

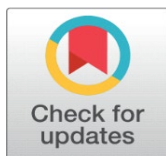


ENGINEERING STUDENT-CENTRIC PROTOTYPE DESIGN FOR EFFICIENT MANAGEMENT OF DIGITAL LIBRARY COLLECTIONS AND RESOURCES UNDER JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

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ABSTRACT

In the ever-evolving landscape of academic institutions, efficient library management systems are essential to support research, learning, and knowledge dissemination. This abstract provides an overview of JNTUKLIBCON, a comprehensive library management system developed for Jawaharlal Nehru Technological University, Kakinada (JNTUK). JNTUKLIBCON is designed to streamline and enhance the library's operations by offering three distinct interfaces: one for administrators, one for librarians, and one for students. Each interface caters to specific user roles, ensuring efficient management of library resources, user accounts, and material requisitions. The system leverages web technologies, including HTML, Java Server Pages (JSP), Tomcat Web server, and a MySQL database, to create a user-friendly and responsive platform. It encompasses a wide range of features, from user authentication to the management of various library materials, such as books, e-books, e-journals, and research reports. Administrators have the privilege of overseeing user accounts, student records, and library resources, while librarians can efficiently manage materials and track material requisitions. Students benefit from a simplified interface for checking material availability and accessing electronic resources. The system's deployment promises to enhance resource management, increase accessibility to electronic materials, and improve overall user experiences within the library. It offers a centralized platform that simplifies library administration and empowers users to make the most of the available resources.

Keywords: Library Management System, Academic Institutions, User Interface, Resource Management, Electronic Resources, JNTUKLIBCON

1. INTRODUCTION

The management of digital resources and library collections plays a pivotal role in the academic success of students and the overall effectiveness of educational institutions. In today's digital age, where information is abundant and easily accessible, universities and colleges must adapt to meet the evolving needs of their students. This is particularly true for technical universities like Jawaharlal Nehru

Technological University, Kakinada (JNTUK), where engineering students rely heavily on a wide range of digital resources to support their studies.

JNTUK, a renowned institution for engineering education, faces the challenge of efficiently managing its digital resources and extensive library collections to cater to the diverse needs of its students. These resources encompass digital textbooks, research papers, e-learning materials, and a wealth of academic content. The efficient organization, accessibility, and utilization of these resources are pivotal to enhancing the learning experience and research capabilities of students and faculty.

In this context, our research presents a student-centric prototype design that seeks to revolutionize the management of digital resources and library collections at JNTUK. Our project aims to address the evolving demands of engineering students by providing them with a tailored, user-friendly platform that streamlines access to digital resources and optimizes the library's collection management.

The primary objectives of our work are two-fold:

- To design a user-centric digital platform that enhances the accessibility and usability of digital resources within the JNTUK library system.
- To improve the efficiency of library collection management, ensuring that students have access to the most relevant and up-to-date academic materials.

Our research holds significant relevance within the context of the ongoing digital transformation of educational institutions. As engineering education increasingly relies on digital resources, the imperative for efficient management and access to these materials becomes all the more pronounced. By concentrating on the unique requirements of students and tailoring our prototype to meet these needs, we aim to contribute meaningfully to the enhancement of the academic experience at JNTUK and provide valuable insights applicable to similar institutions worldwide.

2. LITERATURE REVIEW

Efficient management of digital resources and library collections has become increasingly essential in today's educational institutions. The shift from traditional print collections to digital formats has presented both challenges and opportunities for libraries in delivering information and services to students. This literature review explores key aspects of digital resource management, including accessibility, preservation, and the evolving role of libraries in educational settings.

In the digital age, accessibility and usability are paramount concerns for libraries. As [Luo \(2012\)](#) highlights, ensuring that students can easily find and use digital resources is a central challenge. Libraries must adopt user-friendly interfaces and search functionalities to enhance accessibility. Moreover, they need to consider the diverse needs of students, including those with disabilities, to ensure equitable access [Bawden & Robinson \(2012\)](#). The long-term preservation of digital resources is another critical concern. [Borgman \(2015\)](#) emphasizes that digital libraries must address issues of data curation, metadata standards, and digital archiving to prevent the loss of valuable educational content. Sustainable preservation strategies are essential to ensure that resources remain accessible and usable for future generations [Smith & Thomas \(2020\)](#). Libraries are no longer mere repositories of books but have evolved into dynamic knowledge hubs. [Walters \(2017\)](#) discusses how libraries can embrace their role as publishers and facilitators of scholarly communication. Academic libraries are increasingly involved in open-access

initiatives and collaborative efforts to create and disseminate digital content [Christensen \(2019\)](#).

The development of sustainable digital collections is crucial to meet the diverse needs of students and faculty. [Smith & Thomas \(2020\)](#) argue that libraries should adopt strategic collection development practices, taking into account factors like licensing, copyright, and resource scalability. Building collections that align with the curriculum and research interests is key to maximizing their utility. The rapid advancement of technology continues to influence how libraries manage digital resources. Integration of AI-powered search algorithms, metadata enrichment, and recommendation systems can significantly improve resource discovery [Furner & Zavalina \(2019\)](#). Libraries are also exploring blockchain technology for transparent and secure management of digital assets. Library prototype design plays a pivotal role in modernizing and optimizing library services to meet the evolving needs of users. This review explores the key aspects of library prototype design and the transformative impact it has on enhancing user experiences and operational efficiency.

A cornerstone of effective library prototype design is a user-centric approach. As discussed by [Usher \(2015\)](#), libraries must understand the behaviors, preferences, and expectations of their patrons to create prototypes that align with user needs. User studies, usability testing, and design thinking methodologies have become integral in ensuring that prototypes are intuitive and user-friendly [Blandford et al. \(2019\)](#). Incorporating digital technologies is imperative in modern library prototypes. [Abels & Kristof \(2019\)](#) emphasize the importance of seamlessly integrating digital resources, such as e-books, databases, and online catalogs, into the library's physical and virtual spaces. Hybrid libraries, which blend physical and digital collections, offer users a diverse array of resources while maintaining the library's traditional role [Smit \(2017\)](#).

Physical library spaces have not become obsolete; rather, they have evolved. The design of library spaces and furniture is integral to fostering collaborative learning and creativity [Marquez et al. \(2020\)](#). Ergonomic furniture, flexible seating arrangements, and designated quiet zones are features that accommodate the diverse needs of library users. Advancements in prototyping tools and technologies have revolutionized library design. Virtual reality (VR) and augmented reality (AR) are increasingly being used to simulate and evaluate library spaces before physical implementation [Su et al. \(2019\)](#). Additionally, 3D printing, and makerspaces have become valuable additions to libraries, allowing users to engage in hands-on learning experiences [He et al. \(2020\)](#). Library prototypes must prioritize accessibility and inclusivity. Universal design principles should guide the creation of spaces and services that are usable by all, including individuals with disabilities [Lai & Hong \(2019\)](#). Digital prototypes should also adhere to web accessibility standards to ensure equitable access to online resources. Effective library prototype design is an iterative process. Libraries must continually assess the performance and usability of prototypes, gathering feedback from users and making necessary improvements [Blandford et al. \(2019\)](#). This iterative approach ensures that library prototypes remain relevant and responsive to changing user needs.

3. METHODOLOGY FOR DEVELOPING A PROTOTYPE MODEL

1) Understanding Requirements:

- **Stakeholder Engagement:** Begin by engaging with key stakeholders, including library staff, faculty, and students at JNTUK, to understand

their specific requirements and pain points regarding digital resource management and library services.

- **Needs Assessment:** Conduct a comprehensive needs assessment to identify the specific challenges and goals associated with digital resource management and library collections.

2) Reviewing Existing Systems:

- **Literature Review:** As previously discussed in the literature review section, conduct an extensive literature review to identify existing library systems, digital resource management tools, and best practices in library collection management.
- **Benchmarking:** Evaluate similar library prototypes or systems implemented in other institutions to identify successful features and functionalities that can be adapted to JNTUK's context.

3) Defining Objectives:

- **Setting Clear Objectives:** Based on the insights gained from stakeholders and the literature review, establish clear and measurable objectives for the prototype design, including improved resource accessibility, streamlined collection management, and enhanced user experiences.

4) Design and Development:

- **User-Centric Design:** Employ user-centered design principles to ensure that the prototype caters to the needs and preferences of library users. Conduct user interviews, surveys, and usability testing to gather user feedback.
- **Prototyping Tools:** Utilize appropriate prototyping tools and technologies to create a functional prototype. These may include wire framing software, 3D modeling tools, or virtual reality environments, depending on the nature of the prototype.
- **Digital Integration:** Integrate digital resources, such as e-books, journals, and databases, into the prototype. Ensure seamless access and search functionalities.
- **Database Management:** Develop a robust database management system to organize and catalog digital resources effectively. Implement metadata standards for consistency.

5) Accessibility and Inclusivity:

- **Accessibility Standards:** Adhere to web accessibility standards (e.g., WCAG) to ensure that the prototype is accessible to all users, including those with disabilities.
- **Inclusivity:** Implement features that cater to diverse user groups, including multilingual support, adaptive interfaces, and assistive technologies.

6) Testing and Evaluation:

- **Usability Testing:** Conduct usability testing sessions with a diverse group of users to identify usability issues and gather feedback for improvements.
- **Performance Testing:** Evaluate the performance of the prototype in terms of speed, reliability, and scalability.

7) Refinement:

- **Iterative Design:** Based on user feedback and performance evaluations, iterate on the prototype to make necessary refinements and enhancements.

8) Training and Documentation:

- **User Training:** Develop user training materials and conduct training sessions for library staff and users to ensure effective utilization of the prototype.
- **Documentation:** Create comprehensive documentation, including user guides and system manuals, for reference.

9) Implementation:

- **Gradual Rollout:** Implement the prototype in phases, starting with a limited group of users, and gradually expand its use across the library.

10) Monitoring and Maintenance:

- **Ongoing Monitoring:** Continuously monitor the performance and user satisfaction with the prototype. Address any issues promptly.
- **Regular Maintenance:** Conduct regular maintenance to ensure the prototype remains up-to-date and secure.

11) Feedback and Improvement:

- **Feedback Mechanism:** Establish a feedback mechanism for users and library staff to provide suggestions and report issues for ongoing improvement.

12) Final Evaluation:

- **Post-Implementation Evaluation:** Conduct a final evaluation of the prototype's effectiveness in achieving its objectives. Compare it to pre-implementation benchmarks.

13) Documentation and Reporting:

- **Project Documentation:** Compile comprehensive documentation of the entire development process, including methodologies, decisions made, and outcomes.
- **Final Report:** Prepare a final report summarizing the entire prototype development project, including its impact on digital resource management and library collections at JNTUK.

4. AVAILABLE PROTOTYPE MODELS

The field of library science has undergone significant transformations with the advent of digital technologies and the proliferation of electronic resources. Today, libraries face the complex task of managing not only traditional print materials but also a wide array of digital assets. To efficiently address these challenges and ensure the development of a well-rounded and relevant collection, libraries often turn to library collection development prototype models. These models serve as innovative frameworks or software solutions designed to streamline the acquisition, organization, assessment, and maintenance of library collections.

In this review, we explore the landscape of available library collection development prototype models, shedding light on their essential features, functionalities, and contributions to modern library practices. By understanding

these models and their capabilities, libraries can make informed decisions about adopting or adapting them to meet their specific needs and goals in the digital age.

The evolution of library collection development has been strongly influenced by the shift from print-centric to digitally-driven collections. While traditional methods of collection development remain pertinent, libraries must embrace innovative technologies and strategies to effectively manage and curate their resources. The following sections will delve into various library collection development prototype models, each offering distinct advantages and capabilities, and exemplifying the adaptability of libraries in the face of ever-evolving information landscapes.

As libraries continue to evolve as dynamic information hubs, the exploration of available library collection development prototype models becomes increasingly relevant. These models not only enhance the efficiency and effectiveness of collection management but also empower libraries to stay responsive to the evolving needs and preferences of their diverse user communities. This review seeks to provide an insightful overview of these models, empowering library professionals with the knowledge needed to navigate the complexities of modern collection development successfully.

1) Collection Development Policies:

Collection development begins with the formulation of policies that outline the library's goals, objectives, and criteria for selecting and deselecting materials. These policies are tailored to the library's mission and user community.

2) Selection Tools:

Librarians use various tools to aid in the selection of materials, including standard bibliographies, book reviews, and professional journals. These tools help ensure that materials meet the library's selection criteria.

3) Weeding and Deselection:

Libraries periodically assess their collections to identify materials that are outdated, damaged, or no longer relevant. Deselection, or weeding, helps maintain the collection's quality and relevance.

4) Budget Allocation:

Libraries allocate budgets for collection development. Prototype models might incorporate budget management features, allowing librarians to track expenditures and make informed purchasing decisions.

5) Patron Needs Analysis:

Understanding the needs and preferences of library users is crucial. Models might include data analysis tools to assess patron demographics and reading trends.

6) Electronic Resources Management:

In the digital age, libraries manage electronic resources such as e-books, e-journals, and databases. Prototype models might encompass systems for acquiring, licensing, and providing access to electronic content.

7) Open Access and Institutional Repositories:

Libraries may participate in open access initiatives and maintain institutional repositories. Prototypes could facilitate the organization and accessibility of open access materials.

8) Resource Sharing and Interlibrary Loans:

Libraries often engage in resource sharing and interlibrary loans to provide access to materials not available in their collections. Prototypes could integrate systems for efficient resource sharing.

9) Collection Assessment:

Collection assessment tools help libraries evaluate the usage and impact of materials. This can inform decisions about acquisitions and withdrawals.

10) Digital Preservation:

Libraries are responsible for preserving digital materials. Prototypes might include digital preservation strategies and tools.

11) Vendor Management:

Libraries work with vendors to acquire materials. A prototype could include features for managing vendor relationships, orders, and negotiations.

12) User Engagement and Feedback:

Incorporating mechanisms for user feedback and engagement can help libraries make informed collection development decisions. Prototypes might include user surveys and feedback channels.

13) Analytics and Reporting:

Prototypes may incorporate analytics and reporting tools to track collection usage, budget expenditures, and other key metrics.

It's important to note that the specific features and functionalities of a library collection development prototype would depend on the needs and goals of the library. Libraries often adopt or adapt library management systems and integrated library systems (ILS) to support collection development activities.

5. NEED OF PROTOTYPE DESIGN

In the age of digital information, libraries find themselves at the crossroads of tradition and innovation, grappling with the profound transformations that technology has wrought upon the world of knowledge. As venerable institutions that have historically safeguarded and disseminated information, libraries now face the formidable challenge of adapting to a digital landscape characterized by dynamic content, diverse user needs, and evolving pedagogical paradigms. In response to these seismic shifts, there arises a compelling need for developing library prototype designs that are not just responsive but proactive in meeting the demands of the contemporary knowledge ecosystem.

- **Meeting Evolving User Expectations:** Libraries have undergone a transformation in response to changing user expectations. Today's patrons demand easy access to digital resources, intuitive search interfaces, and seamless online services. Developing a library prototype design is crucial to align library services with these evolving expectations. It enables libraries to create user-centric solutions that cater to the preferences and habits of their diverse user base.
- **Enhancing Accessibility and Inclusivity:** Libraries serve a diverse community with varying needs, including individuals with disabilities. A library prototype design can incorporate accessibility features from the outset, ensuring that all users, regardless of physical or cognitive abilities, can access and utilize library resources effectively. This commitment to inclusivity is essential in promoting equitable access to knowledge.

- **Optimizing Resource Management:** Libraries manage an extensive array of physical and digital resources. Efficiently organizing, cataloging, and retrieving these resources is paramount. A well-designed library prototype addresses resource management challenges, streamlining acquisition, circulation, and maintenance processes. This optimization not only improves efficiency but also frees up staff time for more value-added services.
- **Fostering Technological Innovation:** The library landscape is marked by rapid technological advancements. Developing a library prototype design encourages innovation by providing a testing ground for emerging technologies. Libraries can experiment with new tools, automation, AI-driven solutions, and data analytics to stay at the forefront of information services and adapt to changing user needs.
- **Data-Driven Decision Making:** In the digital age, libraries generate vast amounts of data on user behavior and resource usage. A library prototype can incorporate analytics capabilities to harness this data for informed decision-making. It enables libraries to gain insights into user preferences, collection development, and service effectiveness, leading to evidence-based improvements.
- **Safeguarding Intellectual Property:** Plagiarism-free design is essential for libraries to uphold the principles of intellectual property and copyright. A library prototype should adhere to ethical standards in content acquisition, organization, and distribution, ensuring that creators' rights are respected while promoting the responsible sharing of knowledge.
- **Promoting Lifelong Learning:** Libraries play a pivotal role in supporting lifelong learning. A well-crafted prototype can integrate educational resources, e-learning platforms, and personalized learning pathways. By doing so, libraries empower users to acquire new skills and knowledge throughout their lives, contributing to personal and societal development.
- **Strengthening Community Engagement:** Libraries are not just repositories of knowledge but also community hubs. A library prototype design can incorporate features that enhance community engagement, such as event management, virtual programming, and collaborative spaces. This fosters a sense of belonging and encourages active participation among library patrons.
- **Adapting to Digital Disruption:** Libraries face competition from a multitude of digital platforms and information providers. Developing a library prototype design that seamlessly integrates with these digital ecosystems is vital for staying relevant and competitive. It allows libraries to position themselves as trusted intermediaries in the digital information landscape.
- **Sustainability and Resilience:** Libraries are increasingly mindful of environmental sustainability. A library prototype can explore eco-friendly practices, such as digital preservation, reduced paper usage, and energy-efficient systems. Additionally, it can incorporate disaster recovery and resilience features to protect valuable collections from unforeseen events.

6. JNTUKLIBCON SYSTEM

The prototype design of the JNTUKLIBCON (Jawaharlal Nehru Technological University Kakinada Library Consortium) system is a comprehensive web-based platform aimed at enhancing the management and accessibility of digital resources within the consortium. This prototype encompasses various user roles, including administrators, librarians, and students, each with specific functionalities tailored to their needs.

The system's home page serves as a central hub, providing access to login interfaces for different user categories. Admins, upon successful authentication, are directed to the admin dashboard, which is a pivotal control center for managing system operations. Admins can change their passwords for security purposes and efficiently manage users, including librarians and students, by adding, viewing, and editing their details. Additionally, they can generate detailed reports on student data based on multiple criteria, such as college, class, branch, department, and academic year, facilitating data-driven decision-making.

For electronic resources, the prototype incorporates comprehensive features for managing e-books, e-research reports, e-learning materials, e-reference materials, e-journals/magazines, e-thesis & dissertations, e-databases, and e-newspapers. Admins can add, update, and view details for each type of digital resource. They can also generate reports that provide an overview of the available materials in the consortium, aiding in resource allocation and assessment.

A critical aspect of the system is the ability to manage material requisitions. Admins can raise requisitions for materials on behalf of students and subsequently issue these materials. This functionality streamlines the process of lending digital resources and ensures proper tracking of material utilization.

Moreover, the system offers a material search feature, allowing users to search for specific materials by entering their unique IDs, enhancing resource discoverability. Additionally, there is a dedicated section for accessing materials, enabling users to browse and utilize the resources available within the consortium.

To ensure the security and integrity of the system, a logout option is provided, allowing admins to securely exit their sessions and prevent unauthorized access.

In conclusion, the prototype design of the JNTUKLIBCON system is a well-structured and user-centric platform that caters to the specific needs of administrators, librarians, and students within the consortium. Its multifaceted functionalities encompass user management, material management, report generation, and resource accessibility, all geared toward improving the efficiency and effectiveness of library operations while promoting digital resource utilization.

7. POSSIBLE ROLES IN PROPOSED SYSTEM

In the proposed JNTUKLIBCON (Jawaharlal Nehru Technological University Kakinada Library Consortium) prototype system, there are distinct user roles, each with specific responsibilities and privileges. These roles are designed to facilitate efficient management and usage of digital resources within the consortium. Here are the possible roles in the JNTUKLIBCON prototype system:

1) Administrator (Admin):

- **Responsibilities:** Administrators have the highest level of authority and control over the system. Their responsibilities include system

configuration, user management, material management, and generating reports.

- **Privileges:** Admins can add, view, edit, and delete user accounts, including librarians and students. They can also manage digital resources, raise, and issue material requisitions, and generate reports on user data, material availability, and utilization.

2) Librarian:

- **Responsibilities:** Librarians play a crucial role in managing digital resources and assisting students. They are responsible for updating resource details, handling material requisitions, and ensuring the availability of resources.
- **Privileges:** Librarians can add, view, and edit details of digital resources, including e-books, e-research reports, and more. They can also raise material requisitions on behalf of students, issue materials, and access reports related to their library's resources.

3) Student:

- **Responsibilities:** Students are the end-users of the system and utilize digital resources for academic purposes. They can search for available resources, access materials, and request requisitions.
- **Privileges:** Students have limited privileges compared to admins and librarians. They can search for specific digital resources, check material availability, and request materials through the requisition process.

These roles are carefully defined to ensure efficient workflow and access control within the JNTUKLIBCON system. Administrators have comprehensive control to manage users and resources, while librarians facilitate resource management and material lending. Students primarily benefit from the system by accessing and utilizing digital resources to support their academic endeavors. This role-based structure helps maintain system security, accountability, and effective resource utilization within the consortium.

8. PROCEDURE FOLLOWED TO DEVELOP PROPOSED SYSTEM

Developing a prototype for the JNTUKLIBCON system without plagiarism involves following a structured procedure while ensuring that the content is original. Here's a step-by-step procedure for developing the prototype model without plagiarism:

1) Research and Familiarization:

- Begin by conducting thorough research on the JNTUKLIBCON system, its requirements, and objectives.
- Familiarize yourself with the existing library systems and digital resource management concepts.

2) Gather Requirements:

- Collaborate with stakeholders, including administrators, librarians, and students, to collect detailed requirements for the prototype.
- Document the functional and non-functional requirements, ensuring clarity and completeness.

3) System Design:

- Create a system design document outlining the architecture, data flow, and user interfaces.
- Define the database schema, including tables and relationships.
- Develop wireframes and mockups for the user interfaces.

4) Content Creation:

- Write original content for the prototype, including textual descriptions, user instructions, and labels for buttons and links.
- Ensure that all content, including user guides and help sections, is plagiarism-free.

5) Programming and Development:

- Write code for the prototype using appropriate technologies, such as HTML, CSS, JavaScript, JSP, and databases like MySQL.
- Implement the login and user authentication system for administrators, librarians, and students.
- Develop functionality for adding, updating, and deleting users, digital resources, and material requisitions.

6) User Interface Development:

- Create user interfaces based on the wireframes, ensuring a user-friendly design.
- Use original graphics, icons, and images or properly attribute and obtain permissions for any borrowed visual elements.

7) Data Management:

- Populate the database with sample data, including user profiles, digital resource records, and material requisitions.
- Ensure that all data used in the prototype is either original or properly cited and credited to its source.

8) Testing and Debugging:

- Thoroughly test the prototype for functionality, usability, and security.
- Identify and fix any bugs or issues that may arise during testing.

9) Documentation:

- Create comprehensive documentation for the prototype, including user manuals, administrator guides, and system architecture documentation.
- Clearly state any external sources or references used in the documentation.

10) Review and Revision:

- Conduct a review of the entire prototype to ensure originality and compliance with plagiarism guidelines.
- Revise and rewrite any sections or content that might resemble existing works.

11) Finalization:

- Finalize the prototype by addressing all feedback and making necessary adjustments.

- Ensure that all content and code in the prototype is entirely original or properly attributed.

12) Presentation:

- Prepare a presentation or demonstration of the prototype for stakeholders, highlighting its features and functionality.

13) Legal Considerations:

- If necessary, consult legal experts to ensure that the prototype does not infringe on any copyrights or intellectual property rights.

14) Continuous Monitoring and Updates:

- After the prototype is developed and presented, be prepared to incorporate feedback and make improvements as needed.

15) Plagiarism Check:

- Use plagiarism detection tools to scan the content and code to ensure there is no unintentional plagiarism.

By following this procedure diligently and maintaining a commitment to originality, you can develop a JNTUKLIBCON prototype model that is both functional and free from plagiarism. It's essential to properly attribute and cite any external sources used and seek permissions if required to avoid any legal issues related to plagiarism.

9. DEVELOPED JNTUKLIBCON SYSTEM

The developed system, known as JNTUKLIBCON, represents a comprehensive and feature-rich library management system designed to cater to the needs of multiple user roles: administrators, librarians, and students. This system encompasses a user-friendly interface with a variety of functionalities, ensuring efficient library operations and enhanced user experiences.

9.1. ADMINISTRATIVE FUNCTIONS

The administrative section of JNTUKLIBCON offers a wide array of capabilities. It begins with an Admin Login Page, which requires an Admin ID and password for access. Once logged in, administrators are presented with an Admin Home Page, which serves as the central hub for system control. Here, administrators can perform numerous operations, such as managing user accounts, overseeing student records, handling books, e-materials, reference materials, and more.

Administrators also have the authority to change passwords, add or update user information, and view user details. They can effortlessly manage student data, including adding new students and updating their information. The system even facilitates the generation of detailed reports based on various criteria like college, class, branch, and department.

In addition to student management, administrators can manage an extensive collection of e-resources, including e-books, e-research reports, e-learning materials, e-reference materials, e-journals/magazines, e-thesis & dissertations, e-databases, and e-newspapers. These functionalities encompass adding, updating, viewing, deleting, and generating reports for each category of e-resources.

For library material requisitions, administrators can raise material requisitions and issue materials through the system. A dedicated Material Status Page allows

them to track requisitions, and an Access Material Page enables them to facilitate student access to requested materials.

The system ensures security and data integrity by requiring authentication for each administrative task. After completing their activities, administrators can conveniently log out and, if needed, log in again.

9.2. LIBRARIAN FUNCTIONS

The librarian section of JNTUKLIBCON provides librarians with essential tools to manage library resources efficiently. Similar to administrators, librarians begin with a Librarian Login Page, which requires a Librarian ID and password.

Upon successful login, they access a Librarian Home Page offering a range of functions. Librarians can manage user accounts, handle student data, manage books and other library materials, and initiate material requisitions and access control.

However, it's important to note that librarians have limited privileges compared to administrators, focusing primarily on library-related tasks. They can oversee material availability, handle material requisition, and track material status.

9.3. STUDENT FUNCTIONS

The student section of JNTUKLIBCON aims to simplify the library experience for students. Access begins with a Student Login Page, requiring a Student ID and password. Once logged in, students are presented with a Student Home Page.

Student functionality is relatively straightforward, with a primary focus on checking material availability and accessing materials. Students can view a list of available resources in the library through the Materials Available Page. They can also access specific materials through the Access Material Page, although this function appears to be limited to viewing and preparation rather than downloading or printing.

Each activity page is developed using Hyper Text Markup Language (HTML), Java Server Pages (JSP), Tomcat Web server and MySQL database s. Each activity is performed through respective activity page explained in sequential manner.

- **Home Page**

This is main home page provides login links for all users of JNTUKLIBCON is shown in [Figure 1](#).

Figure 1

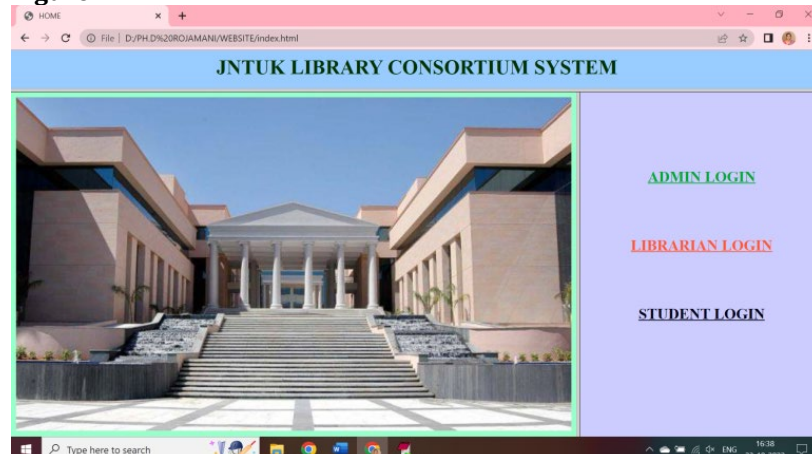


Figure 1 Home Page of Developed JNTUKLIBCON

- **Admin Related Pages**

This section presents the activities that can be performed by the admin.

- **Admin Login Page**

The login page of the admin login is shown in [Figure 2](#). This page allows the administrator to enter login details such as “ADMIN ID” and “PASSWORD” to enter into the respective administrator home page.

Figure 2

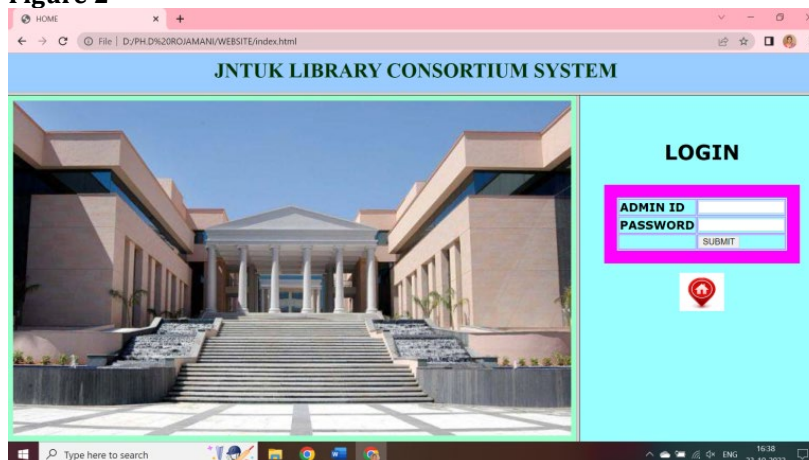


Figure 2 Admin Login Page of Developed JNTUKLIBCON

- **Admin Home Page**

After successful completion of login page, the home page with all links on the left side will be opened. The admin home page is shown in [Figure 3](#). It has HTML links for performing various operations such as changing password, with respect to users, students, books, learning materials, reference materials, magazines, newspapers, material requisition, material status, and access material, etc. The admin has full rights to perform any operation from his login.

Figure 3

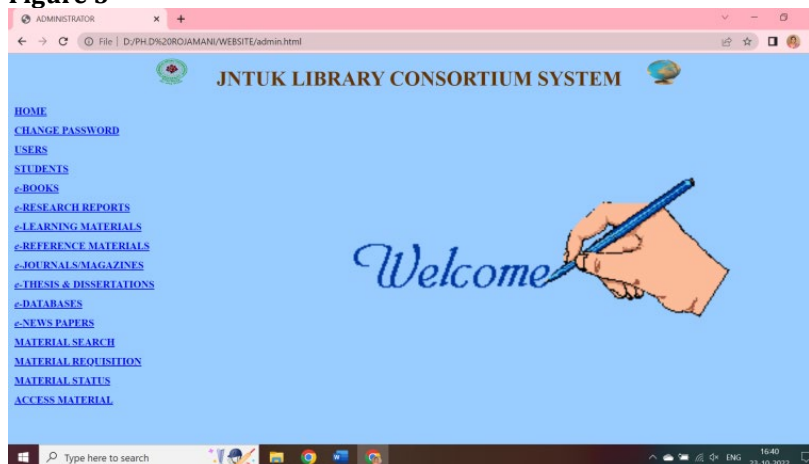


Figure 3 Admin Home Page of Developed JNTUKLIBCON

- **Admin_Home Page**

The result of home link in admin page is shown in Figure 4. This is fixed home page; it results whenever the home link is pressed.

Figure 4

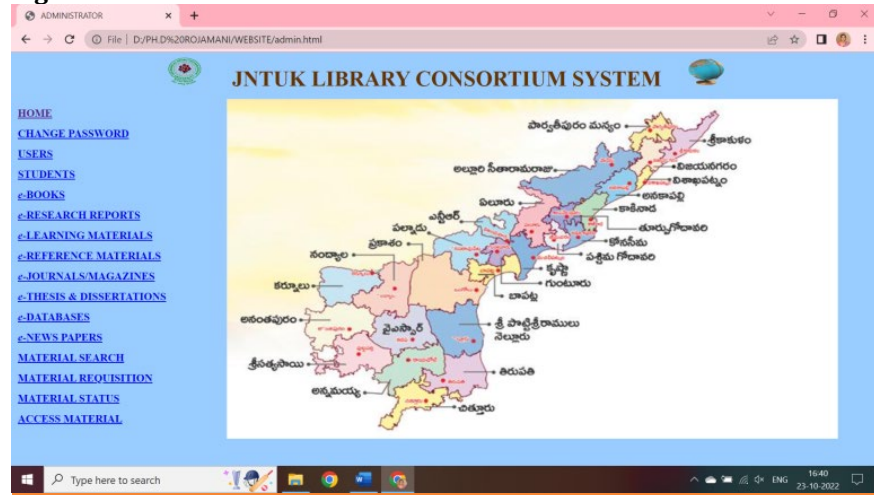


Figure 4 Admin Home Page of Developed JNTUKLIBCON

- **Admin_Change Password Page**

This option helps the user to change the password when it is needed. In this page, there is an option to enter new password along with confirm password fields are available for changing the password. It only allows to change the respective user’s password only. After entering new password and submitting, the user has to logout for new entry to get the password updates.

Figure 5

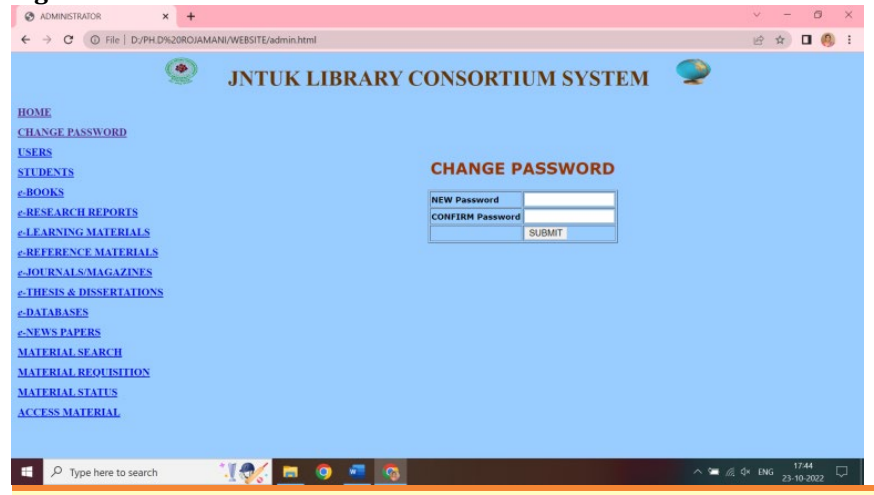


Figure 5 Admin_Change Password Page of Developed JNTUKLIBCON

- **Admin_Users Page**

The page shown in Figure 6 is the result when the users link is pressed. This page is having two sub links displayed in home page. The first link is “ADD USER” and second link is “USER DETAILS”. Using these links, admin can able to perform addition/updating/deletion of the users as per the requirement. Admin can also view the user details by clicking the appropriate link.

Figure 6

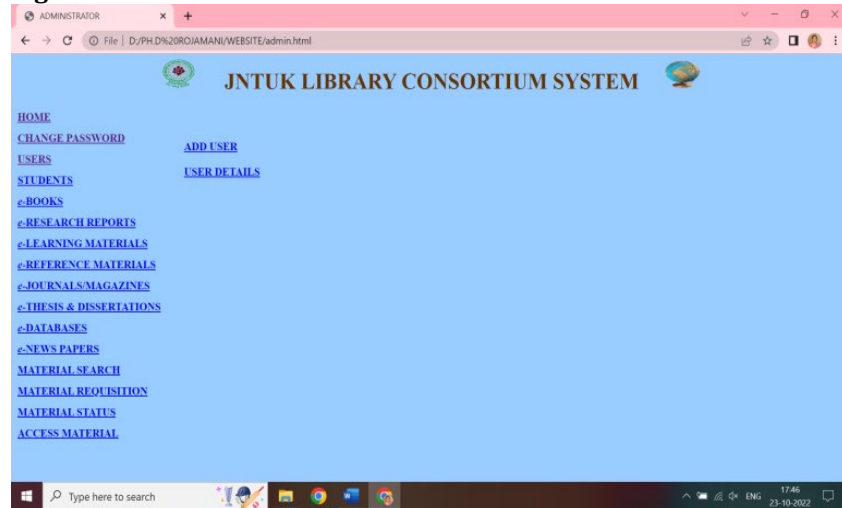


Figure 6 Admin_Users Page of Developed JNTUKLIBCON

- **Admin_Users_Add User Page**

The page shown in Figure 7 is the result when the add user link is pressed. It allows the admin to enter “USER ID”, “PASSWORD” and option to select “DESIGNATION” of the user. These details will be saved in database after clicking “SUBMIT” button available at the bottom.

Figure 7

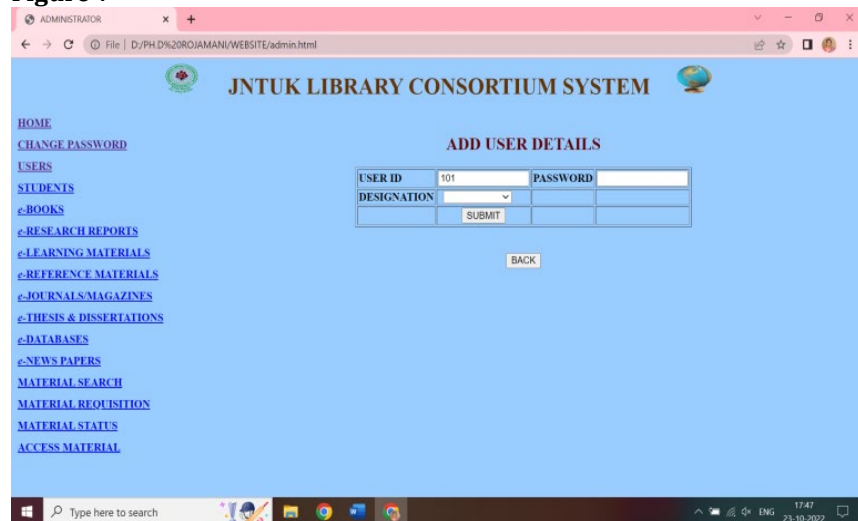


Figure 7 Admin_Users Add User Page of Developed JNTUKLIBCON

- **Admin_Users_User Details Page**

The page shown in Figure 8 is the result when the user details link is pressed. This page allows the admin to select “USER ID” to view the details of the user. The complete user details will be displayed after selecting the user id from drop down menu and clicking the “VIEW” button.

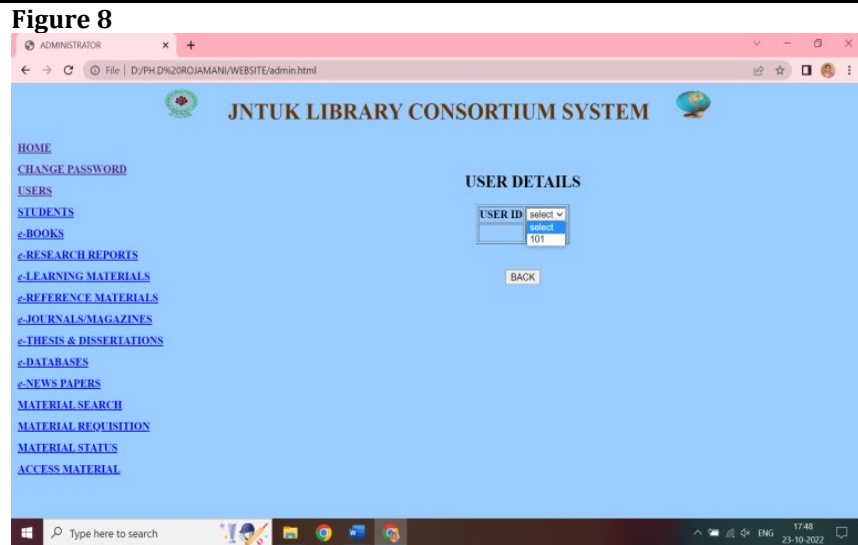


Figure 8 Admin_Users User Details Selection Page of Developed JNTUKLIBCON

The page shown in **Figure 9** is the result when the one of the users is selected from the pop down menu as shown in **Figure 8**. In this page, the complete user details are popped from the database and displayed. Here, the admin is provided with two options, one is to update the user details, second is to delete the user from the database.

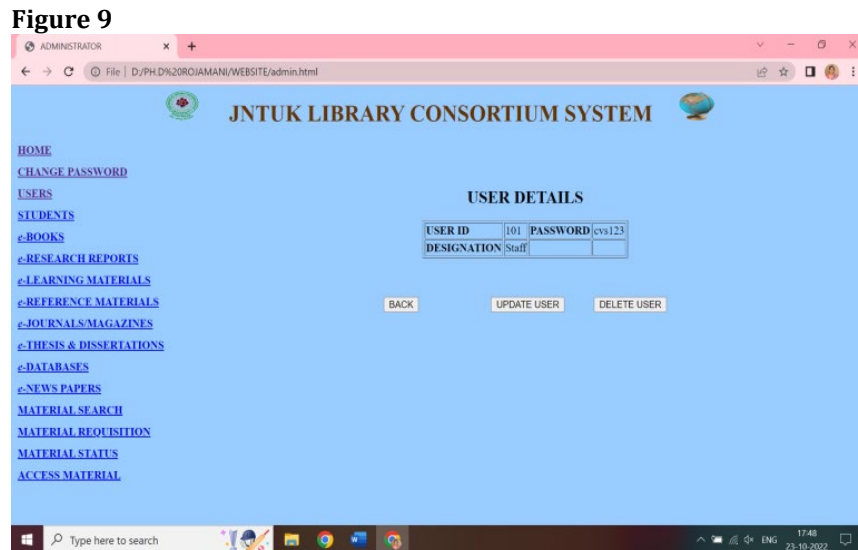


Figure 9 Admin_Users User Details View Page of Developed JNTUKLIBCON

The page shown in **Figure 10** is the result when admin want to update the users' details selected as shown in **Figure 9** by clicking "UPDATE USER". This page provides the admin to update password and designation of the user. After entering the new data in editable fields, admin clicks the "UPDATE" button to save new data in the database.

Figure 10

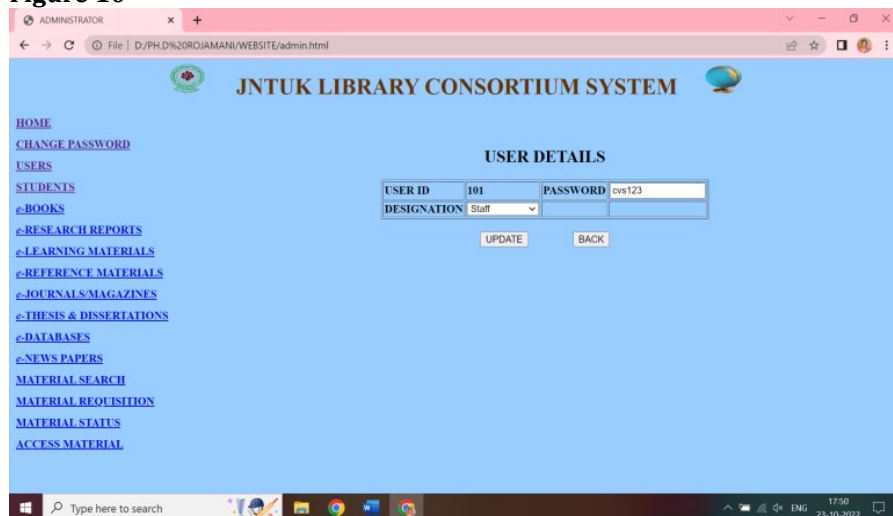


Figure 10 Admin_Users User Details Update Page of Developed JNTUKLIBCON

- **Admin_Students Page**

The page shown in Figure 11 is the result when the students link is pressed. This page provides the admin to choose an appropriate activity by clicking suitable link.

Figure 11

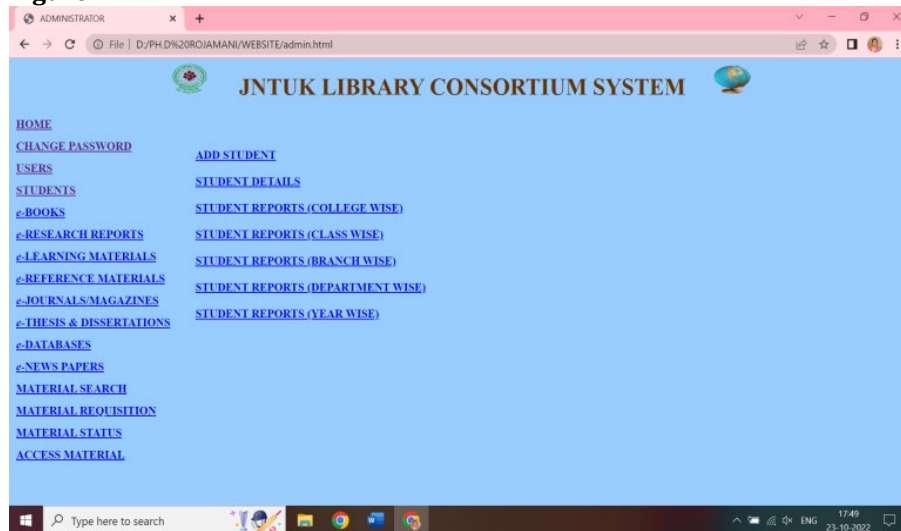


Figure 11 Admin_Students Details Page of Developed JNTUKLIBCON

- **Admin_Students_Add Student Page**

The page shown in Figure 12 is the result when the add student link is pressed. This page provides the admin to add new student details such as college ID, student ID, Student name, father name, gender, year of studying, department, branch, class, branch code, date of joining, address (present and permanent), phone number, email, etc., Upon clicking submit button, all these student details are saved in database.

Figure 12

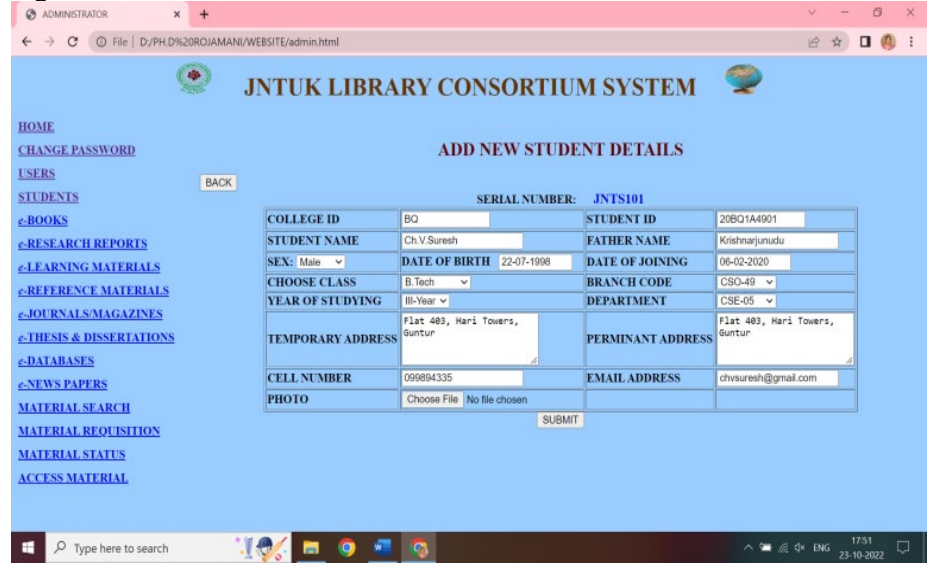


Figure 12 Admin_Student Add Student Details Page of Developed JNTUKLIBCON

- **Admin_Students_Student Details Page**

The page shown in Figure 13 is the result when the student details link is pressed as shown in Figure 11. This page allows the admin to enter student ID in the available text field. After pressing the “SHOW” button, the respective details are populated from the database either for updating or deleting purpose.

Figure 13

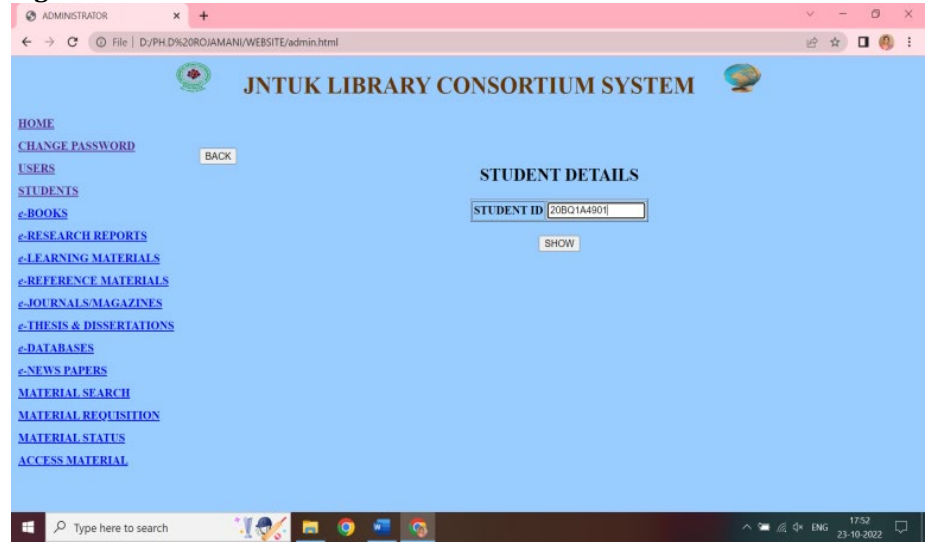


Figure 13 Admin_Students View Student Details Page of Developed JNTUKLIBCON

The page shown in Figure 14 is the result when the one of the students is entered in the text field as shown in Figure 13. After populating the respective student details, there are two possible operations that could have been performed on this data. One is updating any of the student information or deleting the complete student details from the database.

Figure 14

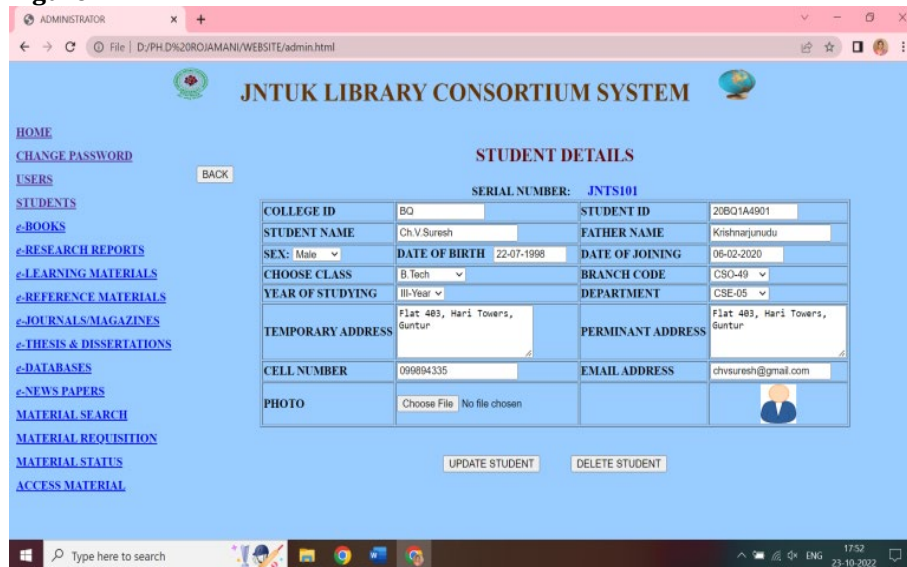


Figure 14 Admin_Students Update Student Details Page of Developed JNTUKLIBCON

- **Admin_Students_Student Reports (College Wise) Page**

The page shown in Figure 15 is the result when admin want to view the student details (college wise). The results will be generated in the form of report based on the college wise. There is a pop down menu in which college ID are available. One among them is selected and after clicking “VIEW” button, a report is generated with list of students in that college.

Figure 15

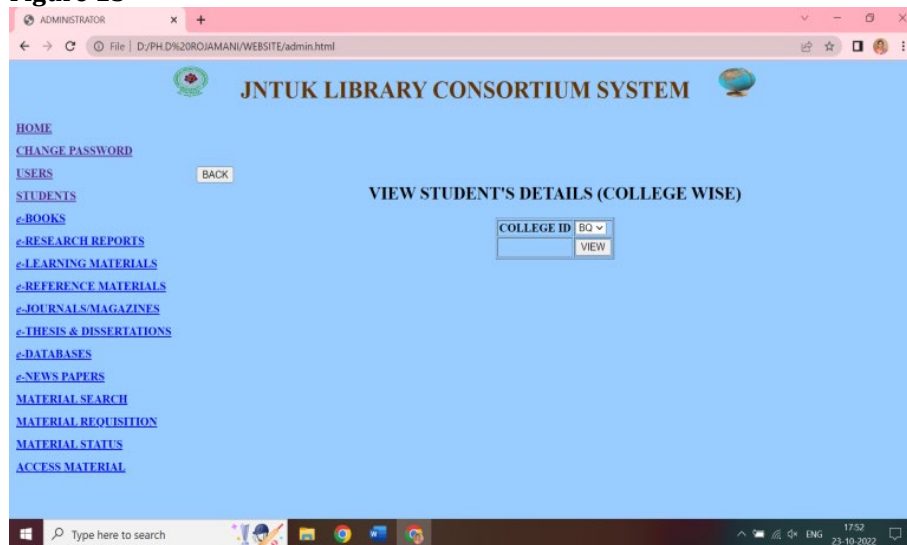


Figure 15 Admin_Students View Student Details (College Wise) Page of Developed JNTUKLIBCON

The page shown in Figure 16 is the result when admin want to generate the total students’ details selected as shown in Figure 15 for one college. This is the output of generated reports based on college wise. There is an option to generated pdf report or directly to send the list a pre-installed printer for hardcopy of the report.

Figure 16

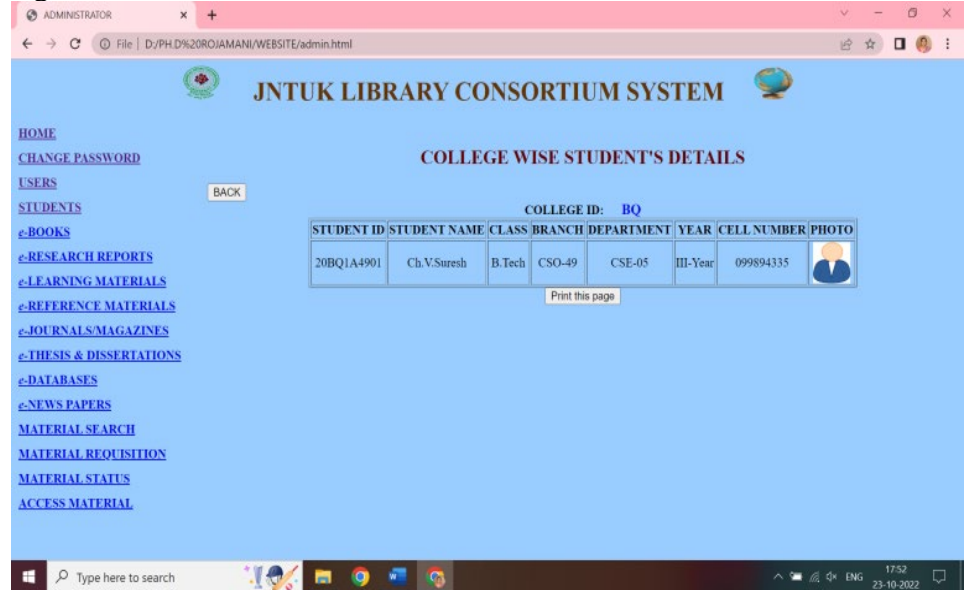


Figure 16 Admin_Students College Wise Student Details Report Page of Developed JNTUKLIBCON

The page shown in Figure 17 is the generated result can be printed as per the requirement or there is an option to generate report in pdf format for further verification/processing as shown in Figure 16 for one college.

Figure 17

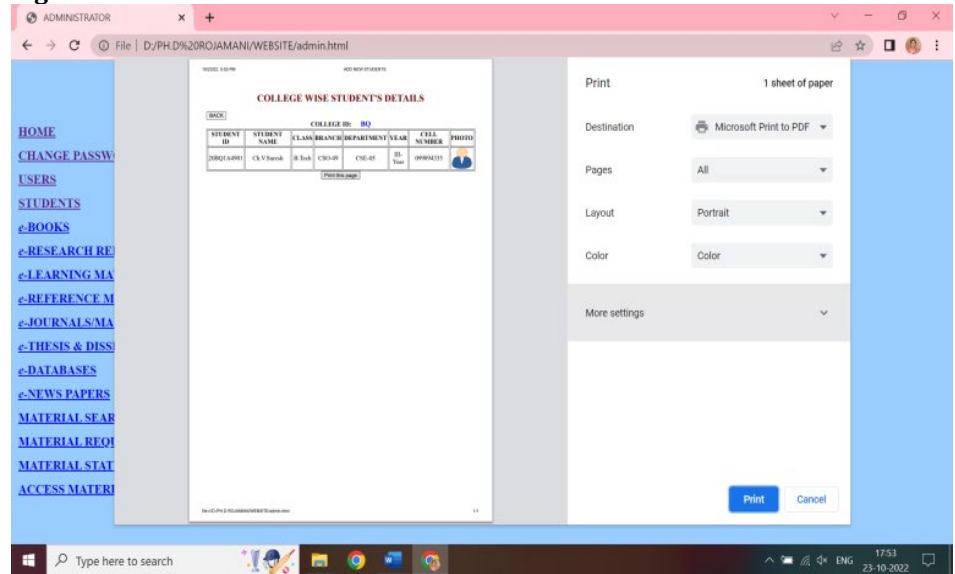


Figure 17 Admin_Students College Wise Student Details Report Print Page of Developed JNTUKLIBCON

- **Admin_Students_Student Reports (Class Wise) Page**

The page shown in Figure 18 is the result when admin want to view the student details (class wise). The results will be generated in the form of report based on the class wise. There is a pop down menu in which list of classes are available. One among them is selected and after clicking "VIEW" button, a report is generated with list of students in that class.

Figure 18

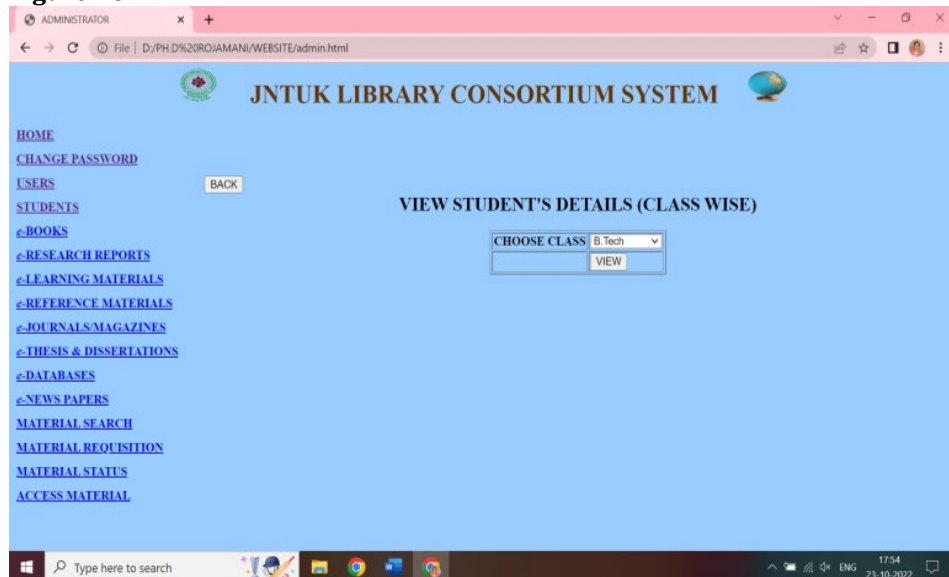


Figure 18 Admin_Students View Student Details (Class Wise) Page of Developed JNTUKLIBCON

The page shown in Figure 19 is the result when admin want to generate the total students' details selected as shown in Figure 18 for one class. This is the output of generated reports based on class wise. There is an option to generated pdf report or directly to send the list a pre-installed printer for hardcopy of the report.

Figure 19

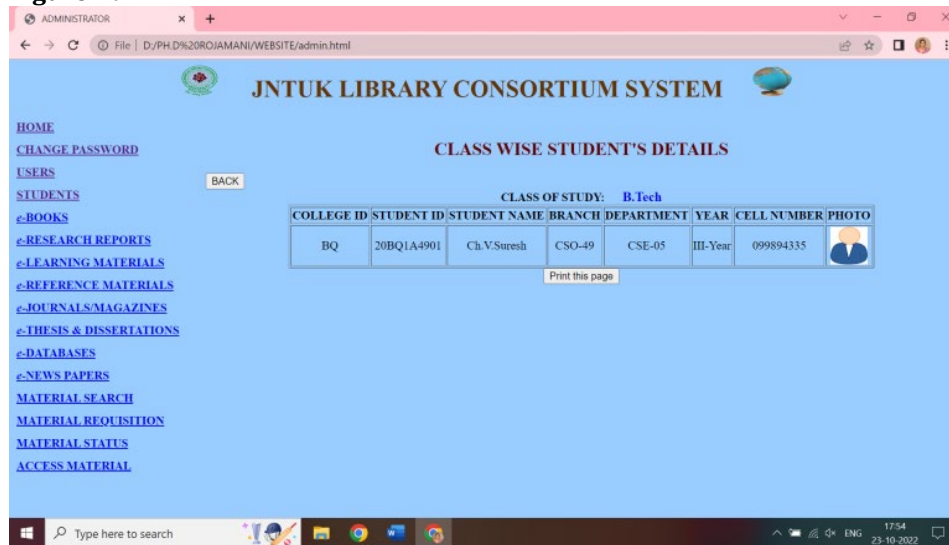


Figure 19 Admin_Students Class Wise Student Details Report Page of Developed JNTUKLIBCON

- **Admin_Students_Student Reports (Branch Wise) Page**

The page shown in Figure 20 is the result when admin want to view the student details (branch wise). The results will be generated in the form of report based on the branch wise. There is a pop down menu in which list of branches are available. One among them is selected and after clicking "VIEW" button, a report is generated with list of students in that branch.

Figure 20

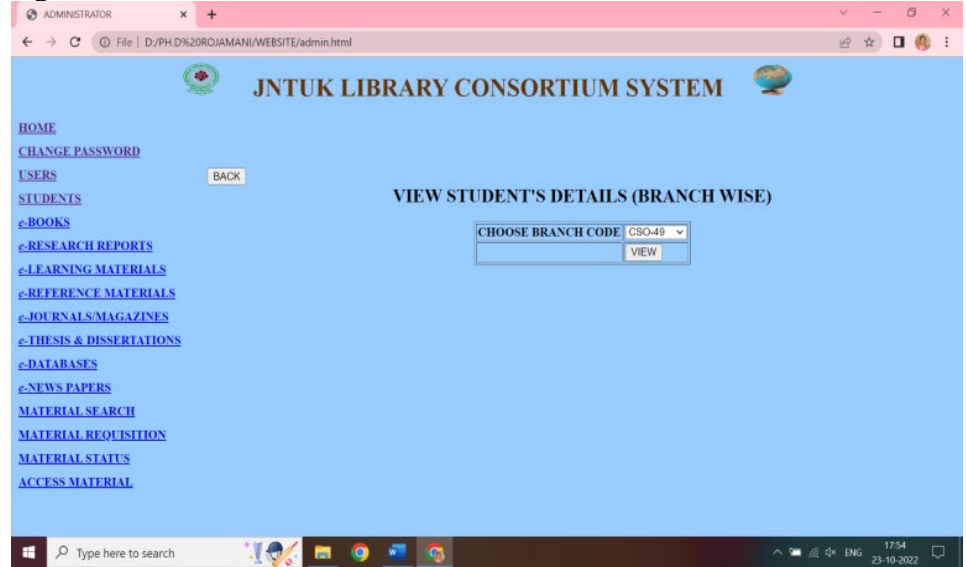


Figure 20 Admin_Students View Student Details (Branch Wise) Page of Developed JNTUKLIBCON

The page shown in Figure 21 is the result when admin want to generate the total students' details selected as shown in Figure 20 for one branch. This is the output of generated reports based on branch wise. There is an option to generated pdf report or directly to send the list a pre-installed printer for hardcopy of the report.

Figure 21

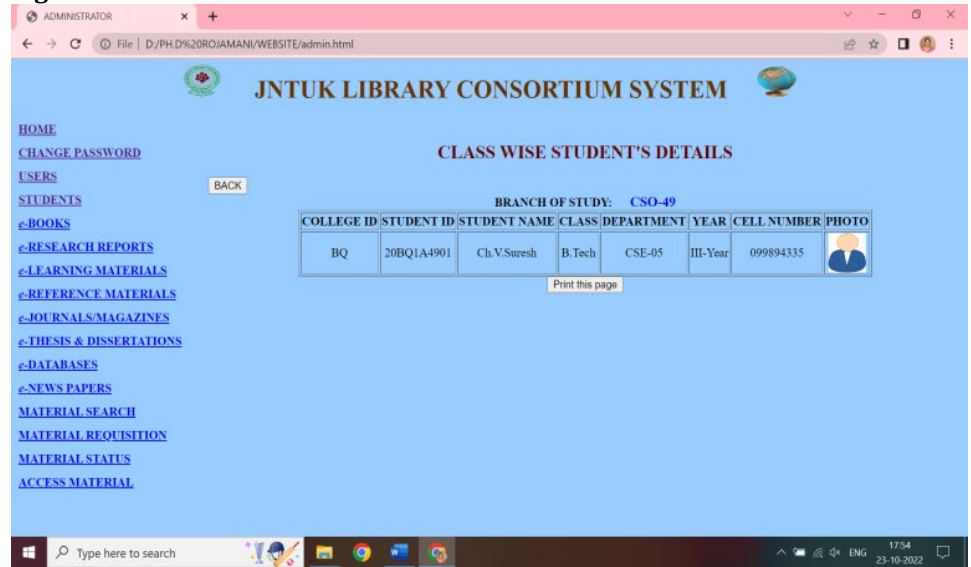


Figure 21 Admin_Students Branch Wise Student Details Report Page of Developed JNTUKLIBCON

- **Admin_Students_Student Reports (Department Wise) Page**

The page shown in Figure 22 is the result when admin want to view the student details (department wise). The results will be generated in the form of report based on the department wise. There is a pop down menu in which list of departments are available. One among them is selected and after clicking "VIEW" button, a report is generated with list of students in that department.

Figure 22

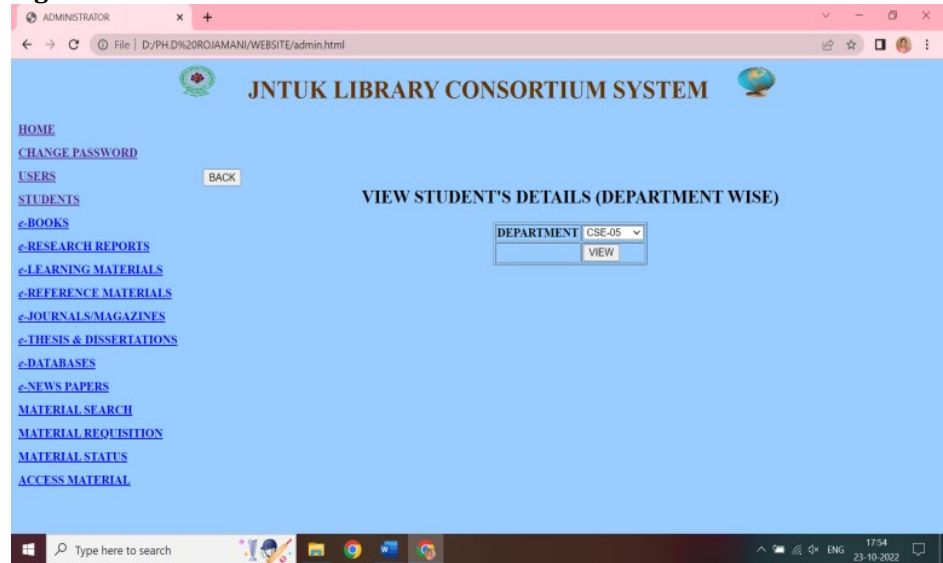


Figure 22 Admin_Students View Student Details (Department Wise) Page of Developed

The page shown in Figure 23 is the result when admin want to generate the total students' details selected as shown in Figure 22 for one department. This is the output of generated reports based on department wise. There is an option to generated pdf report or directly to send the list a pre-installed printer for hardcopy of the report.

Figure 23



Figure 23 Admin_Students Department Wise Student Details Report Page of Developed JNTUKLIBCON

- **Admin_Students_Student Reports (Year Wise) Page**

The page shown in Figure 24 is the result when admin want to view the student details (year wise). The results will be generated in the form of report based on year of study wise. There is a pop down menu in which list of year of studying details are

available. One among them is selected and after clicking “VIEW” button, a report is generated with list of students in that year of study.

Figure 24

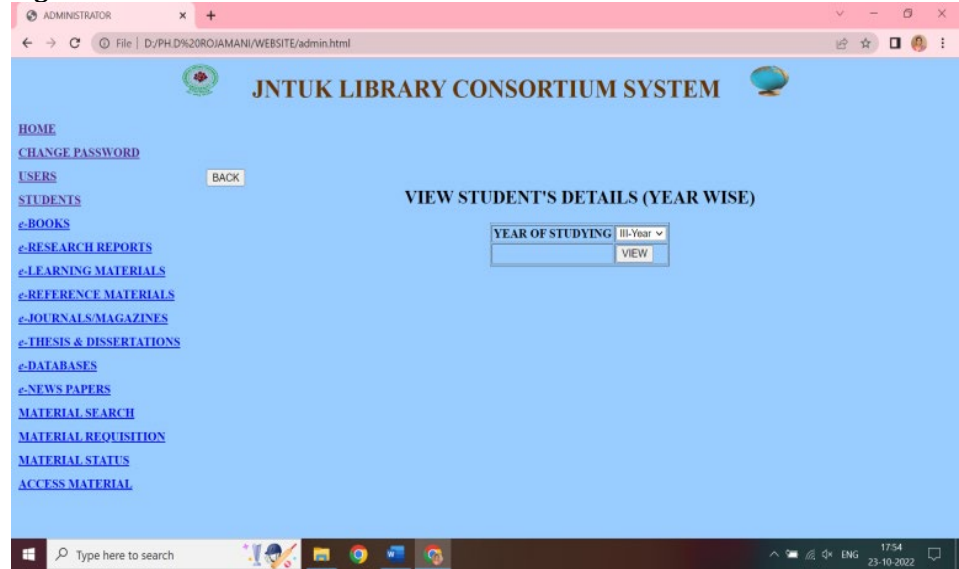


Figure 24 Admin_Students View Student Details (Year Wise) Page of Developed JNTUKLIBCON

The page shown in Figure 25 is the result when admin want to generate the total students’ details selected as shown in Figure 24 for one year. This is the output of generated reports based on year of study wise. There is an option to generated pdf report or directly to send the list a pre-installed printer for hardcopy of the report.

Figure 25

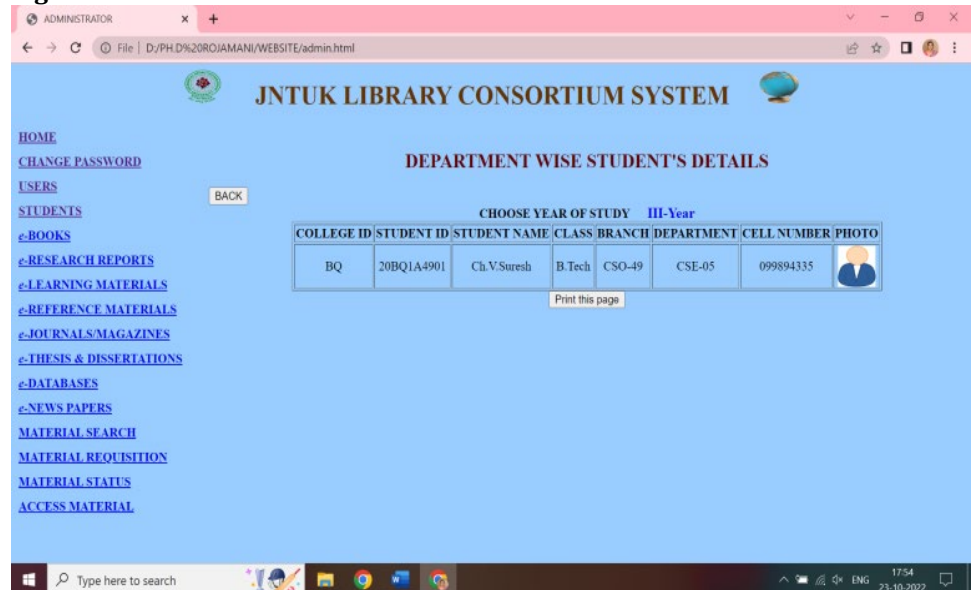


Figure 25 Admin_Students Year Wise Student Details Report Page of Developed JNTUKLIBCON

- **Admin_E-Books Page**

The page shown in Figure 26 is the result when the “e-BOOKS” link is pressed. This page provides the admin to choose an appropriate activity by clicking suitable

link. Using these links, the admin can add, update, view, delete and generate report of e-Books available for establishing consortium.

Figure 26

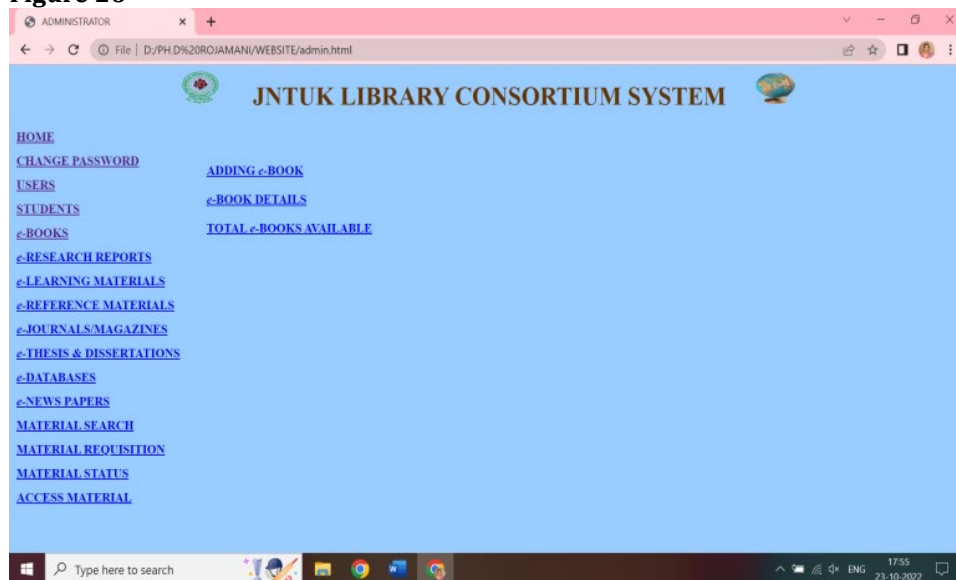


Figure 26 Admin_E-Books Details Page of Developed JNTUKLIBCON

- **Admin_E-Books_Adding E-Book Page**

The page shown in Figure 27 is the result when the add e-Book link is pressed. This page provides the admin to add new e-Book details such as Book ID, Book Title, Book Author, Publisher, Edition, ISBN No, Cost, Pages, Year of publish, etc., Upon clicking submit button, all these E-Book details are saved in database.

Figure 27

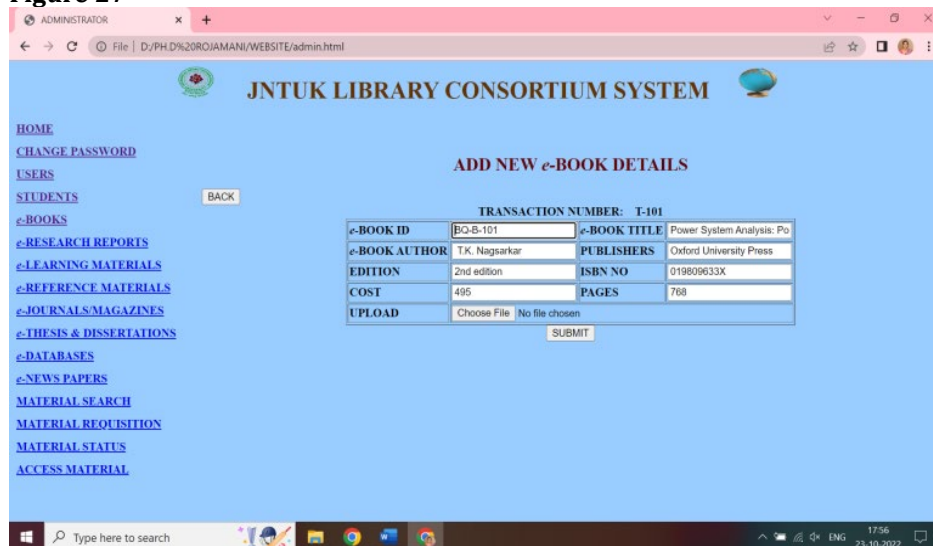


Figure 27 Admin_E-Books Add Book Details Page Of Developed JNTUKLIBCON

- **Admin_E-Books_E-Book Details Page**

The page shown in Figure 28 is the result when the e-Book details link is pressed. This page allows the admin to enter e-Book ID in the available text field.

After pressing the “SHOW” button, the respective details are populated from the database either for updating or deleting purpose.

Figure 28

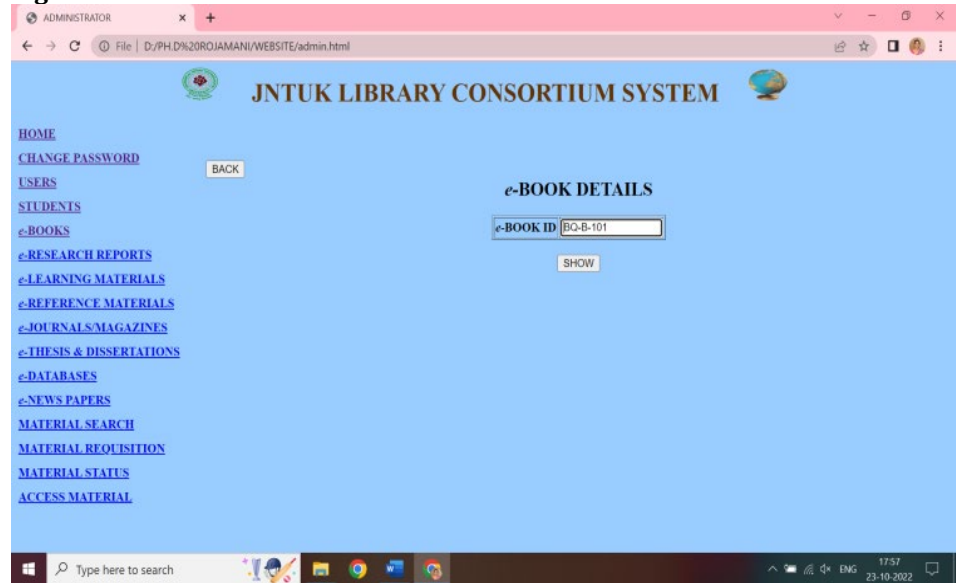


Figure 28 Admin_E-Books View Book Details Page of Developed JNTUKLIBCON

The page shown in Figure 29 is the result when admin want to view e-Book details selected as shown in Figure 28 for one e-Book. There is an option to generated pdf report or directly to send the list a pre-installed printer for hardcopy of the report.

Figure 29

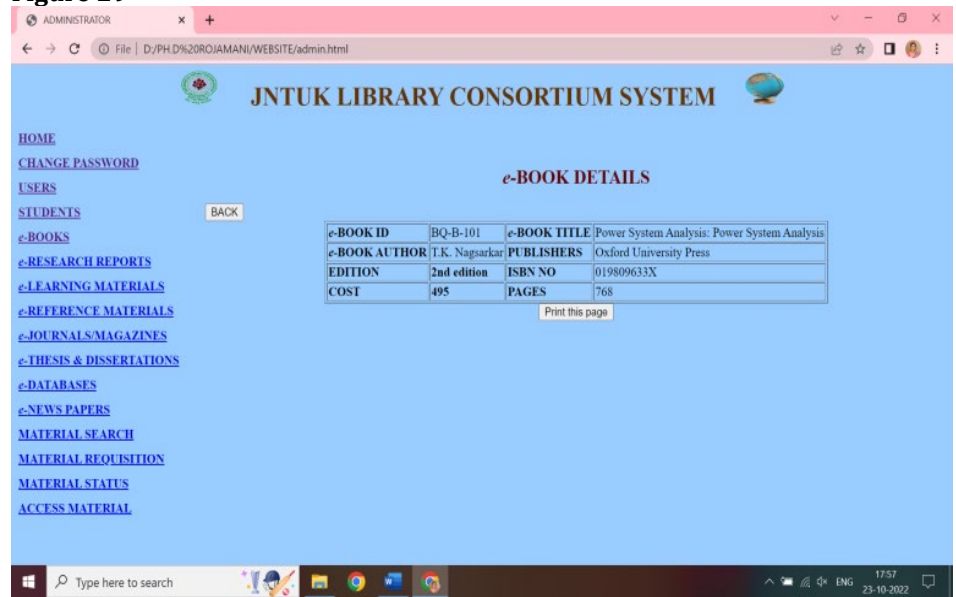


Figure 29 Admin_E-Books Details Page of Developed JNTUKLIBCON

- **Admin_E-Books_Total E-Books Available Page**

The page shown in Figure 30 is the result when admin want to generate the total e-Books for consortium. This is the output of generated reports based on

ascending order of college name. There is an option to generate pdf report or directly to send the list a pre-installed printer for hardcopy of the report.

Figure 30

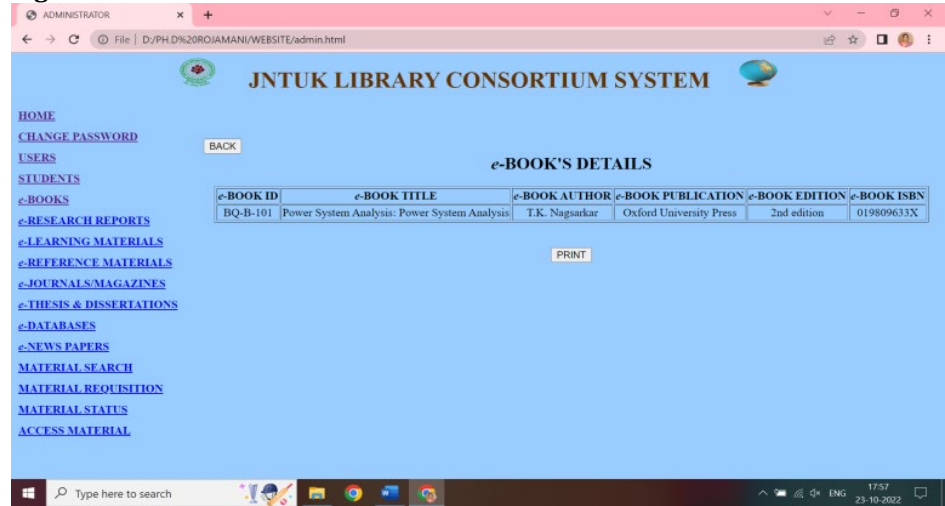


Figure 30 Admin_E-Books Total Details Page of Developed JNTUKLIBCON

10. CONCLUSION

JNTUKLIBCON is a sophisticated library management system designed to streamline and enhance the operations of the library at JNTUK. The system provides administrators with comprehensive control over user accounts, student records, and a wide range of electronic resources, while librarians benefit from tools to efficiently manage library materials and track material requisitions. Students, too, can enjoy a user-friendly interface for checking material availability and accessing resources. The system's implementation promises to bring several advantages, including improved resource management, increased accessibility to electronic materials, and enhanced user experiences. It offers a centralized platform that can significantly simplify library operations and administration. However, it's crucial to ensure that the system's security measures are robust to safeguard sensitive user and resource data. Additionally, user feedback should be continuously solicited and integrated to refine and optimize the system's usability and functionality.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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