use of data collection techniques like questionnaire, observation etc. Data can be captured as primary data or secondary data. Secondary data is available on secondary sources like internet, news magazines, library, etc. Data is analyzed by suitable analysis technique. In this phase feasibility study is also conducted to understand the overall aspects of new proposed system.

2) Design:
In this phase the blue print of the complete system is done in two sections i.e. Physical design and logical design. Physical design includes the form, screen, menus, layouts and database design. For database design ERD (Entity Relationship Diagrams) are used. In logical data design part DFD (Data Flow Diagram), algorithm and flowcharts are used.

3) Coding:
In this phase all the pre-decided rules and objectives are converted into a mechanism by writing programs by using programming. It includes modules, stored-procedures, views, etc.

4) Testing:
Testing is one of the important phases of SDLC where all the programs are tested whether they are working properly or not. Various testing techniques are used to test the programs. It is very useful to get the feedback of our developed system.

5) Implementation:
It includes installation, user training, creating infrastructure, software deployment, hardware, networking structure is defined for successful execution of the new system.

6) Maintenance:
In this phase the system maintenance is done by providing necessary required services to the customer end.
There certain advantages of waterfall model like it is simple to understand and use, phases are processed and completed one at a time, works well for smaller projects where requirements are very well understood, clearly defined stages, etc. At the same time it is having some drawback. There is no risk management study is involved in the waterfall model execution. Waterfall model does not support to backtracking. Any changes required to be done after the implementation will require starting the model from beginning. It is time consuming process and costly too. There is no support for complex and object oriented approach. This model is not suitable for large scale projects rather good for small scale projects.

3.4.3 Prototype Model

“The prototype model of system development is thus very different from the traditional waterfall approach. In this model, the phases of development are not sequential, where any changes or additions suggested by the end user are incorporated by modifying the prototype model and again giving it to the user”.  

![Diagram of Prototype Model](www.google.com)

Figure No. 3.14: Prototype Model

(www.google.com)

Figure no. 14 shows the execution of prototype model. Users are actively involved in the development. “Prototype model provides a better system to users, as used have natural tendency to change their mind in specifying requirements and this method of developing system support this tendency. Since in this method a working model is
given the user for better understanding. Errors can be detected much earlier as the system is made side by development. Quicker user feedback is available leading to better solutions”.

Prototype model reduces the development time, provides quick communication between developer and client, makes use of 4th generation development tools which allows to design the protocol in quick time. After getting the evaluation report of the actual programming can take place and real software is developed. Prototype model does not study the risk management. Too much involvement of the client may disturb the developer. Too many changes at client side may create the problem this may impact on coding department.

3.4.4 Spiral Model

The Spiral model is a linear approach following iterations. It is a continuous process of system improvement.

![Spiral Model Diagram]

Figure No. 3.15: Spiral Model
(Source: www.google.com)
An example of the spiral model is the evolution of Microsoft Windows Operating system from Windows 3.1 to windows 2003. We may refer to Microsoft windows 3.1 Operating System as the first iteration in the spiral approach.

“In each iteration of the spiral approach, software development process follows the phase-wise linear approach. At the end of first iteration, the customer evaluates the software and provides the feedback. Based on the feedback, software development process enters into the next iteration and subsequently follows the linear approach to implement the feedback suggested by the customer. The process of iteration continues throughout the life of the software.”

Spiral Approach Phases:

1. Customer Communication: Includes understanding the system requirements by continuous communication between the customer and the system analyst.
2. Planning: Includes estimating Schedule, cost, and resource for the iteration.
3. Risk Analysis: includes identifying, estimating, and monitoring technical and management risks, such as schedule slippage and cost overrun.
4. Engineering: Includes requirement gathering and design of the software system.
5. Construction and release: Includes coding, testing and deploying software at the customer site and providing user-support documents.
6. Customer Evaluation: Includes evaluation of software by the customer and implementing feedback in the next iteration of the software development.

Spiral model is useful when the cost and risk evaluation is important for the proposed system. It is useful for large scale projects. In this model users ensure their need and problems or demands in the new system. When requirements are complex then significant research or exploration of the study is required and this can be done perfectly in spiral model.
Spiral model provides certain advantages like there is a study of risk management, suitable for large scale project, it is having strong approval or documentation control over the system, additional functionality can be added as per the demand, it is not time consuming, the software can be developed in short period of time.

But at the same time there can be some disadvantage of the spiral model like it can be costly model to use, experts are expected to handle the entire development system through this model, it is complex to understand the process.

3.5.1 Programming Tools.
1) Front-end designing tool. (Client side)
2) Back-end tool.
3) Web design and development tool. (Server side)

3.5.2 Front – End Design Tool
Front – end is software in which front part of the system is designed. Front part may include screens, layouts, forms, reports and menus. It helps to the user to interact with the system conveniently. User friendly environment is essential to interface with each and every operations of the proposed system. These screens and other layouts also can be designed and developed by using traditional programming techniques and tools. But traditional programming techniques and tools requires more attention of coding and testing. It also creates lots of coding and increases the length of the program. For any modification in the layouts again coding is required. That is it is difficult to update of modify screens and layouts in a quick time.

New tools and techniques provide flexibility and less effort for designing screens and layouts for the proposed system. Graphical user interface can be defined with minimum code and that helps to achieve compatibility and also reduces other memory and processing resources of the proposed system. Front – end tools are specially user for designing the user interface for better interaction of the user with the proposed system.
For example, Visual Basic 6.0, Visual Studio Dot Net 2005, Developer 2000, etc. are popular front-end designing tools are used for software development. In this research project, we have used Visual Studio ASP. Dot Net 2005 tool for designing forms, screens, menus, report and layouts. Proposed tools for learning is a web based learning tool and Visual Studio ASP.NET provides all the programming facilities for designing and deploying web based solutions.

3.5.3 Back-End Design Tool

A back-end database is a database that is accessed by users indirectly through an external application rather than by application programming stored within the database itself or by low level manipulation of the data (e.g. through SQL commands). Back end systems are corporate systems that are used to run a company such as systems to manage orders, inventory and supply processing. Back end systems support the company's back office. This system collects input from users or other systems for processing. A back-end database stores data but does not include end-user application elements such as stored queries, forms, macros or reports. The term back-end database is most widely used among developers using small database programming systems which can contain the end-user application programming within the database as a single item. The most common of these is Microsoft Access. The developer must decide whether to include the application programming with the data in a single database, or whether to separate them into two database files, according to the client–server model. For simple database applications, it is common for all programming to be stored with the data. This results in a single file and is easier to develop at the expense of scalability and concurrency. For more advanced database applications it is common to split the data and the programming parts in to a front-end database and a back-end database where the front-end holds all the application programming. This has advantages in terms of scalability, performance and concurrency but requires greater effort on the part of the developer. In the long term it may be easier to maintain and upgrade as new versions of the front-end can be deployed independently of the back-end database. The front and back-end databases do not always have to be of the same types. For example, it is possible to use a Microsoft Access front-end with a Microsoft SQL Server back-end. Microsoft SQL Server 2000 is a full-featured Relational Database Management System (RDBMS)
that offers a variety of administrative tools to ease the burdens of database development, maintenance and administration. In this article, we'll cover six of the more frequently used tools: Enterprise Manager, Query Analyzer, SQL Profiler, Service Manager, Data Transformation Services and Books Online.

3.5.4 Web Design and Development Tool (WDDT)

Server-side scripting is a web server technology in which a user's request is fulfilled by running a script directly on the web server to generate dynamic web pages. It is usually used to provide interactive web sites that interface to databases or other data stores. This is different from client-side scripting where scripts are run by the viewing web browser, usually in JavaScript. The primary advantage to server-side scripting is the ability to highly customize the response based on the user's requirements, access rights, or queries into data stores. From security point of view, server-side scripts are never visible to the browser as these scripts are executed on the server and emit HTML corresponding to user's input to the page. When the server serves data in a commonly used manner, for example according to the HTTP or FTP protocols, users may have their choice of a number of client programs. In the case of more specialized applications, programmers may write their own server, client, and communications protocol that can only be used with one another. In the earlier days of the web, server-side scripting was almost exclusively performed by using a combination of C programs, Perl scripts and shell scripts using the Common Gateway Interface (CGI). Those scripts were executed by the operating system, mnemonic coding and the results simply served back by the web server. Nowadays, these and other on-line scripting languages such as ANSI C scripts or ASP and PHP can often be executed directly by the web server itself or by extension modules. Either form of scripting (i.e., CGI or direct execution) can be used to build up complex multi-page sites, but direct execution usually results in lower overhead due to the lack of calls to external interpreters Dynamic websites are also sometimes powered by custom web application servers.

Server side scripting languages makes it possible to create advanced web sites. This page contains descriptions of the most common scripting languages available in web hosting accounts. For making advanced dynamic web sites, you need some kind of server side scripting. Server side scripts are programs that are executed on the server,
and can be used in many ways. Template based web sites and shopping carts are just two examples. The languages used for these tasks are normal programming languages with special libraries/packages for server side scripting. Not all web hosting accounts support all common scripting languages, so this is an important factor in your search for the perfect web host. Here is a short presentation of the most common programming languages used for server side scripting. ASP/ASP.net, or Active Server Pages, is a technology developed by Microsoft for making advanced web pages. The most common language for programming ASP is VBScript. It is available in most web hosting accounts on Microsoft servers. There is also a version for Unix servers called Chill soft ASP, but it is not as stable as real ASP. There are plenty of online ASP resources too. ASP.net is the next generation ASP technology which allows you to use any .net-enabled language to program your site. The 2 most common languages for .net web programming is VB.net and C#. Both are good choices for both desktop and web applications. VB.net is perhaps easier to learn, and C# is more used for enterprise applications.

3.6.1 Testing and Implementation
System testing of software or hardware is testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. There are two main categories of testing: 1) Black Box Testing 2) White Box Testing

3.6.2 Black-box Testing
It is a method of software testing that tests the functionality of an application as opposed to its internal structures or workings. Specific knowledge of the application's code/internal structure and programming knowledge in general is not required. Test cases are built around specifications and requirements, i.e., what the application is supposed to do. It uses external descriptions of the software, including specifications, requirements, and designs to derive test cases. These tests can be functional or non-functional, though usually functional. The test designer selects valid and invalid inputs and determines the correct output. There is no knowledge of the test object's internal structure.
3.6.3 White-box Testing

It is a method of testing software that tests internal structures or workings of an application, as opposed to its functionality (i.e. black-box testing). In white-box testing an internal perspective of the system, as well as programming skills, are required and used to design test cases. The tester chooses inputs to exercise paths through the code and determine the appropriate outputs. This is analogous to testing nodes in a circuit, e.g. in-circuit testing (ICT).

While white-box testing can be applied at the unit, integration and system levels of the software testing process, it is usually done at the unit level. It can test paths within a unit, paths between units during integration, and between subsystems during a system level test. Though this method of test design can uncover many errors or problems, it might not detect unimplemented parts of the specification or missing requirements.

3.6.4 Unit Test

The first test in the development process is the unit test. The source code is normally divided into modules, which in turn are divided into smaller units called units. These units have specific behavior. The test done on these units of code is called unit test. Unit test depends upon the language on which the project is developed. Unit tests ensure that each unique path of the project performs accurately to the documented specifications and contains clearly defined inputs and expected results.

3.6.5 System Test

Several modules constitute a project. If the project is long-term project, several developers write the modules. Once all the modules are integrated, several errors may arise. The testing done at this stage is called system test. System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points for testing a specific hardware/software installation.
3.6.6 Functional Test
Functional test can be defined as testing two or more modules together with the intent of finding defects, demonstrating that defects are not present, verifying that the module performs its intended functions as stated in the specification and establishing confidence that a program does what it is supposed to do.

3.6.7 Acceptance Testing
Testing the system with the intent of confirming readiness of the product and customer acceptance.

3.7.1 System Implementation
The following figure 3.16 shows the implementation process of proposed designed and developed E-learning model in the present research study.

![Diagram showing System Implementation Process]

**Figure No. 3.16: Implementation Methodology**

System implementation covers a broad spectrum of activities from a detailed workflow analysis to the formal go-live of the new system. During system implementation organizations may refine the initial workflow analysis that had been completed as part of the requirements analysis phase. With the aid of the vendor they may also start mapping out the proposed new workflow. The system implementation phase requires prominent role to be played in system development life cycle. The purpose of System Implementation can be summarized as follows: making the new system available to a prepared set of users (the deployment), and positioning on-going support and maintenance of the system within the Performing Organization (the transition). At a finer level of detail, deploying the system consists of executing all steps necessary to educate the users of the MCA E-Learning Model on the use of the new system, placing the newly developed system into real use, confirming that all data required at the start of operations is available and accurate, and validations of the all options and fields and those functions interact with the system properly. Following figure shows the detailed process of proposed MCA E-Learning Model.
3.7.2 Prepare System for Deployment

In this phase of implementation deployment process is completed. Deployment is a process of transforming developed package or tool into actual working condition or state. System configuration is a major phase for deploying either small or large scale software. A System Configuration means the computers, processes, and devices that compose the system and its boundary. It describes required elements and components to install and run the developed MCA E-Learning Model. Following configuration tools are required to implement proposed MCA E-Learning Model.

3.7.3 User Training

In this phase, training provides guidelines for using and controlling the developed MCA E-Learning Model in a proper way. It helps to learn the system flow, system menus and sub options of the MCA E-Learning Model. User training can be given in the form of workshop, seminar, presentation, manual book or online help. As per as this developed MCA E-Learning Model is concern, we have attached help file is attached online with the system. Even through direct interaction user training is done while getting feedback from the sampled users.

3.7.4 Go-online

In this phase, user has to user E-Learning model online.
Section B:  
E-Learning Model

In this section the details pertaining to the E-learning model of MCA is presented. For the development of the E-learning model number of software, program and tools and Prototype Model has been used along with SDLC (System Development Life Cycle) phases. The development tools are presented here under.

3.8 Softwares used for Developing E-learning Model.

1) **ASP.NET 4.0**
A Microsoft server-side Web technology. ASP.NET takes an object-oriented programming approach to Web page execution. Every element in an ASP.NET page is treated as an object and run on the server. An ASP.NET page gets compiled into an intermediate language by a .NET Common Language Runtime-compliant compiler. Then a JIT compiler turns the intermediate code to native machine, and that machine code is eventually run on the processor. Because the code is run straight from the processor, pages load much faster than classic ASP pages, where embedded VBScript or JScript had to be continuously interpreted and cached.

2) **Dot Net Framework 4.0**
The .NET Framework is Microsoft's comprehensive and consistent programming model for building applications that have visually stunning user experiences, seamless and secure communication, and the ability to model a range of business processes.

The Microsoft .NET Framework 4 redistributable package installs the .NET Framework runtime and associated files that are required to run and develop applications to target the .NET Framework 4 works side by side with older Framework versions. Applications that are based on earlier versions of the Framework will continue to run on the version targeted by default.
3) Visual Studio Dot Net 2010
Web development in Visual Studio 2010 has been enhanced for greater CSS compatibility, increased productivity through HTML and ASP.NET markup snippets and new dynamic IntelliSense JavaScript.

Visual studio Dot Net 2010 provides facilities for followings:

- Improved CSS Compatibility
- HTML and JavaScript Snippets
- JavaScript IntelliSense Enhancements
- Web Application Deployment
- Web packaging
- Web.config transformation
- Database deployment
- One-click publish for Web applications, etc.

4) SQL Server 2000
“Microsoft SQL Server 2000 is a relational database management and analysis system for e-commerce, line-of-business, and data warehousing solutions. SQL Server 2000, the latest version, includes support for XML and HTTP, performance and availability features to partition load and ensure uptime, and advanced management and tuning functionality to automate routine tasks and lower total cost of ownership”.

“Microsoft SQL Server 2000 is a full-featured relational database management system (RDBMS) that offers a variety of administrative tools to ease the burdens of database development, maintenance and administration. In this article, we'll cover six of the more frequently used tools: Enterprise Manager, Query Analyzer, SQL Profiler, Service Manager, Data Transformation Services and Books Online”.
5) IIS (Internet Information Service)

IIS 7.0 has a modular architecture. Modules, also called extensions, can be added or removed individually so that only modules required for specific functionality have to be installed. IIS 7 includes native modules as part of the full installation. These modules are individual features that the server uses to process requests and include the following:

Security modules: Used to perform many tasks related to security in the request-processing pipeline, such as specifying authentication schemes, performing URL authorization, and filtering requests.

Content modules: Used to perform tasks related to content in the request-processing pipeline, such as processing requests for static files, returning a default page when a client does not specify a resource in a request, and listing the contents of a directory.

Compression modules: Used to perform tasks related to compression in the request-processing pipeline, such as compressing responses, applying Gzip compression transfer coding to responses, and performing pre-compression of static content.

Caching modules: Used to perform tasks related to caching in the request-processing pipeline, such as storing processed information in memory on the server and using cached content in subsequent requests for the same resource.

Logging and Diagnostics modules: Used to perform tasks related to logging and diagnostics in the request-processing pipeline, such as passing information and processing status to HTTP. sys for logging, reporting events, and tracking requests currently executing in worker processes. 23
3. 9 Requirement of Softwares for Model Installation:

**Software Requirements**

- Operating System: WinXP
- Programming Tools: Dot Net Framework 4.0 onwards
- Back-End (Database): SQL Server 2000
- Others: Internet Explorer 7.0 onwards

**Hardware requirements**

- Processor: Pentium 4 Onwards. (2.4 GHz)
- Memory: 1 GB RAM, 160 GB HDD
- Monitor: TFT-LCD
- Others: Internet Connection With speed 256 KBPS, Modem

3.10 Architecture of Present E-Learning Model

Architectural Design: the process of defining the collection of hardware and software components and their interfaces to establish the framework for the development of a computer system.

Detailed Design: the process of refining and expanding the preliminary design of a system or component to the extent that the design is sufficiently complete to begin implementation.

Functional Design: the process of defining the working relationships among the components of a system.

Preliminary Design: the process of analyzing design alternatives and defining the architecture, components, interfaces, and timing/sizing estimates for a system or components. Hence software design includes architectural views, but and also low level component and algorithm implementation issues. Depending on the type, a software design may be platform-independent or platform-specific.
In figure No. 3.17 first section describes user interface, web browser and web server. It provides network services to the client. Second section enlists programming tools at client and server side. These tools are playing major role to present the model to the user, take their inputs and provide to service for further action process, validation, inputs, authorities to the client side. In third section the component database is used to store the data inputted by the user and provides the existing data to the user.

Figure No. 3.18: Client Side Design
Figure No. 3.17 displays the client side design. User has to register by giving data like name, address, email id, phone number, city, institute name, etc. This data is verified by the administrator and allocates a login and password to the user in the mail box. So, once the user is registered then all the facilities of E-learning model can be availed by him like downloading algorithm, notes, power point slides of various subjects, audio-video support, online examination, etc.

Figure No. 3.19: Admin Side Design

Figure no. 3.19 displays various tasks carried out by admin user.

1) User Registration Process: For accessing the E-learning model user has to register the profile details in the system. Admin user generates the password and mails the details with URL on the users email id. User has to click on that link then the account will be activated for further accessibility.

2) Creating Master Files: Master file includes the subject title, question bank for a particular subject, marks schema, user profile, etc.

3) Result Process: After giving the online examination the result is generated automatically and displayed and forwarded to the user on the email id with all the details.

4) Controlling Module Events: Controlling all these events, schedules, updates, removing privileges, etc. are controlled by the admin user.
3.11 System Flow: New User Registration

The above figure no. 3.20 shows the flow for new user registration. E-learning model cannot be accessed without registration in the system. Any new user has to register in the model. A link is given on home page of the model. User has to just click it at registration form appears on the screen by filling all the details and submit the form. The details are stored in the server. Admin panel of the model automatically generates password and send it on the email id of the user. The user has to login in email id and click on link for activation for the account of the E-learning model and hence the new user registration process is successfully completed. User can make login into the system and access all the features of the E-learning model.
3.12 System Flow: Existing User

Above figure 3.21 explores the detailed process flow for existing user of the E-learning model. Once the user is registered in the model then all the facilities of the model are accessible. A link is available on the home page of the model, user has to login with password the it is verified in control panel of the model. If login name or password is wrong then message is given to the user otherwise user can access the facilities like selection of subject, downloading power point presentation slides, algorithm, programs, audio videos, online examination, etc.
3.13 System Flow: Online Examination

Figure No. 3.22: System Flow – Online Examination

Above displayed figure no. 3.22 explains the flow for using online examination module of the E-learning model. For accessing this facility user should be having the registered account in the model. There is a link available in the menu bar of the home of model. User has to click it along with login name and password. The login and password is verified by the control panel of the model. If there is any problem in the login name or password related message is displayed on the screen. On the successful login, user has to select the subject from listed subject and click and start exam button. One after another questions start flashing on the form along with multiple answers. The correct answer has to be selected by user accordingly all the questions can be solved at the end click on submit exam button. After submission of exam, the result is prepared by control panel and it sends all the details on the users email id which he has mentioned at the time of user registration process.
3.14 System Flow: Admin User

The above given figure no. 3.23 shows the process of admin user. There are two types of user are maintained by the E-learning model. Admin user is responsible for all types of control, giving permissions, deletion process, updating control panel settings, exam settings, master data manipulations, etc. Normal user is not given access to all these listed operations.

E-learning model includes online examination module. It requires some pre arrangement like addition of subjects, subject related question bank, settings of questions, correct answer and all possible answer, mark schema for exam, etc. These all operations are executed and controlled by the admin user. All types of settings are available in admin control panel.
3.15 Database Tables

The following is list of table structure which describes the column name, data type and other details. These tables have been created in SQL Server 2000 for the purpose of storing the required data of the E-learning model. Each table is used for some specific task.

Table No. 3.1 : Algorithm Master

In the table 3.1 the details of algorithm is stored. It is created in the database software i.e. SQL Server 2000. This database table holds all the data about algorithms which are used in the developed E-learning model.
Table No. 3.2 : City Master

The table 3.2 holds the database details about respondents city name, state name. This entire data is indentified by city id key.

Table No. 3.3 : Class Master

The table 3.3 represents the data about the class details in which student currently pursuing MCA degree programme.
Table No. 3.4: Course Master

The above table 3.4 describes the details about course selected by the students.

Table No. 3.5: Field Master

The above displayed database table 3.5 holds the details about the fields to be added in the present developed E-learning model.
The above mentioned table 3.6 shows the various fields used for storing the responses given by the respondents. These responses are stored in this table called as Feedback Master Table. After using the E-learning model respondent can give on line feedback and give the opinion about it.
Table No. 3.7: Login Master

The table 3.7 is used for storing the login details of the users. It includes the username, password, confirm password, login creation date, current states.

Table No. 3.8: Media Master

The table 3.8 describes the details about media used in the present developed E-learning model.
Table No. 3.9: News Master

Above displayed table 3.9 stores the information about the news which is displayed in the model. The new news can be added or removed from the model. All the information about this is stored in above mentioned table.

Table No. 3.10 : Mark Master

The table 3.10 holds the data of total marks scored by the student after giving the online examination in the developed E-learning model.
Table No. 3.11: Note Master

The above table 3.11 is used for storing the details of subject wise notes in the model. It represents the data in columns like note title, note description, file type, filename, status, etc.

Table No. 3.12 State Master

The table 3.12 is used for holding the current status of the used. Through the use of this table user can be activated or deactivated in the present developed model.
Table No. 3.13: Online Exam Master

The above table 3.13 represents the details of online examination process. The exam details of the respondent can be maintained in this table. It includes subject of exam, question, possible options, clicked answer of user, any remark, time duration, current answer, etc.
The above table 3.14 holds the information related to PPTs of respective subjects stored in the database tables.

The above table 3.15 describes the list of institutes and their affiliated universities.
Table No. 3.16: Project Report Master

The table 3.16 is used for holding the data about reports generated by the exam module of the E-learning model.

Table No. 3.17: Semester Master

The table 3.17 shows the details of semester of each student who have registered in the E-learning model.
Above mentioned table 3.18 is used for storing the details of questions which are used in the developed model. It includes the questions, options, answer key, etc.

Table No. 3.19 : User Type Master
The above displayed table 3.19 is used for holding the details of user in the model.
Table No. 3.20: Subject Master

The table 3.20 is used to describe and store the information about the subject i.e. subject name, description, status, etc.

Table No. 3.21: University Master

The above displayed database table represents the details of university which are listed in the developed E-learning model.
Table No. 3.22: User Registration

The above table 3.22 is used for user registration purpose. Firstly the new user has to register in the E-learning model then the user can avail the other facilities of the E-learning model. Any new user has to register along with some details i.e. first name, last name, address, institute in which is pursing the MCA degree, affiliated university name, city, email id, login name, password, etc.
Table No. 3.23 : Syllabus Master

The above displayed table 3.23 is used for storing the details of MCA syllabus given by each university of the state.
### 3.16 Screen Shots

#### Home Page

![Home Page](image_url)

**Screen Shot 3.1: Home Page**

This is a home page of E-learning model which includes the links for main menu and sub options of it. On the top right hand side there is a facility for user login. Two types of login are maintained in the model i.e. Member user and Admin user. Below that a menu bar is displayed with tabs like Home, About us, Register Account, Downloads, Feedback, Online Exam Model, Contact Us, Questionnaire and important links. Home page is a first page of the model from where all links are established. About us tab describes information about the topic. Register account tab is used for making registration of new user in the model. Downloads tab is useful for downloading the MCA course material which is available in the form of notes, PPT, ebooks, algorithm, syllabus, etc. Feedback tab is used to give online feedback from
registered user about the system. Online exam tab allows access to online examination module. Student can select the subject and give the objective type of exam by clicking this particular tab. Questionnaire tab is useful for filling up online questionnaire of the respondents. Important link tab contains the useful links for the candidate.

**Member Login**

![Screen Shot 3.2: Member Login](image)

Above displayed form is used for making member logging in the E-learning model. User has to type email id along with password and click on login button. In case user is not willing to login then just click on go back to website option then automatically home page of the model will be opened.
## Downloading Notes

The above shown form is used to download the notes of various subjects.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name</th>
<th>File Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Beginning While</td>
<td>Download</td>
</tr>
<tr>
<td>2</td>
<td>C Examples</td>
<td>Download</td>
</tr>
<tr>
<td>3</td>
<td>Principles of OOPs</td>
<td>Download</td>
</tr>
<tr>
<td>4</td>
<td>C Tutor</td>
<td>Download</td>
</tr>
<tr>
<td>5</td>
<td>Constructor Destructor</td>
<td>Download</td>
</tr>
<tr>
<td>6</td>
<td>C Essentials</td>
<td>Download</td>
</tr>
<tr>
<td>7</td>
<td>Line Bar</td>
<td>Download</td>
</tr>
<tr>
<td>8</td>
<td>2D Line Bar</td>
<td>Download</td>
</tr>
<tr>
<td>9</td>
<td>Program_of_Line_3D</td>
<td>Download</td>
</tr>
<tr>
<td>10</td>
<td>Program_of_Circle</td>
<td>Download</td>
</tr>
<tr>
<td>11</td>
<td>Program_of_Ellipse</td>
<td>Download</td>
</tr>
<tr>
<td>12</td>
<td>Program_of_Fill_Ellipse</td>
<td>Download</td>
</tr>
<tr>
<td>13</td>
<td>Program_of_Fill_ellipse</td>
<td>Download</td>
</tr>
<tr>
<td>14</td>
<td>Evaluation of DBMS</td>
<td>Download</td>
</tr>
<tr>
<td>15</td>
<td>Structure of DBMS</td>
<td>Download</td>
</tr>
<tr>
<td>16</td>
<td>Transaction Management</td>
<td>Download</td>
</tr>
<tr>
<td>17</td>
<td>Normalization</td>
<td>Download</td>
</tr>
<tr>
<td>18</td>
<td>Introduction to IT</td>
<td>Download</td>
</tr>
<tr>
<td>19</td>
<td>Number System</td>
<td>Download</td>
</tr>
<tr>
<td>20</td>
<td>Computer Codes</td>
<td>Download</td>
</tr>
<tr>
<td>21</td>
<td>Boolean Algebra</td>
<td>Download</td>
</tr>
<tr>
<td>22</td>
<td>Secondary Storage Devices</td>
<td>Download</td>
</tr>
<tr>
<td>23</td>
<td>Java Script</td>
<td>Download</td>
</tr>
<tr>
<td>24</td>
<td>Data Communication</td>
<td>Download</td>
</tr>
<tr>
<td>25</td>
<td>Multiplexing</td>
<td>Download</td>
</tr>
<tr>
<td>26</td>
<td>Multiplexing</td>
<td>Download</td>
</tr>
<tr>
<td>27</td>
<td>Networking Models</td>
<td>Download</td>
</tr>
<tr>
<td>28</td>
<td>OSI Networking Model</td>
<td>Download</td>
</tr>
<tr>
<td>29</td>
<td>Transmission Media</td>
<td>Download</td>
</tr>
<tr>
<td>30</td>
<td>Software Engineering Techniques</td>
<td>Download</td>
</tr>
</tbody>
</table>
Screen Shot 3.4: Downloading PPT

This form is useful for downloading power point slides of the required subjects. User has to select the file and click on download button. The select file will be downloaded to users computer automatically.
Above form is useful for downloading the syllabus of the MCA course. In the first box the list of university from Maharashtra state is displayed. As you select the respective university in the second combo box the faculty wise syllabus can be downloaded.
Control panel form is one of the most important form of the E-learning model. It includes all the settings of the model. This form is not accessible for any normal user, it can be accessed only by admin user. In this admin user can manipulate data, master files, question bank, uploading syllabus, notes, ebooks, etc.
Login for Online Examination

The above displayed form is used for online examination. The student or candidate has to type the login name which he entered at the time of registration process along with the password. Then click on login button, it will open the link for online examination. In case one avail the facility of recovering the password by using remember password link displayed in the form.
The above shown screens shows the type of question which the candidate receives after successful entry in the login form. The questions appear on the screen along with the question and four possible answers. The student has to select the correct answer from the list and press on next button for getting another question. Previous button is used to reload the previous question.
The above displayed image shows the result of the student with details like total questions, correct answers, wrong answers, total marks scored, question weights. As student will clicks on submit exam button then result is recorded in the database of the E-learning model and the result send on the email id of the candidate along with exam details.
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