



# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



## Biotechnology Department

## Biotechnology Department

## B.Tech Fifth Sem (NEP)

### BBT33501: Bioprocess Engineering

Course Code	Course Outcomes
BBT33501.1	Describe types and principles of fermentation anaerobic, batch, and continuous conditions
BBT33501.2	Formulate fermentation media principles under physical and chemical constraints
BBT33501.3	Analyze microbial growth, substrate, and product kinetics relation to inoculum development and fermentation conditions
BBT33501.4	Explain fermenter design and QA/QC practices and sterility requirements
BBT33501.5	Compare the production processes of industrial products as citric acid, antibiotics, and vitamins under specified conditions



# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



## Biotechnology Department

## Biotechnology Department

## B.Tech Fifth Sem (NEP)

### BBT33502: Genetic Engineering and rDNA Technology

Course Code	Course Outcomes
BBT33502.1	Explain role of enzymes to modified DNA by r technology.
BBT33502.2	Discussed the types of vector used for cloning and expression of gene.
BBT33502.3	Demonstrate the principle of various PCR to amplify the gene sequences
BBT33502.4	Illustrate different selection techniques for visual identification of recombinants
BBT33502.5	Compare application of genetic engineering in different fields



# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



## Biotechnology Department

## Biotechnology Department

## B.Tech Fifth Sem (NEP)

### BBT33503: Fluid Mechanics and Solid Handling

Course Code	Course Outcomes
BBT33503.1	<b>Examine</b> the nature of fluid and fluid flow under theoretical and lab-scale conditions.
BBT33503.2	<b>Apply</b> the techniques for measuring fluid flow using standard flow measurement devices in laboratory settings.
BBT33503.3	<b>Examine</b> the working and classification of pumps in typical hydraulic system environments.
BBT33503.4	Summarize the theories of crushing and crushers in the context of mechanical operations.
BBT33503.5	Outline the processes of filtration and mixing in a bioreactor during bioprocess operations.



# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



## Biotechnology Department

## Biotechnology Department

## B.Tech Fifth Sem (NEP)

### BBT33504: Bioprocess Engineering lab

Course Code	Course Outcomes
BBT33504.1	Demonstrate isolation and preservation techniques relevant microorganisms
BBT33504.2	Compare microbial growth under varying parameters to assess environmental influences on kinetics
BBT33504.3	Formulate and optimize fermentation media using statistical tools and design approaches
BBT33504.4	Evaluate sterilization methods based on their effectiveness in fermentation processes.
BBT33504.5	Calculate microbial growth rate and yield using batch fermenter data and titration methods.



# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



## Biotechnology Department

## Biotechnology Department

## B.Tech Fifth Sem (NEP)

### BBT33505: Genetic Engineering and rDNA Technology Lab

Course Code	Course Outcomes
BBT33505.1	Explain the banding Pattern of DNA fragments on Agarose gel
BBT33505.2	Perform the isolation and identification of given DNA samples.
BBT33505.3	Demonstrate the technique of amplification and elution of DNA from gel
BBT33505.4	Execute the method of transformation of in bacteria.
BBT33505.4	Analyze the different banding pattern on agarose and SDS-PAGE



# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



## Biotechnology Department

## Biotechnology Department

## B.Tech Fifth Sem (NEP)

### BBT33506: Fluid Mechanics and Solid Handling lab

Course Code	Course Outcomes
BBT33505.1	Classify the flow regime as laminar or turbulent by observing fluid behavior using Reynolds apparatus.
BBT33505.2	Explain the relationship between pressure, velocity, and elevation through Bernoulli's theorem experiment.
BBT33505.3	Apply the coefficient of discharge using orifice meter, venturimeter, and notches in lab experiments.
BBT33505.4	Apply the friction factor in pipe flow using friction factor test setup.
BBT33505.5	Calculate average particle size, crushing efficiency, and filtration performance through particle technology experiments.



# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



## Biotechnology Department

## Biotechnology Department

## B.Tech Fifth Sem (NEP)

### BBT33507- Biopharmaceutical Technology

Course Code	Course Outcomes
BBT33507.1	Summarize the scope and products of biopharmaceutical technology in comparison to traditional pharmaceuticals.
BBT33507.2	Describe production and regulatory processes under quality control and assurance requirements.
BBT33507.3	Analyze formulation and stabilization strategies under conditions relevant to biopharmaceutical development
BBT33507.4	Evaluate analytical techniques for characterization and regulatory compliance in product validation
BBT33507.5	Apply knowledge of market trends and therapeutic uses to solve commercialization challenges in biopharmaceuticals.



# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



## Biotechnology Department

## Biotechnology Department

## B.Tech Fifth Sem (NEP)

### BBT33508- Introduction to Bioinformatics

Course Code	Course Outcomes
BBT33508.1	Explain bioinformatics applications in genomics, proteomics, and drug discovery
BBT33508.2	Classify biological databases for effective data retrieval
BBT33508.3	Compare alignment tools and matrices to assess sequence similarity.
BBT33508.4	Predict gene/protein structures using bioinformatics tools.
BBT33508.5	Evaluate phylogenetic trees and docking results for evolutionary and drug insights.





# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



## Biotechnology Department

## Biotechnology Department

## B.Tech Fifth Sem (NEP)

### BBT33509- Bioremediation and Biodegradation

Course Code	Course Outcomes
BBT33509.1	Classify bioremediation principles and types based on pollutant degradation processes
BBT33509.2	Explain microbial and enzymatic mechanisms under varying environmental conditions.
BBT33509.3	Analyze pollutant-specific bioremediation strategies with respect to microbial interactions
BBT33509.4	Apply bioremediation technologies and monitoring tools to manage contaminated sites
BBT33509.5	Evaluate field-based case studies to identify challenges and innovations in bioremediation



# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



## Biotechnology Department

## Biotechnology Department

## B.Tech Fifth Sem (NEP)

### BBA33501: Digital Marketing and Content Development

Course Code	Course Outcomes
BBA33501.1	Explain fundamental concepts of marketing within the context of the digital marketing environment
BBA33501.2	Evaluate digital marketing strategies and online platforms to determine their effectiveness in reaching target audiences
BBA33501.3	Apply social media tools and techniques for brand communication and campaign execution
BBA33501.4	Design content types and formats according to specific audience needs and platforms
BBA33501.5	Develop interactive, plagiarism- free content as per content writing standards and legal regulations



# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



## Biotechnology Department

## Biotechnology Department

## B.Tech Fifth Sem (NEP)

### BBT35310: Bioterrorism and National Security

Course Code	Course Outcomes
BBT35310.1	Explain the concept, history, and evolution of bioterrorism in the context of emerging biological
BBT35310.2	Classify bioterrorism agents based on their types and modes of action
BBT35310.3	Describe dispersal techniques used in past bioterrorism events.