

**Electronic Theses and Dissertations (ETD): An initiative at Central Library,
Indian Institute of Technology, Bombay**

By

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Proposal

With the advancement in computerization and telecommunication, the Central Library, Indian Institute of Technology Bombay (IITB) has been providing state-of-the-art electronic facility to its users. The trend is, towards digitizing traditional resources to e-resources. Realizing digital revolution, Central library IITB undertook the work of ETD to provide access to research carried out at the Institute, to their students. The research is carried out at Masters and Doctorate level. In order to differentiate the research carried out at Masters Level, it is called as Dissertation and at Doctorate level it is called as Thesis. The Institute has established ETD as a signatory to the **Networked Digital Library of Theses and Dissertations (NDLTD)** initiated with the Virginia Tech. University as leader of this worldwide project. Since January 1999, IITB has introduced first of its kind in India, 'Online Submission of Electronic Theses and Dissertations (ETD)' of M. Tech. and Ph. D. students in addition to its printed copy. It is mandatory to submit full text and one page of abstract for postgraduate students.

The work of creating a database of M. Tech. Dissertations and Ph. D. Theses through online submission of ETD was meticulously implemented and successfully accomplished. The paper primarily focuses on the work of digitization of ETD. The process of digitizing has been bifurcated into:

1 Online submission of M. Tech. Dissertations from 1999 and Ph. D. Theses from 2000 onwards was started and Web server was set up at central library on Intranet at site <http://etd.library.iitb.ac.in> Infrastructure was available in the library.

2 Digitization of abstracts of Ph. D. Theses prior to 2000 to supplement ETD has been completed. The data (bibliographic with abstract) are made available on Internet using open source Greenstone Digital library Software

The paper explains infrastructure set up, storage devices and formats, conservation and preservation, intellectual property rights, dissemination, standards used, recommendations, future etc and finally conclusion. Different activities mentioned above, are supported by graphs, charts, tables etc wherever found to be suitable.

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Introduction

The Indian Institute of Technology, Bombay (IITB) is one of the seven higher Institutes of Technology in the country which ranked third in Asia, had been set up with the objective of making available facilities for higher education, research and training in various fields of Science and Technology. Over the years, there has been dynamic progress at IIT Bombay in all academic and research activities, and a parallel improvement in facilities and infrastructure, to keep it at par with the world-renowned institutions. Vision and mission of the institute are centered on scholarly research.

India, Australia, Canada, France, England, Germany, the Organization of American States, and the United Nations—all are committed to the increased sharing of global knowledge through digital libraries of Electronic Theses and Dissertations (ETDs).

In order to be at par with world trend, Department of Computer Science and Engineering and Central Library of the IITB initiated first of its kind project in India “Online submission of Electronic Thesis and Dissertation (ETD)”. Initially, there was lot of discussions among faculty and management so as to have e-resources of doctorate and masters level research in addition to its print version. This problem has been overcome and the Senate finally approved submission of ETD. The Institute then implemented ETD since January 1999 onwards, as a signatory to the "Networked Digital Library of Theses and Dissertations (NDLTD)" initiative, with the Virginia Tech University as leader of this worldwide project, for all M.Tech. / M.Des./M.Mgt./M.Phil. Dissertations and since 2000 onwards Ph.D. theses are to be submitted to the IIT Bombay in electronic format, in addition to its printed copy. It is mandatory to submit full text and one page of extended abstract.

Objectives to Initiate ETD

This project was initiated with the following objectives:

- To advance digital technology
- To lower the cost of submitting and handling theses and dissertations
- To improve the research quality in engineering and technology in India
- To facilitate the search of protected research information

Reasons to Implement ETD

The prime reason to implement ETD is to provide supreme quality of information and variety of resources to our users. Moreover, systematic compilation of postgraduate research and make underused work visible and accessible via network is also of equal importance. Some of the other reasons for digitization, are enumerated below:

- Archival storage by establishing centralized metadata
- Multiple referencing
- Quality preservation
- Wide global participation (NDLTD)

Technical Issues With Respect to Production and Dissemination of ETD

- Hardware's and other peripherals were procured from library MODROB project.
- Software - B. Tech. students developed in-house software using Java programming language and database management system in MYSQL and operating system of server is in Linux environment.
- Metadata models for search interfaces
- On experimental basis for search interface used Greenstone digital library

ETD Practices at IITB

The central library, IITB has continued traditional mode of submission in addition to e-version of theses/dissertations. Statistical data of department-wise print version are tabulated below.

Table: - 1. Department-wise list of Ph. D. Theses and M. Tech. Dissertations in print version

Departments	Doctoral	Masters
Aerospace Engineering.	60	370
Biomedical Engineering. /Biotechnology	42	114
Chemical Engineering.	204	983
Chemistry	426	1526
Civil Engineering.	263	867
Computer Science Engineering.	66	131
Earth Science	96	100
Electrical Engineering.	205	1749
Energy System Engineering.	14	199
Environment Science	52	229
Humanities and Social Science	104	51
Industrial Design Center	-	859
Industrial Engineering Operational Research	01	191
Industrial Management.	-	112
Mathematics	202	-

Material Science	08	114
Mechanical Engineering.	202	1652
Metallurgy Engineering.	152	687
Physics	132	
Reliability Engineering.	13	139
System Control Engineering.	19	181
School of Management.	09	
School of Information Technology	-	45
Total	2270	10299

The table indicates that quantitatively there are 2270 Doctoral theses and 10,299 Masters dissertations submitted till to-date in different departments and interdisciplinary centers/schools.

The Institute had distinct needs to accommodate academic computing services such as ETD and key decisions were taken. One such decision was taken in the “**145th. Senate Meeting was held on 5th. November 1998**”. Those IITB students have to submit full text and one page of abstract in addition to its printed copy of thesis/dissertation. Consequently, Web server has been set up and maintained at central library on **Intranet** at site <http://etd.library.iitb.ac.in>



Figure 1

Online Submission of ETD

Before submission student are supposed to prepare one file of their thesis/dissertation in DOC/PS/PDF format and one page extended abstract should be separately prepared in .txt file before viva. The file size to be uploaded of thesis/dissertation can be up to 25 MB. In case, the size of the file is big, one can zip it and submit. In case, it exceeds 25 MB and cannot be submitted even after zipping, contact ETD administrator.

Note: Submit your thesis/dissertation only after final defense.

Step1. Registration

- Open URL <http://etd.library.iitb.ac.in>. Through Web interface students have to be register by using his/her department IITB e-mail address and click on get password.
- Check your e-mail supplied by the department, as ETD server would have sent auto-generated email along with password to you, after your registration.

Step 2. Submission

- Open main page of ETD site <http://etd.library.iitb.ac.in> for submission
- After clicking on submit thesis, login by typing your e-mail address and enter password that was received from ETD server to you after registration
- Online submission form (Fill up Alumni information - Name, Roll no. Hostel no. Permanent address and e-mail etc.)
- Thesis/Dissertation information (Fill up Supervisor's e-mail, Title of thesis, Number of pages, Path for uploading full thesis, Abstract etc.)
- Click on 'Submit Thesis' this will allow uploading of your file from local machine to the ETD server. Time taken for this process will depend on size of your file.
- New window will show the message "your thesis has been successfully entered in our database". **Click on generate PostScript**, the server will generate the PS file as well as html file of students provided information and abstract.
- After submission of thesis, ETD server will send an auto-generated email to the supervisor for online approval.
- Supervisor is required to approve online, submitted thesis /dissertation using the faculty approval interface on the main page of ETD website.
- In case your supervisor is not satisfied with the results you can login again and fix the entries in the submission form. But each time you do so your supervisor will get email requesting him/her to view your submission and give online approval. So please make sure that all fields are correct, and minimize resubmissions.
- **Note:** Resubmission will not be possible once your supervisor approves your submission online.

Step 3. Library approval

- After obtaining signature of your supervisor on print outs of PS file and as well as online approval, approach to Computer Applications and Reference Section of Central Library for library approval
- ETD administrator will verify whether all formalities are completed or not, through library administrative interface and after verification will approve your thesis/dissertation and give the following certification

Step 4. Certification

ETD administrator will certify on the form provided by Academic Section of the Institute that, electronic version of full thesis/dissertation and abstract are Submitted by the student.

Statistical data of department-wise ETDs are tabulated below.

Table 2 Department-wise lists of e-version Ph. D. Theses and M. Tech. Dissertations submitted to IITB.

Departments	Doctoral	Masters
Aerospace Engineering	05	104
Biomedical Engineering /Biotechnology.	09	43
Chemical Engineering	14	162
Chemistry	44	
Civil Engineering	30	209
Computer Science Engineering	04	213
Corrosion Science Engineering	01	44
Earth Science	06	42
Electrical Engineering.	27	388
Energy System Engineering	04	81
Environment Science	11	45
Humanities and Social Science	11	
Industrial Design Center	-	26
Industrial Engineering Operational Research	01	40
Mathematics	14	-
Mechanical Engineering.	16	291
Metallurgy Engineering	17	117
Material Science	05	-

Reliability Engineering	03	48
School of Information Technology	05	33
School of Management	05	
System Control Engineering	08	45
Visual Communication		26
TOTAL	240	1957

The table indicates that quantitatively there are 240 Ph. D. theses and 1957 M. Tech. dissertations submitted till to-date in different departments and interdisciplinary centers/schools.

* Due to some reasons in few cases (450) full text have not been submitted and only abstracts have been incorporate in ETD database.

Role of ETD administrator

To prepare manual, help students in on-line submission maintenance of site and server, library approval, storage system-Backups, CD-ROM, Tape cartridge, metadata conversion and migration of ETD data (bibliographic details with abstracts) on Greenstone Digital Library search interface etc.

Digitization of Abstracts of Ph. D. Theses to Supplement ETD

Central library IITB focused on digitizing abstracts of Ph.D. theses of the institute prior to 2000. In order to create the database in digitized form, resources have been selected, required infrastructure has been set up, appropriate storage devices and formats have been decided.

The main issues for selection of Ph.D. theses are:

- National and International ETD initiatives to preserve in digitized format
- New approaches to migration
- Preservation of meta-data
- Strategic issues in refreshing and reformatting data

Procedure

We have scanned abstract pages of Ph.D. theses from the earliest submitted theses of 1964 to 1999 Various parameters such as preparing of different types of files, space required, statistics of theses, nature of work involved etc. were discussed. Those with abstracts were scanned as OCR and were stored in WORD/TXT/PDF/HTML after editing under file name as an accession number. The digitized abstracts of Ph. D. theses prior to 2000 and the theses submitted electronically online have been merged to form the complete database and have been housed in ETD server. The data elements such as [Title](#), [Creator](#), [Subject](#), [Contributor\(s\)](#), [Degree](#), [Department](#),

Language, Degree, Grantor, Date, Format, Identifier, Abstract and Rights have been selected for display format using Dublin Core metadata standards.

Conservation and Preservation

Conservation of online submitted ETD and abstracts of Ph. D. theses at IITB

Conservation of online submitted ETD has an ability to rapid and easy access, enhance digital images, integration of different media, can be delivered at lower cost, potential to display material that is in accessible formats compressed form of storage etc. These benefits outweigh hard copy submitted thesis/dissertation.

The digitized material has been conserved in different formats such as WORD/ TXT/ PDF/HTML and stored on different devices such as Server, CD-ROMS, hard disk etc. at controlled temperature. The materials used in these devices are magnetic, plastic etc. that are less affected by humidity, temperature etc and are durable.

Preservation of ETD and abstracts of Ph. D. theses at IITB

In order to preserve digital material on a scale commensurate with mass storage capabilities and in formats that are accessible and usable, it is necessary to articulate some basic requirements such as Users' perspective, Institution's responsibility, Missions of parent institution etc. Digitized information Data selected for long-term preservation in digitized form must ensure full access and continued usability of data. Digitized information is stored on devices such as hard disks, CD-ROMs etc. and formats to prevent from disaster, accident, or any untoward incident. Central library, IITB maintains its data on different devices and in different formats. Some examples are enumerated below:

- CD-ROM backup
- DAT Tape cartridge backup
- ETD backup-acts as automatic server
- ETD mirror server maintained at different locations
- ETD server-RAID hard disk

Retrieval

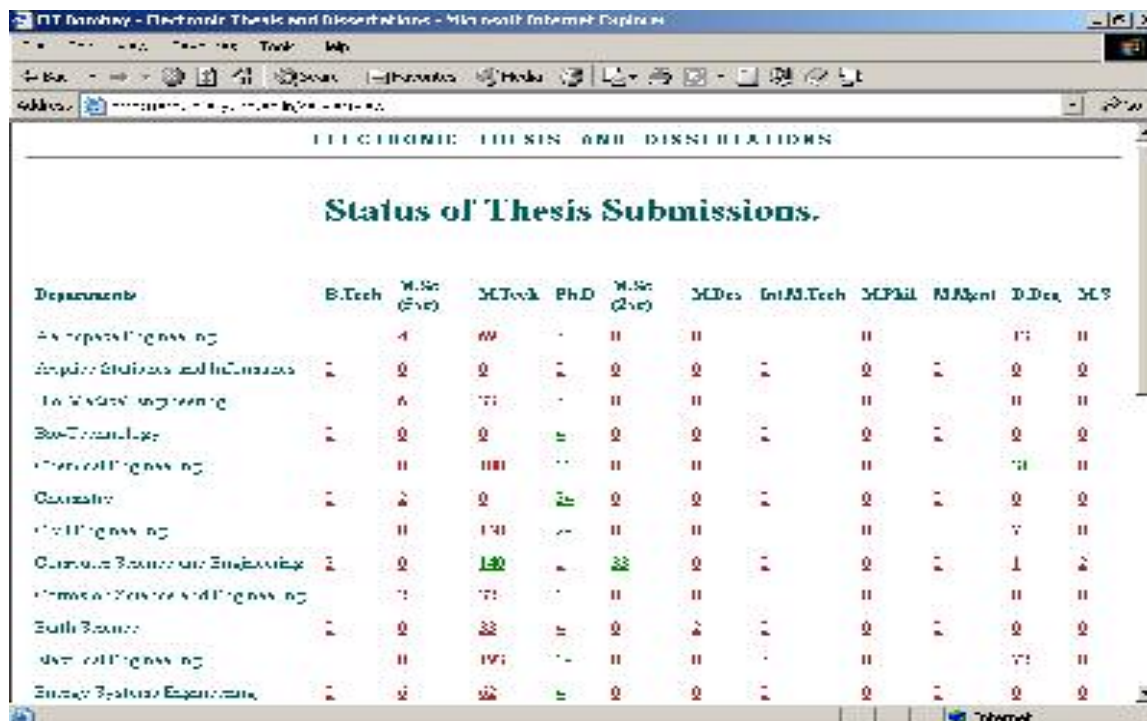
Central library IITB web site has provided link to ETD web page to access the abstracts of Ph. D. and M. Tech. dissertations through On-line Public Access Catalogue (Intranet).

Retrieval of ETD homepage at IITB facilitates browse and search options.

Step 1. Browse

At present the software only facilitates 'Browse' option, the work of 'Search' option is in progress. In order to browse online submitted theses/dissertations open <http://etd.library.iitb.ac.in> website. Click on "1999-2003" to view submitted abstracts as shown in figure 1.

Department-wise and degree-wise statistical data have been provided in figure 2 of submitted theses/dissertations.



Electronic Theses and Dissertations

Status of Thesis Submissions.

Departments	B.Tech	M.Sc (Eng)	M.Tech	Ph.D	M.Sc (Sci)	M.Des	Int.M.Tech	MPhil	M.Agmt	D.Des	M.S
Aerospace Engineering		4	69	-	0	0		0		17	0
Applied Statistics and Mathematics	2	0	0	2	0	0	2	0	2	0	0
Automotive Engineering		6	77	-	0	0		0		0	0
Bio-Technology	2	0	0	5	0	0	2	0	2	0	0
Chemical Engineering		0	000	11	0	0		0		70	0
Chemistry	2	2	0	25	0	0	2	0	2	0	0
Civil Engineering		0	130	22	0	0		0		7	0
Computer Science and Engineering	2	0	130	22	0	0	2	0	2	1	2
Computer Science and Engineering		7	77	-	0	0		0		0	0
Earth Science	2	0	22	5	0	2	2	0	2	0	0
Electrical Engineering		0	197	11	0	0		0		77	0
Energy Systems Engineering	2	0	22	5	0	0	2	0	2	0	0

Figure 2

One can click on any department to view list of abstracts. The link of servlet html pages provides lists submitted ETDs in tabulated form and when you click on any department link, then it display the list of link of html pages and it provides name of the students, their roll numbers and the title of submitted theses. In order to view the abstract click on any title. Abstract along with bibliographic details such as Author, Title, Name of the Supervisor, Department etc. will be displayed.

Step 2. Search

At present, we have experimented browse and search interface using Greenstone Digital Library software hosted on central library Web server. We have scanned abstracts of all Ph.D. theses submitted prior to year 2000 and converted them into html and PDF formats and abstracts of the theses along with the database of ETD

has been incorporated of Masters and Doctoral dissertations/theses and are made available on the Web.

The site screen shot are shown below in figure 3.

<http://purl.oclc.org/NET/iitbetd> or <http://www.library.iitb.ac.in/~mnj/etd/>

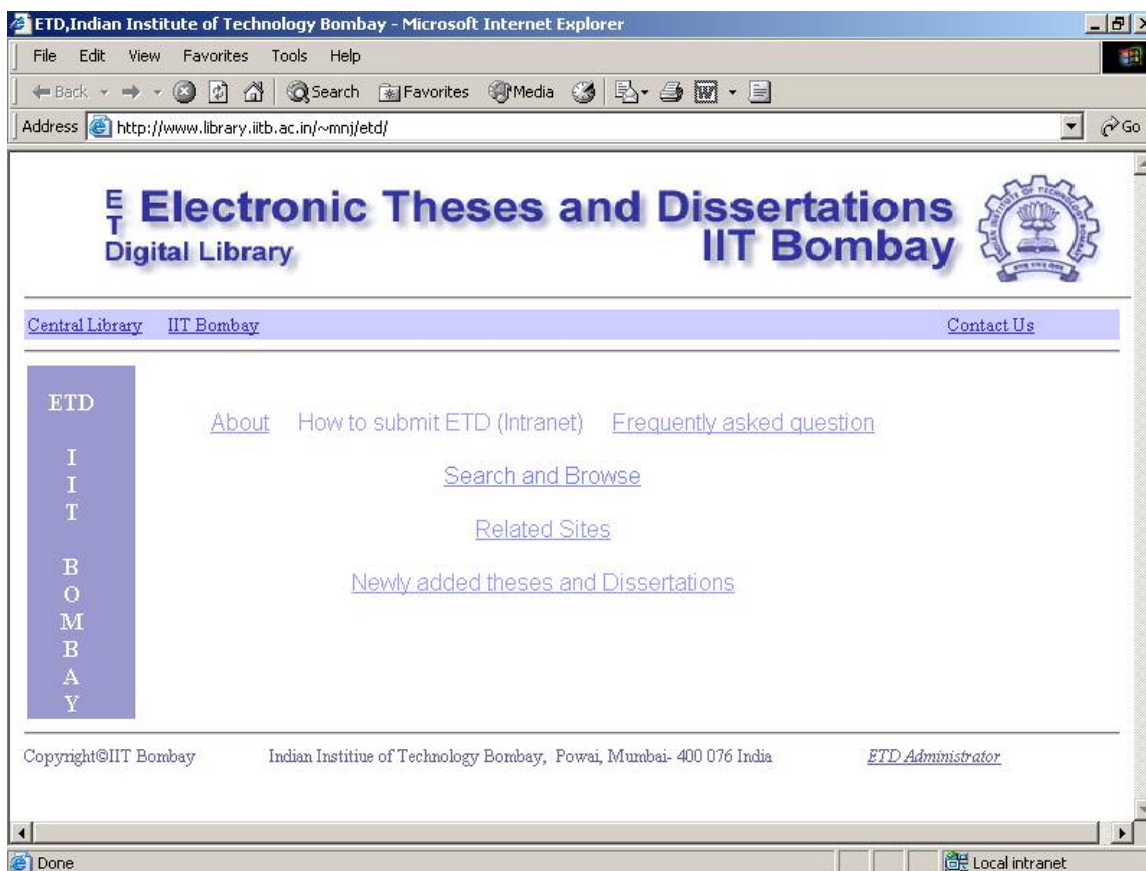


Figure 3

Further improvements in searches will be incorporated in future with metadata.

Intellectual Property Rights

We provide access to bibliographic details and abstract of the post-graduate research carried out at the Institute. All these details along-with full text are stored on ETD server. As far as full text of soft copies are concerned they are not made available to anybody because of copyright restrictions. Hard copies are made available for reference only to our staff and students and valid outside users. However, due to copyright restrictions photocopies of hard copies of theses/dissertations are supplied to universities on payment basis. Individual requests are not entertained.

Future

The central library, IITB has ambitious future plan in order to maintain its state-of-the-art electronic facility to its users. The future plan are enumerated below:

- Make available ETD database globally to public
- Open Archive Initiatives complaint
- Add ETD database of IITB in NDLTD
- Develop own Search interface
- Implements the metadata e.g. standards XML, Dublin core
- Follow common protocols, and procedures to ensure interoperability
- Setup role model of ETD in India under INDEST consortia among all IITs, NITs, and other engineering and technological institutions.

Conclusion

Academic scholarship is currently undergoing the process by which one medium is reformed and improved upon by another. The trend is towards digitizing traditional resources to e-resources. Realizing digital revolution, Central library, IITB meticulously implemented ETD and successfully accomplished creation of database. The paper explained all the activities carried out such as required infrastructure, technical issues, online submission, retrieval, conservation and preservation, storage devices and formats used, IPRs, future etc and finally conclude. We wish to share our experience with other institutions and find out about others' experience.

Acknowledgement

We wish to place on record our sincere thanks to Prof. G. Sivakumar, Head, Computer Sciences and Engineering Department, Mrs. V. S. Subbarao, Librarian and students who have developed the in-house stage of the software for online submission of Electronic Thesis and Dissertation (ETD) of Department of Computer Science and Engineering and our subordinate and superiors for their kind co-operation, moral support, inspiration and motivation at every stage. We also wish to thank our Director, Dy. Director for permitting to writing this paper.