FOSSEE Winter Internship Report

On

Title of Your Internship Work – Include the Name Osdag such as Development of QWERTY for Osdag

Submitted by

Amrutha Jaganathan

3rd Year B.Tech Student, Department of Artificial Intelligence and Data Science

Rajalakshmi Institute of Technology

TamilNadu

Under the Guidance of

Prof. Siddhartha Ghosh

Department of Civil Engineering

Indian Institute of Technology Bombay

Mentors:

Ajmal Babu M S

Parth Karia

Ajinkya Dahale

December 27, 2024

Acknowledgments

- I express my gratitude to the **Osdag team**, especially **Ajmal Babu M. S.**, **Ajinkya Dahale**, and **Parth Karia**, for their collaboration.
- I thank **Prof. Siddhartha Ghosh**, Osdag PI, Department of Civil Engineering, IIT Bombay, for his mentorship.
- I am grateful to **Prof. Kannan M. Moudgalya**, FOSSEE PI, Department of Chemical Engineering, IIT Bombay, for his guidance.
- I acknowledge **Usha Viswanathan**, **Vineeta Parmar**, and the FOSSEE team for their constant support.
- My thanks to the **National Mission on Education through ICT**, Ministry of Education (MoE), for facilitating this project.
- I appreciate the support of my colleagues and peers during this project.
- Finally, I thank my college, department, and faculty for their encouragement.

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Chapter 1

Introduction

1.1 National Mission in Education through ICT

The National Mission on Education through ICT (NMEICT) is a scheme under the Department of Higher Education, Ministry of Education, Government of India. It aims to leverage the potential of ICT to enhance teaching and learning in Higher Education Institutions in an anytime-anywhere mode.

The mission aligns with the three cardinal principles of the Education Policy—**access, equity, and quality**—by:

- Providing connectivity and affordable access devices for learners and institutions.
- Generating high-quality e-content free of cost.

NMEICT seeks to bridge the digital divide by empowering learners and teachers in urban and rural areas, fostering inclusivity in the knowledge economy. Key focus areas include:

- Development of e-learning pedagogies and virtual laboratories.
- Online testing, certification, and mentorship through accessible platforms like EduSAT and DTH.
- Training and empowering teachers to adopt ICT-based teaching methods.

For further details, visit the official website: www.nmeict.ac.in.

1.1.1 ICT Initiatives of MoE

The Ministry of Education (MoE) has launched several ICT initiatives aimed at students, researchers, and institutions. The table below summarizes the key details:

No.	Resource	For Students/Researchers	For Institutions
Audio-Video e-content			
1	SWAYAM	Earn credit via online courses	Develop and host courses; accept credits
2	SWAYAMPRABHA	Access 24x7 TV programs	Enable SWAYAMPRABHA viewing facilities
Digital Content Access			
3	National Digital Library	Access e-content in multiple disciplines	List e-content; form NDL Clubs
4	e-PG Pathshala	Access free books and e-content	Host e-books
5	Shodhganga	Access Indian research theses	List institutional theses
6	e-ShodhSindhu	Access full-text e-resources	Access e-resources for institutions
Hands-on Learning			
7	e-Yantra	Hands-on embedded systems training	Create e-Yantra labs with IIT Bombay
8	FOSSEE	Volunteer for open-source software	Run labs with open-source software
9	Spoken Tutorial	Learn IT skills via tutorials	Provide self-learning IT content
10	Virtual Labs	Perform online experiments	Develop curriculum-based experiments
E-Governance			
11	SAMARTH ERP	Manage student lifecycle digitally	Enable institutional e-governance
Tracking and Research Tools			
12	VIDWAN	Register and access experts	Monitor faculty research outcomes
13	Shodh Shuddhi	Ensure plagiarism-free work	Improve research quality and reputation
14	Academic Bank of Credits	Store and transfer credits	Facilitate credit redemption

Table 1.1: Summary of ICT Initiatives by the Ministry of Education

1.2 FOSSEE Project

The FOSSEE (Free/Libre and Open Source Software for Education) project promotes the use of FLOSS tools in academia and research. It is part of the National Mission on Education through Information and Communication Technology (NMEICT), Ministry of Education (MoE), Government of India.

1.2.1 Projects and Activities

The FOSSEE Project supports the use of various FLOSS tools to enhance education and research. Key activities include:

- **Textbook Companion**: Porting solved examples from textbooks using FLOSS.
- **Lab Migration**: Facilitating the migration of proprietary labs to FLOSS alternatives.
- **Niche Software Activities**: Specialized activities to promote niche software tools.
- **Forums**: Providing a collaborative space for users.
- **Workshops and Conferences**: Organizing events to train and inform users.

1.2.2 Fellowships

FOSSEE offers various internship and fellowship opportunities for students:

- Winter Internship
- Summer Fellowship
- Semester-Long Internship

Students from any degree and academic stage can apply for these internships. Selection is based on the completion of screening tasks involving programming, scientific computing, or data collection that benefit the FLOSS community. These tasks are designed to be completed within a week.

For more details, visit the official FOSSEE website.

Figure 1.1: FOSSEE Projects and Activities

1.3 Osdag Software

Osdag (Open steel design and graphics) is a cross-platform, free/libre and open-source software designed for the detailing and design of steel structures based on the Indian Standard IS 800:2007. It allows users to design steel connections, members, and systems through an interactive graphical user interface (GUI) and provides 3D visualizations of designed components. The software enables easy export of CAD models to drafting tools for construction/fabrication drawings, with optimized designs following industry best practices [1, 2, 3]. Built on Python and several Python-based FLOSS tools (e.g., PyQt and PythonOCC), Osdag is licensed under the GNU Lesser General Public License (LGPL) Version 3.

1.3.1 Osdag GUI

The Osdag GUI is designed to be user-friendly and interactive. It consists of

- **Input Dock**: Collects and validates user inputs.
- **Output Dock**: Displays design results after validation.
- **CAD Window**: Displays the 3D CAD model, where users can pan, zoom, and rotate the design.
- **Message Log**: Shows errors, warnings, and suggestions based on design checks.

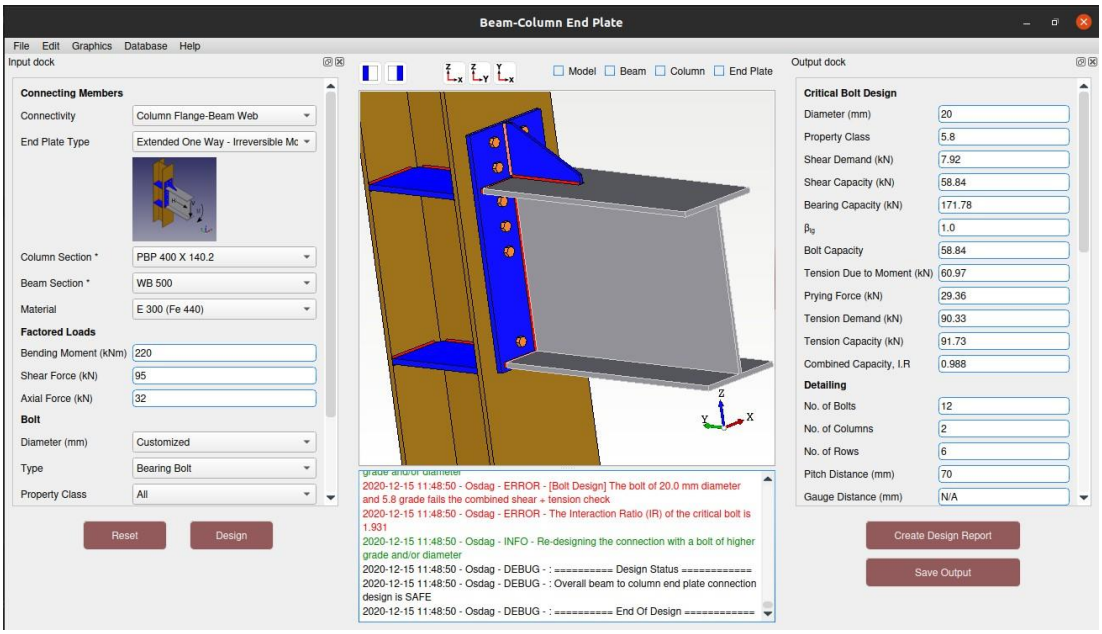

Figure 1.2: Osdag GUI

1.3.2 Features

- **CAD Model**: The 3D CAD model is color-coded and can be saved in multiple formats such as IGS, STL, and STEP.
- **Design Preferences**: Customizes the design process, with advanced users able to set preferences for bolts, welds, and detailing.
- **Design Report**: Creates a detailed report in PDF format, summarizing all checks, calculations, and design details, including any discrepancies.

For more details, visit the official Osdag website.

Chapter 2

Screening Task

2.1 Problem Statement

Design a laterally supported beam ensuring compliance with IS 800:2007 for moment, shear, and deflection criteria.

2.2 Tasks Done

Developed a design algorithm, implemented it in Python, and validated results against IS 800:2007 provisions.

Chapter 3

Internship Task 1 Title

3.1 Task 1: Problem Statement

The first task undertaken during the internship involved documentation and verification of the Osdag design framework. This involved comparing the expected and observed results from the example designs provided within the Osdag platform. The goal was to ensure that the design calculations and their outputs were accurate, adhering to the specifications set forth by Osdag.

3.2 Task 1: Tasks Done

The following tasks were completed during this assignment:

- **Osdag Documentation**: Reviewed and documented the Osdag sample design files.
- **Comparison of Expected and Observed Results**: Performed checks on various design types, such as shear connections, moment connections, and tension member designs.
- **Design Types Verified**:
  - Shear Connections: Fin Plate, End Plate, Cleat Angle, Seated Angle.
  - Moment Connections: Beam-to-Beam, Splice Connection (Cover Plate Bolted, End Plate, Cover Plate Welded).

  - Beam-to-Column Connection (End Plate).
  - Column-to-Column Splice Connection (Cover Plate Bolted, Cover Plate Welded, End Plate).
  - Base Plate Connection.
  - Tension Member Design (Bolted to End Gusset, Welded to End Gusset).

- **Documentation of Results**: Tables were prepared to compare the observed results from the Osdag framework with the expected results as defined by design codes and standards.

3.3 Task 1: Python Code

Although the task primarily focused on documentation and comparison, the following Python script description would apply to typical design calculations performed in Osdag. It illustrates the process of comparing expected and observed results, but the actual task didn't involve creating code.

3.3.1 Description of the Script

- **Input Parameters**: The user inputs specific parameters, such as connection type, material properties, load conditions, and design code to perform calculations.
- **Design Calculations**: The script would calculate the required values, such as the number of bolts, strength checks, and other design parameters.
- **Output**: The output would include the design results, such as bolt arrangements, adequacy checks, and verification of the connection's strength.

In this case, the task was about documenting existing code and ensuring the results align with expected outcomes. For example, a script that designs a beam-to-column connection would be run with certain input parameters, and the output results would be compared to the theoretical or standard calculations.

3.4 Task 1: Documentation

The Osdag Developer/User Manual was the primary reference for the documentation task. The directory structure and program flow were outlined as follows:

3.4.1 Directory Structure

Osdag

- osdagMainPage.py
- Common.py
- ResourceFiles
  - images
  - last_designs
  - ...
- design_type
- design_report
- cad
- gui

The main entry point for the program is osdagMainPage.py. To start the program, open the Osdag folder, open the terminal in that path, and execute the following command:

```
$ python osdagMainPage.py
```

The task involved verifying the design calculations for various connection types, ensuring that the results matched the expected outputs from the Osdag framework's sample designs. Each connection type's expected results were compared to the observed results, with discrepancies flagged for further investigation.

By focusing on the comparison between expected and observed results, the task helped validate the accuracy and reliability of the Osdag design framework.

Chapter 4

Internship Tasks

4.1 4.1 Tasks Accomplished

- Familiarized with the Osdag platform and its functionality.
- Assisted in configuring and setting up the OSDaG environment for various projects.
- Participated in testing and debugging features on the platform.
- Collaborated with the team to implement solutions using Osdag tools and resources.

4.2 4.2 Skills Developed

- Gained experience in using Git and GitHub for version control and collaboration.
- Learned to install and configure packages necessary for the Osdag platform.
- Developed problem-solving skills by troubleshooting issues on the Osdag platform.
- Improved professional communication through collaboration with team members and stakeholders.

Chapter A

Appendix

A.1 Work Reports

Appendix

February 12, 2025

1 Introduction

This document includes the results of the Expected and Observed Outcome.This comparison between the two versions underscores the importance of validating software updates to ensure that modifications do not introduce unexpected in- accuracies. Understanding these variations is crucial for engineers and designers who rely on Osdag for structural analysis and design, ensuring that the results remain trustworthy for real-world applications.

Expected

Module	DDCL	Calculations	Unit Test- pytest	Report- pyLaTeX	GUI- PyQt	CAD- PyOCC	GUI- React	CAD- FreeCAD	2D - ez
Background ->	Civil	Civil	Civil	Civil	Software	Software	Software	Software	Softwa
Existing modules- Connections: Testing is remaining; Also 2D models									
Fin plate (Shear)	Completed	Completed	Not Started	Completed	Comple...	Completed	Completed	In Progress	Not St
End plate (Shear)	Completed	Completed	Not Started	Completed	Comple...	Completed	Completed	Not Started	Not St
Seated angle (Shear)	Completed	Completed	Not Started	Completed	Comple...	Completed	Not Started	Not Started	Not St
Cleat angle (Shear)	Completed	Completed	Not Started	Completed	Comple...	Completed	Not Started	Not Started	Not St
Beam-beam Cover Plate Bolted	Completed	Completed	Not Started	Completed	Comple...	Completed	Not Started	Not Started	Not St
Beam-beam Cover Plate Welded	Completed	Completed	Not Started	Completed	Comple...	Completed	Not Started	Not Started	Not St
Beam-beam End Plate	Completed	Completed	Not Started	Completed	Comple...	Completed	Not Started	Not Started	Not St
Beam-Column End plate	Completed	Completed	Not Started	Completed	Comple...	Completed	Not Started	Not Started	Not St
Column-to-Column Splice Cover Plate Bolted	Completed	Completed	Not Started	Completed	Comple...	Completed	Not Started	Not Started	Not St

Figure 1: This illustrates the expected results observed in an older version of Osdag when performing a comparative analysis of results. This version of the software produced outputs that aligned with theoretical calculations and estab- lished benchmarks, ensuring reliability in structural design evaluations. The observed values in this version were consistent with previously validated data, confirming the accuracy of the implemented design methodologies and calcula- tions. Users of this version could confidently interpret the results, knowing that the software adhered to expected performance standards.

Beam-beam Cover Plate Welded	Completed	Completed	Completed	Completed	Comple...	Completed
Beam-beam End Plate	Completed	Completed	Completed	Completed	Comple...	Completed
Beam-Column End plate	Completed	Completed	Completed	Completed	Comple...	Completed
Column-to-Column Splice Cover Plate Bolted	Completed	Completed	Completed	Completed	Comple...	Completed
Column-to-Column Splice Cover Plate Welded	Completed	Completed	Completed	Completed	Comple...	Completed
Column-to-Column Splice End Plate	Completed	Completed	Completed	Completed	Comple...	Completed
PEB connections	Blocked	Blocked	Not Started	Blocked	Blocked	Blocked
Base plate - Slab base	Completed	Completed	Completed	Completed	Comple...	Completed
Base plate - Base	Completed	Completed	Completed	Completed	Comple	Completed

Figure 2: It presents the observed results in the new version of Osdag during the same comparison of results. This version, while incorporating updates and possible improvements, shows deviations from the expected outcomes. The dif- ferences between the observed results in this new version and those in the older version highlight potential changes in computational methods, modifications in design parameters, or updates in the underlying structural analysis algorithms. These discrepancies may necessitate further investigation to determine whether they stem from software enhancements, error corrections, or unintended com- putational variations that affect the reliability of the output.

INTERNSHIP REPORT

Name	Amrutha J
Project	Osdag
INTERNSHIP	Fossee Winter Fellowship 2024

DATE	DAY	TASK	Hours worked
13 Nov 2024	Wednesday	Installed OSDAG on Windows 10 x64 machine an	2
14 Nov 2024	Thursday	Installed OSDAG on Windows 10 x64 machine an	1
15 Nov 2024	Friday	Installed OSDAG on Windows 10 x64 machine an	3
16 Nov 2024	Saturday	Installed OSDAG on Windows 10 x64 machine an	4
18 Nov 2024	Monday	Semester Examination	-
19 Nov 2024	Tuesday	Semester Examination	-
20 Nov 2024	Wednesday	Semester Examination	-
21 Nov 2024	Thursday	Semester Examination	-
22 Nov 2024	Friday	Semester Examination	-
23 Nov 2024	Saturday	Semester Examination	-
24 Nov 2024	Sunday	Semester Examination	-
25 Nov 2024	Monday	Semester Examination	
26 Nov 2024	Tuesday	Semester Examination	1
27 Nov 2024	Wednesday	Semester Examination	1
28 Nov 2024	Thursday	Semester Examination	2
29 Nov 2024	Friday	Semester Examination	2
30 Nov 2024	Saturday	Semester Examination	1
2 Dec 2024	Monday	Development module	1
3 Dec 2024	Tuesday	Development module	
4 Dec 2024	Wednesday	Development module	4
5 Dec 2024	Thursday	Development module	5
6 Dec 2024	Friday	Development module	5
9 Dec 2024	Monday	Designing the report	6
10 Dec 2024 11 Dec 2024 12 Dec 2024 13 Dec 2024	tuesday Wednesday Thursday Friday	Designing the report Finding Errors and customizing the input parameters Finding Errors and customizing the input parameters Finding Errors and customizing the input parameters	4.5 5 5 5
14 Dec 2024	saturday	Finding Errors and customizing the input parameters	5
15 Dec 2024	Sunday	Osdag sample Design Documentation	4.5
16 Dec 2024	Monday	Osdag sample Design Documentation	5

	17 Dec 2024	tuesday	Osdag sample Design Documentation	2
	18 Dec 2024	Wednesday	Osdag sample Design Documentation	2
	19 Dec 2024	Thursday	Osdag sample Design Documentation	2
	20 Dec 2024	Friday	Osdag sample Design Documentation	1
	21 Dec 2024	saturday	Osdag sample Design Documentation	2
	22 Dec 2024	Sunday	Osdag sample Design Documentation	4
	23 Dec 2024	Monday	Osdag sample Design Documentation	2
	24 Dec 2024	tuesday	Osdag sample Design Documentation	2
	25 Dec 2024	Wednesday	Osdag sample Design Documentation	2
	26 Dec 2024	Thursday	Osdag sample Design Documentation	2
	27 Dec 2024	Friday	Osdag sample Design Documentation	1
	28 Dec 2024	saturday		1

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