



International Journal of Engineering Research and Science & Technology

www.ijerst.org

ISSN : 2319-5991

Vol. 22 No. 3 (2026)



**ijerst.editor@gmail.com
editor@ijerst.com**

Research Paper

AI COURSE GENERATOR FOR TOPIC

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ABSTRACT

The AI Course Generator for Topic is an intelligent system designed to automatically create structured and personalized courses from a topic provided by the user. Traditional course creation requires significant time to research the subject, organize learning materials, prepare lessons, and design assessments. This proposed system uses Artificial Intelligence to automate these activities and generate a complete learning path from a simple topic or keyword.

The system accepts a topic such as Artificial Intelligence, Python Programming, Data Science, Cybersecurity, or Digital Marketing as input. The AI analyzes the topic and identifies its important concepts, subtopics, prerequisites, and learning objectives. Based on this analysis, it generates a structured course containing modules, lessons, explanations, examples, activities, and assessments. The generated course can be customized according to the learner's knowledge level and preferred learning style.

Natural Language Processing and Generative AI are used to understand the topic and produce meaningful educational content. The system can divide a large topic into smaller and logically connected modules so that learners can study the subject step by step. It can also generate quizzes, multiple-choice questions, assignments, summaries, and practical exercises for each module. This helps create an interactive learning experience instead of providing only static information.

The proposed system also considers the learner's level, such as beginner, intermediate, or advanced. Based on the selected level, the AI can adjust the difficulty, depth, examples, and activities included in the course. A learner can preview the generated course, modify selected sections, regenerate content, and track their progress. This provides flexibility and allows the generated course to be improved according to individual requirements.

Overall, the **AI Course Generator for Topic** reduces the effort involved in course development and makes personalized education more accessible. It can be useful for students, teachers, trainers, educational institutions, and online learning platforms. The system can be further enhanced with multimedia generation, multilingual support, real-time tutoring, learner performance analysis, and adaptive learning capabilities.

I. INTRODUCTION

Creating a high-quality course normally requires careful planning, subject knowledge, research, content development, and assessment design. Teachers and instructional designers need to identify learning objectives, arrange topics in the correct sequence, prepare explanations, and create exercises for learners. This process can become difficult when courses need to be created for multiple subjects or different learner levels. An automated solution can significantly reduce this workload.

Artificial Intelligence has introduced new possibilities in the field of education by enabling systems to understand content and generate learning materials automatically. Modern AI models can analyze natural language, summarize information, identify important concepts, and generate human-readable educational content. These capabilities can be used to transform a simple topic into a complete learning structure. Instead of manually preparing every lesson, users can provide a topic and allow the AI system to create an initial course.

The **AI Course Generator for Topic** focuses on converting a user-provided topic into an organized learning path. The system first understands the topic and determines its major concepts and relationships. It then creates modules and lessons based on the identified concepts. Each lesson can contain explanations, examples, key points, practical activities, and assessments. This approach helps learners move from basic concepts to more advanced concepts in a systematic manner.

Personalization is another important feature of the proposed system. Different learners have different levels of knowledge, learning goals, and preferred study durations. The system can use information such as learner level, course duration, and learning objectives to generate suitable content. For example, a beginner may receive simple explanations and basic examples, while an advanced learner may receive deeper concepts, case studies, and practical challenges.

The proposed system aims to make course development faster, flexible, and intelligent. It can support educational institutions, online learning platforms, corporate training programs, and individual learners. By combining AI-based content generation with structured course planning and assessment generation, the system provides a complete framework for automated learning content creation.

II. LITERATURE SURVEY

Traditional Learning Management Systems mainly provide predefined courses and learning materials created by instructors or content developers. These systems are useful for organizing educational resources, but they generally depend on humans to create and update course content. Creating a complete course manually requires considerable time and effort. The lack of automatic content generation also makes it difficult to quickly create courses for new or specialized topics.

Research in **Intelligent Tutoring Systems** has explored the use of Artificial Intelligence to provide personalized educational support. These systems can analyze learner performance and provide recommendations, hints, or learning materials according to individual needs. Intelligent tutoring approaches demonstrate that AI can improve learning experiences by adapting content to learners. However, many such

systems focus mainly on tutoring or recommendation rather than automatically generating an entire course from a topic.

Natural Language Processing has also been widely used for educational content processing. NLP techniques can extract keywords, identify concepts, summarize text, classify educational materials, and generate questions from learning resources. These capabilities can help an automated course-generation system understand the structure of a subject. However, conventional NLP approaches may have limitations when generating long, coherent, and context-aware educational content.

Recent developments in **Generative AI and Large Language Models** have significantly improved automated content generation. These models can generate explanations, examples, summaries, questions, exercises, and learning objectives from natural-language instructions. They can also modify the complexity and style of generated content. This makes Generative AI highly suitable for developing educational courses, although content accuracy and consistency still need to be verified.

Adaptive learning research focuses on adjusting educational content according to learner characteristics and performance. Such systems may modify the difficulty level, recommend additional resources, or provide remedial learning activities. Combining adaptive learning with Generative AI can enable the creation of courses that are customized for individual learners. This approach can make learning more flexible and reduce the need for learners to follow the same fixed course structure.

Existing research shows strong potential for combining NLP, Generative AI, knowledge extraction, and adaptive learning to automate educational content creation. However, challenges such as factual accuracy, hallucinated information, content quality, learning progression, and assessment reliability remain important. The proposed **AI Course Generator for Topic** addresses these challenges by combining topic analysis, course planning, AI content generation, assessment generation, validation, and user customization into one integrated system.

III. SYSTEM ANALYSIS

The **AI Course Generator for Topic** is designed to automatically transform a user-provided topic into a complete and structured learning course. The user first enters a topic and selects options such as learner level, course duration, and learning objectives. The system analyzes the topic using Natural Language Processing and identifies important concepts and related subtopics. It then determines prerequisites and arranges the concepts in a logical learning sequence. An AI course planner creates modules and lessons based on the analyzed information. The Generative AI engine produces explanations, examples, summaries, and practical activities for each lesson. The system also generates quizzes, multiple-choice questions, assignments, and assessments. A validation module checks the generated content for structure, relevance, duplication, and basic consistency. The learner can preview the generated course and modify individual modules or lessons. Updated content can be regenerated according to the learner's requirements. Finally, the completed course is displayed through a user-friendly interface and can be saved, shared, or exported.

Existing System

Existing course creation systems mainly depend on teachers, trainers, instructional designers, or content development teams. The instructor generally starts by selecting the subject and researching the required learning materials. After collecting information, the instructor manually identifies concepts, creates learning objectives, and divides the subject into modules. Lesson explanations, examples, activities, and assessments are then prepared separately for each module. Learning Management Systems can store and deliver these materials but usually do not automatically create the complete course. Some online platforms provide predefined templates or recommended learning resources, but the actual course content still requires considerable human effort. Creating courses for different learner levels also requires additional customization. Updating an existing course can take significant time when the subject changes frequently. Manual course creation may also result in inconsistent lesson structures or differences in content quality. Instructors may find it difficult to create quizzes and practical exercises for every lesson. As a result, traditional systems are less efficient when a large number of customized courses need to be developed quickly.

Disadvantages of Existing System

- Requires significant manual effort to create course content.
- Course development can take a long time.
- Limited personalization for individual learners.
- Difficult to quickly create courses for new topics.
- Manual research and content organization are required.
- Creating assessments for every lesson is time-consuming.
- Content quality may vary between different instructors.
- Updating outdated course materials requires additional effort.
- Limited automatic identification of prerequisites and subtopics.
- Difficult to generate multiple difficulty levels automatically.
- Course creation may require specialized instructional-design skills.
- Less suitable for large-scale personalized learning.

Proposed System

The proposed **AI Course Generator for Topic** automatically creates a complete course from a topic entered by the user. The system first accepts the topic along with optional information such as learner level, course duration, objectives, and preferred learning style. NLP techniques analyze the topic and identify keywords, concepts, subtopics, and prerequisites. An AI planning module organizes these concepts into a logical sequence of modules and lessons. Generative AI then creates lesson explanations, examples, key points, summaries, and practical activities. The system automatically generates quizzes, multiple-choice questions, assignments, and assessments for the generated lessons. A personalization module adjusts the content according to beginner, intermediate, or advanced learners. A validation module checks the generated content for relevance, consistency, completeness, and structural quality. Users can preview the course and edit, regenerate, or remove individual sections. The system stores the final course and maintains learner progress and generated content history. The completed course can be accessed through a dashboard and exported for use in an online learning environment.

Advantages of Proposed System

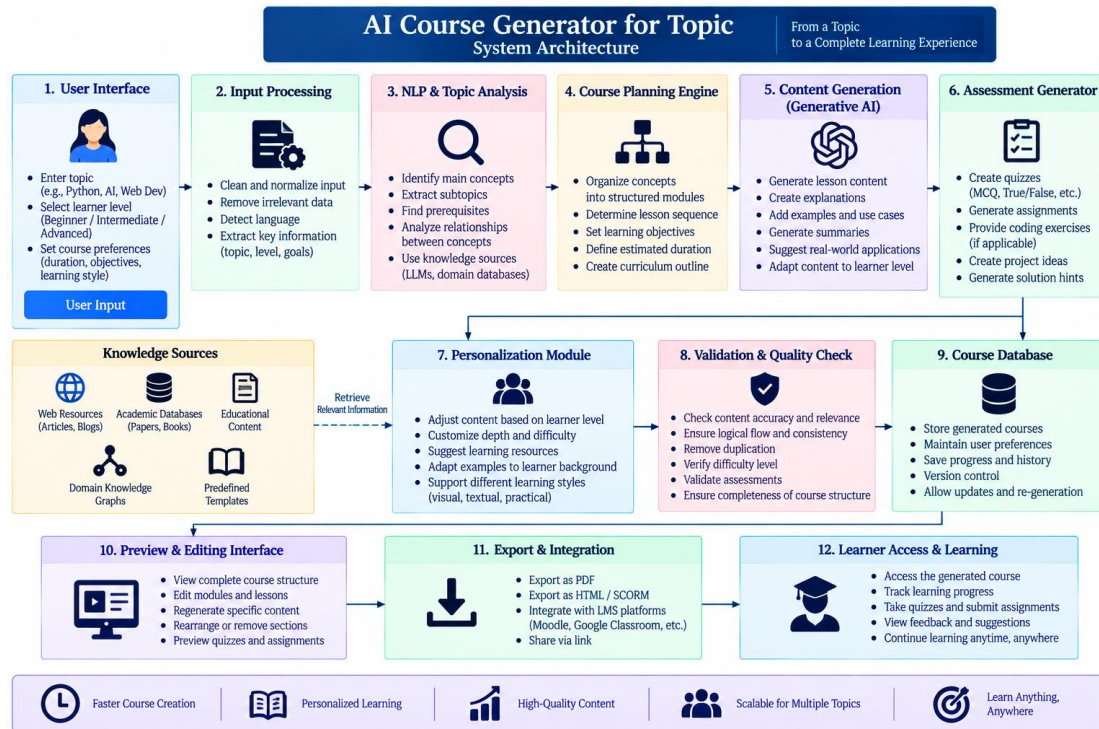
- Automatically generates complete courses from simple topics.
- Reduces the time required for course development.
- Provides personalized learning content.
- Supports beginner, intermediate, and advanced levels.
- Automatically identifies important subtopics and prerequisites.
- Generates structured modules and lessons.
- Creates quizzes and assessments automatically.
- Provides examples, summaries, and practical activities.
- Allows users to edit and regenerate AI-generated content.
- Makes course updates faster and easier.
- Supports scalable content creation for multiple subjects.
- Provides an interactive and user-friendly learning experience.

IV. METHODOLOGY

The methodology of the proposed system begins when the user enters a topic into the course-generation interface. The user can optionally select the learner's knowledge level, desired course duration, objectives, and preferred content format. The input is passed to a preprocessing module that cleans and normalizes the topic information. NLP techniques are then used to extract important keywords, concepts, relationships, prerequisites, and subtopics. An AI planning module organizes the identified concepts into a logical course structure. The structure is divided into modules and lessons according to the selected learner level and course duration. The Generative AI engine creates lesson explanations, examples, summaries, activities, and important points. An assessment-generation module creates quizzes, questions, assignments, and practice exercises for the lessons. A personalization module adjusts the depth and difficulty of the generated content. A validation module checks the course for relevance, consistency, completeness, and possible content errors. The user can preview and edit the generated course before finalizing it. Finally, the system saves the course and provides the completed learning material through the dashboard or export options.

SYSTEM ARCHITECTURE

The system architecture consists of several interconnected modules that work together to generate a complete course from a topic. The User Interface allows users to enter a topic and configure course-generation preferences. The Input Processing Module cleans and prepares the submitted information for further analysis. The NLP and Topic Analysis Module identifies keywords, concepts, subtopics, and prerequisites. The AI Course Planner converts the analyzed information into a structured sequence of modules and lessons. The Generative AI Engine creates explanations, examples, summaries, activities, and other educational content. The Assessment Generator creates quizzes, questions, assignments, and practice exercises. The Personalization Module adjusts content according to learner level and requirements. The Validation Module evaluates the generated course for relevance, consistency, and completeness. The Course Database stores generated courses, user preferences, progress information, and version history. The Preview and Editing Module allows users to review, modify, and regenerate content. Finally, the Export and Learning Module delivers the completed course through the dashboard or supported learning formats.



V. RESULT AND OUTPUT

The screenshots illustrate the CourseGen AI application interface, demonstrating the process of generating a complete course from a topic and the resulting output.

Top Left Screenshot: The main interface for generating a course. It includes a search bar, a sidebar with navigation options (Home, My Courses, Templates, Progress, Settings), and a central area titled "Generate a Complete Course with AI". The user has entered "Web Development" as the topic, selected "Beginner" as the learner level, "4 Weeks" as the course duration, and "Mixed (Video + Text + Practice)" as the learning style. A "Generate Course" button is visible.

Top Right Screenshot: The "Generated Course Outline" view. It shows the course structure for "Web Development" (Level: Beginner, Duration: 4 Weeks). The outline includes six modules, each with a list of lessons and their durations. A "Download" button is present.

Bottom Left Screenshot: A detailed view of a lesson, "Lesson 1.2: How the Web Works". It includes a video player, a transcript, and a list of key points. The lesson content explains how the web works using a client-server model and HTTP/HTTPS protocols.

Bottom Right Screenshot: The "Final Output - Generated Course (Sample)". It shows a sample of the generated course content, including a "Web Development: A Complete Beginner's Course" title, a "Project: Your First Web Page" section, and a "Next Steps" section. The output is available in PPTX, PDF, and HTML formats.

VI. CONCLUSION

The AI Course Generator for Topic provides an intelligent and efficient solution for automatically creating structured learning courses from a simple topic. The system reduces the time and effort required to manually research a subject, organize modules, prepare lessons, and create assessments.

By combining Natural Language Processing, Generative AI, topic analysis, and personalization techniques, the system can identify important concepts and transform them into a logical course structure. It can generate lesson explanations, examples, summaries, activities, quizzes, assignments, and other learning materials based on the selected learner level.

The system also provides flexibility by allowing users to preview, edit, and regenerate the generated content. This ensures that users can customize the course according to their learning objectives and requirements. The validation module further helps improve the relevance, consistency, and completeness of the generated course.

Overall, the proposed system makes course creation faster, easier, scalable, and more personalized. It can be useful for students, teachers, trainers, educational institutions, and online learning platforms. In the future, the system can be enhanced with multilingual course generation, AI-based tutoring, multimedia and video generation, adaptive learning based on learner performance, and integration with Learning Management Systems.

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