Formulation and Evaluation of Eco-Friendly Dish Washing Liquids

A Minor Project Report

In Partial Fulfillment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Aryan Singh (22021113)

Under the Guidance of

Dr. Neeraj Chandraker (Associate Professor)

And

Mr. Satyajit Bhattacharjee (Assistant Professor)

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2025

CERTIFICATE

Certified that the Minor Project Report entitled **"Formulation and Evaluation Eco-Friendly Dish washing Liquids"** submitted by Aryan Singh of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

Guided By
Signature 09.05.25

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Mr. Satyajit Bhattacharjee

Assistant Professor
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Approved By

Signature_____

Prof. Amit Jain

Head of Department

Department Of Chemical Engineering
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SMART AGRICULTURAL MONITORING SYSTEM

A Project Report

In Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Abhishek Singh (22021104)

Vineet Yadav (22021164)

Under the Guidance of

Associate Professor Dr. Anuradha N. Joshi

DEPARTMENT OF CHEMICAL ENGINEERING

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GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2025

CERTIFICATE

Certified that the Project Report entitled ***"Smart Agricultural Monitoring System"*** submitted by **Abhishek Singh & Vineet Yadav** of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

Prof. Amit Jain
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09/05/25.

Dr. Anuradha N. Joshi
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ANN-Based Prediction of Extraction Efficiency for Propionic Acid Recovery Using TOA in Edible Oils

A Project Report

In Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Amisha Kumari (22021109)

Under the Guidance of

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Bilaspur, Chhattisgarh

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY

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May 2025

CERTIFICATE

Certified that the Major Project Report entitled ***"ANN-Based Prediction of Extraction Efficiency for Propionic Acid Recovery Using TOA in Edible Oils"*** submitted by Amisha Kumari of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

Prof. Amit Jain
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Yadav 9/5/25

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Menthol-Acetic Acid DES for Propionic Acid Separation

A Project Report

In Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Ankit Raj (2202110)

Raj Chandrakar (22021141)

Under the Guidance of

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Asscociate Professor

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May 2025

Certified that the Major Project Report entitled ***"Menthol - Acetic acid DES for Propionic Acid Separation"*** submitted by Ankit Raj ,Raj Chandrakar of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2025-26.

Prof. Amit Jain
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Menthol-Acetic Acid DES for Propionic Acid Separation

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A Minor Project Report

On

Theoretical analysis and Numerical modelling of Gasification Process

In Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Kashish Sain (22021121)

Shambhavi Kumari (22021153)

Akshat Pandey (22021108)

Naga Magadasu (22021122)

Nitish Kumar Roy (22021170)

Under the Guidance of

Dr. Gautam Prasad Dewangan

Associate Professor

DEPARTMENT OF CHEMICAL ENGINEERING

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GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2024-25

Name of student : Bipkey Kumar Shukla
Roll No. : 23021104
Note: Avoid unnecessary ...

Total Credit
Practical IA – (10)
Heat Transfer-15.10.25
Chemical Engineering

CERTIFICATE

Certified that the Minor Project Report entitled ***"Theoretical analysis and numerical modelling of gasification Process"*** submitted by Kashish Sain, Shambhavi Kumari, Akshat Pandey, Naga Magadasu, Nitish Kumar Roy of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

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Dr. Gautam Prasad Dewangan
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TABLE OF CONTENT

A

PROJECT REPORT

on

"Process Simulation of Lignin-Derived Aromatics from Biomass and Syngas Using Aspen Plus"

Submitted in partial fulfilment of the requirement for the award of

BACHELOR OF TECHNOLOGY

IN

CHEMICAL ENGINEERING

SUBMITTED BY :

NIDHI NETAM (22021129)

UNDER THE GUIDANCE OF :

Dr. Pankaj Kumar

(Assistant Professor, Chemical Engineering)

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES IN ENGINEERING & TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA

(Central University of C.G. India)

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES IN ENGINEERING & TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA

(A CENTRAL UNIVERSITY)

BILASPUR , CHHATTISGARH, INDIA

CERTIFICATE

We hereby certify that the work which is being presented in the B.Tech. Project Report on ""Process Simulation of Lignin-Derived Aromatics from Biomass and Syngas Using Aspen Plus" in partial fulfilment of the requirements for the award of the Bachelor of Technology in Chemical Engineering submitted to the Department of Chemical School of Studies of Engineering & Technology , Guru Ghasidas Vishwavidyalaya, Central University, Bilaspur, Chhattisgarh, India is an authentic record of our work carried out during a period from January 2025 to May 2025 (6^{th} Semester) under the Guidance of Dr. Pankaj Kumar, Assistant Professor of the Department, Chemical Engineering Department. The matter presented in this project Report has not been submitted by us or by anyone else for the award of any other degree elsewhere.`

Signature of Students

NIDHI NETAM (22021129)

This is to certify that the above statement made by the student is correct to the best of my knowledge,

Signature of HOD

Dr. Amit Jain

Department of Chemical Engineering

Signature of Mentor

Dr. Pankaj Kumar

Assistant Professor ,

Department of Chemical Engineering

ABSTRACT

The escalating global demand for sustainable energy and chemicals has intensified interest in biomass valorization, particularly the conversion of lignin—a highly abundant yet underutilized biopolymer—into valuable aromatic compounds. This study investigates the process simulation of lignin-derived aromatics from biomass and syngas using Aspen Plus, aiming to model an integrated biorefinery capable of producing high-value chemicals like benzene, toluene, and xylene (BTX). The research adopts a systematic approach involving lignin extraction via Organosolv and Deep Eutectic Solvents (DES), catalytic depolymerization under hydrogen-rich syngas atmospheres, and product recovery.

The simulation incorporates key process blocks, including lignin isolation, syngas production from biomass gasification, and catalytic conversion pathways such as hydrogenolysis and fast pyrolysis. Various catalysts (e.g., Ru/C, Ni/Al_2O_3, HZSM-5) and reaction conditions were analyzed for their efficacy in breaking down β-O-4 ether linkages and enhancing aromatic yields. Organosolv and DES-extracted lignins were found to be more amenable to depolymerization due to their preserved functional structures and sulfur-free profiles.

The results highlight the critical role of syngas, not only as a hydrogen source but also in enabling a circular energy model within the biorefinery. The simulation demonstrated monomeric aromatic yields of up to 35 wt% under optimized conditions. Furthermore, integration of all biomass fractions, including carbohydrates for ethanol production and syngas recycling, significantly improved the system's economic and environmental metrics.

This project establishes a robust framework for simulating lignin valorization into aromatics, underscoring the feasibility and sustainability of such biorefinery configurations. It also lays the groundwork for future experimental validation and process intensification strategies, such as continuous flow reactors, advanced solvent systems, and decentralized feedstock logistics, crucial for commercial-scale deployment.

DEPARTMENT OF CHEMICAL ENGINEERING
SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2025

UASB Reactor and It's Mathematical Approach to Treatment of POME

A Project Report

In Partial Fulfilment of the Requirement for Award of Degree of
Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Bishal Sahani (22021116)
Mohit Aashutosh Harshvardhan (22021125)
Rahul Kumar (22021139)

Under the Guidance of

Dr. Sandeep Dharmadhikari (Assistant Professor)

CERTIFICATE

Certified that the Major Project Report entitled **"UASB Reactor and It's Mathematical Approach to Treatment of POME"** submitted by Bishal Sahani, Mohit Aashutosh Harshvardhan and Rahul Kumar of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

Prof. Amit Jain
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Dr. Sandeep Dharmadhikari
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A Project Report

on

PLANT BASED BODY LOTION

Submitted in Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

MUKESH KUMAR (22021126)

Under the Guidance of

Mr. Satyajit Bhattacharjee

Assistant Professor

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2025

CERTIFICATE

Certified that the Project Report entitled ***"PLANT BASED BODY LOTION"*** submitted by **MUKESH KUMAR** of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B.Tech) in Chemical Engineering, is according to his own investigation carried out by him in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

Prof. Amit Jain
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Mr. Satyajit Bhattacharjee
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" From Flowers Waste to Organic Dhoop Sticks "

A Project Report

In Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Muskan Kumari (22021128)

Under the Guidance of

Dr. Vishnu Prasad Yadav

Assistant Professor

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2025

CERTIFICATE

Certified that the Project Report entitled ***" From Flowers Waste To Organic Dhoop Sticks "*** submitted by Muskan Kumari of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

Prof. Amit Jain
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Yadav 9/5/25
Dr. Vishnu Prasad Yadav
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A
Project Report
on

"Removal of Indigo Carmine dye from waste water using CaO nano Adsorbent"

Submitted in partial fulfilment of the requirement for award of degree of
Bachelor of Technology in Chemical Engineering

Submitted By

Nishukant	22021130
Soumyashree	22021157
Vedant Soni	22021160
Abhishek Kumar	22021103
Adarsh Kumar	22021105
Priyanjana Malakar	22021137

Under The Guidance Of -

Professor Anil Kumar Chandrakar
Department of Chemical Engineering
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Department of Chemical Engineering
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(A Central University Established by the Central University Act 2009 No. 25 of 2009)

Certificate

Certified that the Project Report entitled **"Removal of Indigo Carmine Dye from Waste Water using CaO Nano Absorbent"** submitted by **Nishukant, Vedant Soni, Priyanjana Malakar, Soumyashree, Abhishek Kumar, Adarsh Kumar** of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

Chandrakar
09/05/25

Prof. Amit Jain
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Prof. Anil Kumar Chandrakar
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Abstract

The discharge of synthetic dyes from textile industries is a major environmental issue due to their intense color and resistance to degradation. Indigo carmine, a widely used blue synthetic dye, is especially difficult to remove from industrial wastewater. In this project, calcium oxide (CaO) nanoparticles were synthesized from waste chicken eggshells using the sol-gel method and tested as an effective and low-cost adsorbent for dye removal. Eggshells, mainly composed of calcium carbonate, were first dissolved in dilute hydrochloric acid to form calcium chloride. Sodium hydroxide was then added to form calcium hydroxide gel, which was dried and calcined at high temperature to produce CaO nanoparticles. The synthesized adsorbent was characterized using FTIR to confirm the presence of functional groups. Batch adsorption experiments were conducted using two different amounts of CaO-0.5g and 0.25g in 100 mL of indigo carmine dye solution (50 mg/L). The results showed significant dye removal within 5 minutes, with over nearly 100% efficiency achieved using 0.5 g of CaO. This study presents a simple, economical, and environmentally friendly approach to treat dye-containing industrial wastewater using biowaste-derived CaO nano adsorbent.

Extraction of Citric Acid by Distillation

A Project Report

In Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Omprakash Meena

(21021133)

Under the Guidance of

Dr. Vishnu Prasad Yadav

Assistant Professor

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Certified that the Project Report entitled **Extraction of citric acid by distillation** submitted by Omprakash Meena of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to his own investigation carried out in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

Prof. Amit Jain
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Dr. **Vishnu Prasad Yadav**
Supervisor
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ABSTRACT

Citric acid is one of the most widely used organic acids in the food, pharmaceutical, cosmetic, and chemical industries due to its versatile properties as an acidulant, antioxidant, and chelating agent. Traditionally, citric acid is recovered from fermentation broth using lime precipitation followed by sulfuric acid treatment, ion exchange, and crystallization. However, these methods are associated with high chemical consumption, significant waste generation (e.g., gypsum), and multi-step processing. This study explores an alternative approach—the extraction of citric acid by distillation, focusing on vacuum distillation, molecular distillation, and reactive distillation techniques.

The research involved experimental investigations using both synthetic citric acid solutions and real fermentation broth samples. Vacuum distillation was performed under reduced pressure (10–50 mbar) and controlled temperatures (60–80°C), achieving water removal efficiencies of 70–85% while maintaining citric acid purity above 95%. Molecular distillation, operating under ultra-high vacuum (<0.01 mbar) and temperatures up to 100°C, demonstrated structural preservation of citric acid but with lower recovery rates (65–75%) due to equipment limitations and low throughput. Reactive distillation involving esterification of citric acid with ethanol significantly enhanced volatility, enabling efficient separation of ethyl citrate esters via standard distillation, with subsequent hydrolysis regenerating citric acid at yields of 70–78%.

Solvent-assisted distillation using tri-n-octylamine (TOA) and tributyl phosphate (TBP) in kerosene showed potential for improving extractability into an organic phase before distillation. Process optimization using Response Surface Methodology (RSM) identified key operational parameters such as temperature, pressure, and feed concentration that significantly affect yield and purity. Thermal degradation studies confirmed that citric acid remains stable under optimized conditions, although decomposition products like aconitic acid were observed at higher temperatures.

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ADHESIVE MAKING PROCESS FROM CASSAVA STARCH

A Minor Project Report

In Partial Fulfillment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Omprakash (22021131)

Under the Guidance of

Dr. Neeraj Chandraker (Associate Professor)

And

Mr. Satyajit Bhattacharjee (Assistant Professor)

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY

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May 2025

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Certified that the Minor Project Report entitled **"Adhesive making process from cassava starch"** submitted by Omprakash of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

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Signature 09/05/25

Dr. Neeraj Chandraker

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Co-Guided By
Signature 07/05/25

Mr. Satyajit Bhattacharjee

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Bilaspur, Chhattisgarh

Approved By

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Prof. Amit Jain

Head of Department

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Bilaspur, Chhattisgarh

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A Mini Project Report

on

Energy Consumption Analysis and Planning for a Remote Village Ecosystem with Windmill

Submitted in partial fulfilment of the requirement of the degree of
Bachelor of Technology *in* Chemical Engineering

Submitted by

Prathamesh Prashant Nagapure

Session 2024-25

Guided by

Dr Gautam Prasad Dewangan
Associate Professor

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(A central university established by the central university Act, 2009)

2024-25

CERTIFICATE OF APPROVAL

This is to certify that the project entitled **"Energy Consumption Analysis and Planning for a Remote Village Ecosystem with Windmill"** submitted by **Prathamesh P Nagapure** (Roll No: 21021137) in fulfilment of the requirements for the degree of **Bachelor of Technology** in **Chemical Engineering** is a record of bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree, diploma, associate-ship, fellowship, or other similar titles to them. I further certify that the work reported in this project was carried out independently by the candidate.

Approved by

Amit Jain
Head
Department of Chemical Engineering
School of studies of Engineering and Technology
Guru Ghasidas Vishwavidyalaya
Bilaspur, Chhattisgarh

Guided by

9/5/25

Dr. Gautam Prasad Dewangan
Associate Professor
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Bilaspur, Chhattisgarh

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A Minor Project Report

On

Prepration of Herbal Handwash

In Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Priyanka Kumari

Under the Guidance of

Mr.Satyajit Bhattacharjee

Assistant Professor

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GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2024-25

CERTIFICATE

Certified that the Minor Project Report entitled ***"Preparation of Herbal Handwash"*** submitted by Priyanka Kumari of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

Prof. Amit Jain
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A Project Report

on

FORMATION OF HERBAL LIPSTICK USING MAHUA OIL

Submitted in partial fulfilment of the requirement for award of degree of

Bachelor of Technology in Chemical Engineering

Submitted by

Mahi Srivastava	22021123
Ramesh Kumar	22021142

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Prof. Amit Jain

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(A Central University Established by the Central University Act 2009 No. 25 of 2009

CERTIFICATE

Certified that the Project Report entitled **Formation of Herbal Lipstick using Mahua Oil** submitted by **Mahi Srivastava** and **Ramesh Kumar** of B.Tech. VI Semester, for partial fulfilment of the requirements for the award of degree in Bachelor of Technology in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

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Signature Amit Jain 09/05/2025

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Bilaspur, Chhattisgarh

Co-Guided By

Signature 09/05/25

Mr. Satyajit Bhattacharjee
Assistant Professor
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School of Studies of Engineering and Technology
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Bilaspur, Chhattisgarh

Synthesis of Air-Freshener Gel Using Apple Peels

A Project Report

In Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology in Chemical Engineering

Submitted by

Ravi Ranjan Kumar

Aayush Kumar

Anwar Sahil Ali

Dimpal Gautam

Jitesh Meher

Harshit Malang

Session 2023-24

Guided by

Dr. Ghoshna Jyoti

Assistant Professor

Department of Chemical Engineering

Guru Ghasidas Vishwavidyalaya Bilaspur,

Chhattisgarh

Department of Chemical Engineering

School of Studies of Engineering and Technology

Guru Ghasidas Vishwavidyalaya, Koni, Bilaspur, Chhattisgarh

(A central university established by the central university Act, 2009)

CERTIFICATE

Certified that the Major Project Report entitled "**Synthesis of Air-Freshener Gel Using Apple Peels**" submitted by **Ravi Ranjan Kumar, Aayush Kumar, Anwar Sahil Ali, Dimpal Gautam, Jitesh Meher, Harshit Malang** of B.Tech. 6th Semester, in partial fulfilment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

09/05/25

Prof. Amit Jain
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Department of Chemical Engineering
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GGV

Dr. Ghoshna Jyoti
(Assistant Professor)
Department of Chemical Engineering
SoS of Engineering & Technology,
GGV

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A Project Report

On

"Preparation of Herbal Soap Using Neem Leaves"

In Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

RavindraKumar Meena(22021146)

Under the Guidance of

Dr. NeerajChandrakar

Associate Professor

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2024-25

CERTIFICATE

Certified that the Project Report entitled ***"Preparation of Herbal Soap Using Neem Leaves"*** submitted by RavindraKumar Meenaof B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the student their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

Prof. Amit Jain
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02.05.25

Dr. NeerajChandrakar
Supervisor
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A

Minor project report

on

Preparation of cellulose and CMC from southern cattail *(Typha domingensis)*

Submitted in partial fulfillment for

the requirment of the degree of

Bachelor of Technology

in

Chemical Engineering

Submitted by

Sadhana Mall(22021147)

Under the guidance of

Mr. Satyajit Bhattacharjee(Assistant Professor)

Department of Chemical Engineering

School of Studies in Engineering and Technology,

Guru Ghasidas Vishwavidyalaya Bilaspur, Chhattisgarh

May 2025

CERTIFICATE OF APPROVAL

This is to certify that the Minor Project Report entitled **"Preparation of cellulose and CMC from Southern cattail: A review report"** submitted by **Sadhana Mall (Roll No. : 22021147)** in fulfilment of the requirements for the degree of **Bachelor of technology** in **Chemical Engineering** is a record of bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree, diploma, associate-ship, fellowship, or other similar titles to them. We, further certify that the work reported in this project was carried out independently by the candidate.

Approved by

Prof. Amit Jain

Head of Department

Department of Chemical Engineering
SoS of Engineering & Technology, GGV

Guided By

Mr. Satyajit Bhattacharjee

Assistant Professor

Department of Chemical Engineering
SoS of Engineering & Technology, GGV

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Carbon Purification For Industries/Factories

A Minor Project Report

In Partial Fulfillment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Sagar Kumar (22021171)

Under the Guidance of

Dr. Neeraj Chandrakar (Associate Professor)

And

Mr. Satyajit Bhattacharjee (Assistant Professor)

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2025

CERTIFICATE

Certified that the Minor Project Report entitled ***"Carbon Purification For Industries/Factories"*** submitted by Sagar Kumar of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

uided By
ature 09/05/25

Neeraj Chandrakar

ssociate Professor
epartment Of Chemical Engineering
hool of Studies of Engineering and
echnology Guru Ghasidas Viswavidyalaya
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Co-Guided By
Signature_____

Mr. Satyajit Bhattacharjee

Assistant Professor
Department Of Chemical Engineering
School of Studies of Engineering and
Technology Guru Ghasidas Viswavidyalaya
Bilaspur, Chhattisgarh

Approved By

Signature_____

Prof. Amit Jain

Head of Department

Department Of Chemical Enginee
School of Studies of Engineering a
Technology Guru Ghasidas
Viswavidyalaya
Bilaspur, Chhattisgarh

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A Project Report

On

Production of Biodiesel from Coconut Oil Using Acidic Catalyst

Submitted for the partial fulfilment of award of degree of

Bachelor of Technology of the 3rd Year

in

Chemical Engineering

Submitted by

Sagar Raj (22021148)

Guided by

Satyajit Bhattacharjee

Assistant Professor

Department of Chemical Engineering
School of Studies of Engg. and Tech.
Guru Ghasidas Vishwavidyalaya
Bilaspur, Chhattisgarh

Department of Chemical Engineering
School of Studies of Engineering and Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)
May 2025

Department of Chemical Engineering
School of Studies of Engineering and Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur

Certificate

This is to certify that the minor project entitled **Production of Biodiesel from Coconut Oil Using Acidic Catalyst** submitted by **Sagar Raj** (Roll No:22021148), partial fulfilments for the requirements for the award of Bachelor of Technology degree in Chemical Engineering is a Bonafide record of the work carried out by them under my supervision and guidance.

Guided By

Satyajit Bhattacharjee
Assistant Professor
Department of Chemical Engineering
School of Studies of Engg. and Tech.
Guru Ghasidas Vishwavidyalaya
Bilaspur, Chhattisgarh

Approved by

Prof. Amit Jain
Head
Department of Chemical Engineering
School of Studies of Engg. and Tech.
Guru Ghasidas Vishwavidyalaya
Bilaspur, Chhattisgarh

ABSTRACT

The increasing demand for sustainable energy sources has motivated research into biodiesel as a renewable and environmentally friendly alternative to conventional fossil fuels. This study focuses on the production of biodiesel from coconut oil using methanol as alcohol and zinc sulfide as a catalyst through the transesterification process. Coconut oil, a non-edible feedstock with abundant availability, was chosen to avoid competition with food sources.

The transesterification process was carried out by optimizing key parameters such as alcohol-to-oil molar ratio, catalyst concentration, and reaction temperature. There performance in biodiesel production was compared. The biodiesel yield, physical property (specific gravity), and compliance with ASTM standards were analysed.

The results indicate that coconut oil biodiesel produced with methanol achieved a yield (47.29%), with optimal reaction conditions being 65°C and a molar ratio of 1:9. The fuel properties demonstrated close similarity to conventional diesel, suggesting its compatibility with existing combustion engines.

This study highlights coconut oil's potential as a viable feedstock for biodiesel, offering a renewable, cost-effective, and environmentally sustainable alternative. Further exploration into large-scale production and economic feasibility is recommended for transitioning toward greener energy solutions.

A Project Report

DWSIM Simulation of Large-Scale Hydrogen Production via Water Electrolysis Using Renewable Energy Sources.

in partial fulfilment of the requirement for the completion of Third Year B.Tech.
Chemical Engineering

submitted by

Shivam Kumar (220221154)

under the guidance of

Dr. Saurabh Meshram

Associate Professor

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2025

CERTIFICATE

Certified that the Major Project Report entitled ***"DWSIM Simulation of Large-Scale Hydrogen Production via Water Electrolysis Using Renewable Energy Sources"*** submitted by Shivam Kumar of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

Prof. Amit Jain
HoD
Department of Chemical Engineering
SoS of Engineering & Technology, GGV

Dr. Saurabh Meshram
Associate Professor
Supervisor
Department of Chemical Engineering
SoS of Engineering & Technology, GGV

A Generalized ANN Framework for Predicting Extraction Efficiency in Reactive Separation of Organic Acids

A Project Report

In Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Shreyansh Shukla (22021155)

Under the Guidance of

Dr. Vishnu Prasad Yadav

Assistant Professor

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2025

CERTIFICATE

Certified that the project report entitled ***"A Generalized ANN Framework for Predicting Extraction Efficiency in Reactive Separation of Organic Acids"*** submitted by Shreyansh Shukla of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

Prof. Amit Jain
HoD
Department of Chemical Engineering
SoS of Engineering & Technology, GGV

9/5/25
Dr. Vishnu Prasad Yadav
Supervisor
Department of Chemical Engineering
SoS of Engineering & Technology, GGV

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A Project Report

on

FORMULATION OF LIQUID HANDWASH

In Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Sujit kumar (22021158)

Under the Guidance of

Dr. Neeraj Chandraker (Associate Professor)

And

Dr. Satyajit Bhattacharjee (Assistant Professor)

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2025

CERTIFICATE

Certified that the Major Project Report entitled ***"Formulation of Liquid handwash"*** submitted by Sujit Kumar of B.Tech. 6th Semester, in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

09.05.25

Prof. Amit Jain
HoD
Department of Chemical Engineering
SoS of Engineering & Technology, GGV

Dr. Neeraj Chandraker
And
Dr. Satyajit Bhattacharjee
Supervisor
Department of Chemical Engineering
SoS of Engineering & Technology, GGV

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A Review on

"REACTIVE EXTRACTION OF CITRIC ACID"

A Project Report

In Partial Fulfilment of the Requirement for Award of Degree of

Bachelor of Technology of the 3rd Year in Chemical Engineering

Submitted By

Tejavath Veeranna (22021161)

Under the Guidance of

Dr. Vishnu Prasad Yadav

Assistant Professor

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

May 2025

CERTIFICATE

Certified that the Major Project Report entitled " **A Review on Reactive Extraction of Citric Acid**" submitted by Tejavath Veeranna of B.Tech.(6th Semester), in partial fulfillment of the requirements for the award of degree in Bachelor of Technology (B. Tech) in Chemical Engineering, is according to the students their own investigation carried out by them in the Department of Chemical Engineering, School of Studies of Engineering & Technology, GGV, during the session 2024-25.

9/5/28

Prof. Amit Jain
HOD

Department of Chemical Engineering

SoS of Engineering & Technology, GGV

Dr. Vishnu Prasad Yadav
Supervisor

Department of Chemical Engineering

SoS of Engineering & Technology, GGV

ABSTRACT

Citric acid, a widely used organic acid in food, pharmaceutical, and chemical industries, has seen a continuous increase in global demand. Traditional methods for its recovery are often energyintensive and inefficient. This project explores reactive extraction as a more effective alternative for citric acid separation. The study focuses on the use of tri-n-octylamine (TOA) as an extractant in various diluents such as octanol, cyclohexanol, iso-butyl alcohol, and paraffin oil. Experiments were conducted for both physical and reactive extraction, highlighting the superior performance of TOA-based reactive systems. The extraction efficiency improved significantlyup to 90%-when TOA was used in combination with suitable diluents. Furthermore, the process was enhanced by back-extraction using sodium carbonate as a stripping agent, enabling solvent recycling. The optimized setup demonstrates a sustainable approach for citric acid recovery, particularly from biomass sources like oil palm empty fruit bunches post-biocatalytic conversion.

Project Report on

This study used Red flower's Leaves of Banana to prepare carboxy Methyl Cellulose (CMC)

Submitted in partial fulfilment of the requirement of Credits in Third year of

Bachelor of Technology in Chemical Engineering

Submitted by

Group No:-06

Sandeep kumar

B.tech 6th semester

Date:-09/05/25

Session 2024-25

Guided by: -

Dr. Neeraj Chandrakar

Associate Professor

Co-Guided by: -

Mr. Satyajit Bhattacharjee

Assistant Professor

Department of Chemical Engineering

School of Studies of Engineering and Technology

Guru Ghasidas Vishwavidyalaya, Koni, Bilaspur, Chhattisgarh

(A central university established by the central university Act, 2009)

CERTIFICATE OF APPROVAL

This is to certify that the project entitled **"Preparation of Carboxy Methyl Cellulose(CMC) from Banana Flower's leaves"** submitted by Sandeep Kumar Roll No(22021151) in partial fulfilment of the requirements of Credits in Third year of **Bachelor of Technology, Chemical Engineering** is a record of Bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree, diploma, associate-ship, fellowship, or other similar titles to them. We, further certify that the work reported in this project was carried out independently by the candidate.

Sandeep Kumar

Roll No:-22021151

This is to certify that the above statement made by the students is correct in the best of my knowledge.

Date: 02/05/25

Approved by

Professor. Amit Jain

Head
Department of Chemical Engineering
School of studies of Engineering and Technology.
Guru Ghasidas Vishwavidyalaya
Bilaspur, Chhattisgarh.

Guided by

Dr. Neeraj Chandrakar

Associate Professor Che.

Co-Guided by

Mr. Satyajit Bhattacharjee

Assistant Professor Che.

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