



# Biotechnology Engineering

What it means to be a Biotechnology Engineer!

**Gajendra Circle Initiative (GCI) from IIT Madras Alumni Association and The Hindu Group**

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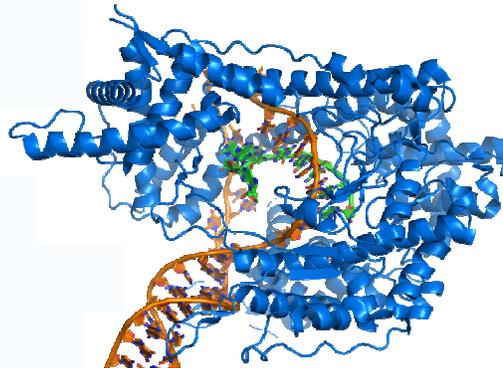
## What it means to be a Biotechnology Engineer!

### Introduction

Biotechnology is a field of applied biology that involves the use of living things in engineering, technology, medicine, and other useful applications. Modern use of the term includes genetic engineering as well as cell and tissue culture technologies. The concept encompasses a wide range (and history) of procedures for modifying living organisms according to human purposes that goes back to domestication of animals, cultivation of plants and "improvements" through breeding programs, employ artificial selection and hybridization. By comparison to biotechnology, bioengineering is generally thought of as a related field with its emphasis more on higher system approaches (not necessarily altering or using biological materials directly) for interfacing with and utilizing living things. The United Nations Convention on Biological Diversity defines biotechnology as:

"Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use."

Biotechnology draws on the pure biological sciences (genetics, microbiology, animal cell culture, molecular biology, biochemistry, embryology, cell biology) and in many instances it is also dependent on knowledge and methods from outside the sphere of biology (chemical engineering, bioprocess engineering, information technology, and biorobotics). Conversely, modern biological sciences (including even concepts such as molecular ecology) are intimately entwined and dependent on the methods developed through biotechnology and what is commonly thought of as the life sciences industry.



### What You Learn in Biotechnology Engineering?

You will learn how to use cells and microorganisms to produce, for example, better medicines, foods or agricultural products that won't harm the environment.

The Biotechnology programme consists of:

- Biochemistry, which deals with the chemistry of living organisms
- Molecular biology, which is the study of biology on a molecular level
- Gene technology, which deals with the manipulation of organisms' genetic structures

#### Core Courses and Topics in Biotechnology:

- Human Biology
- Cell Biology and Biological Systems
- Chemistry
- Structural Biochemistry
- Biological Chemistry
- Plant Science
- Microbiology
- Protein Science
- Molecular Genetics
- Metabolism
- Immunology
- Physical Chemistry
- Organic Chemistry
- Environmental Microbiology
- Genomics and Bioinformatics
- Food Microbiology

### Opportunities

Like in Information Technology sector, Biotechnology in India is also throwing up tremendous scope for growth and contributing to the total biotech market worth US \$100 billion. The country has a global market worth \$91 billion and there is a scope for cheap R&D through bio-partnering and co-developing technologies mainly with Chinese and American companies. More and more global pharmaceutical companies are seeking India to set their research and development centers here.

A biotechnologist may find jobs in various quarters. In India Students can mainly explore job options in the following fields:

- Drug and pharmaceutical research
- Public funded laboratories
- Chemicals
- Environment control
- Waste management
- Energy
- Food processing &
- Bio-processing industries

The government institutes and organisations, such as Department of Biotechnology (DBT), several agriculture, dairy and horticulture institutes offer employment to Biotechnology professionals.

In private sector, there are tremendous job openings for biotechnologists that have their own R&D units. Some of the premier companies that offer Biotechnology professionals with handsome pay-package are:

- Dabur
- Ranbaxy
- Hindustan Lever
- Dr Reddy's Labs

There are also sample opportunities available for biotechnologists in:

- Food processing industry
- Chemical industry
- Textile industry.

Some industries employ biotechnologists in their marketing divisions to develop business in sectors where their products would be required. There are many opportunities in government labs as well.

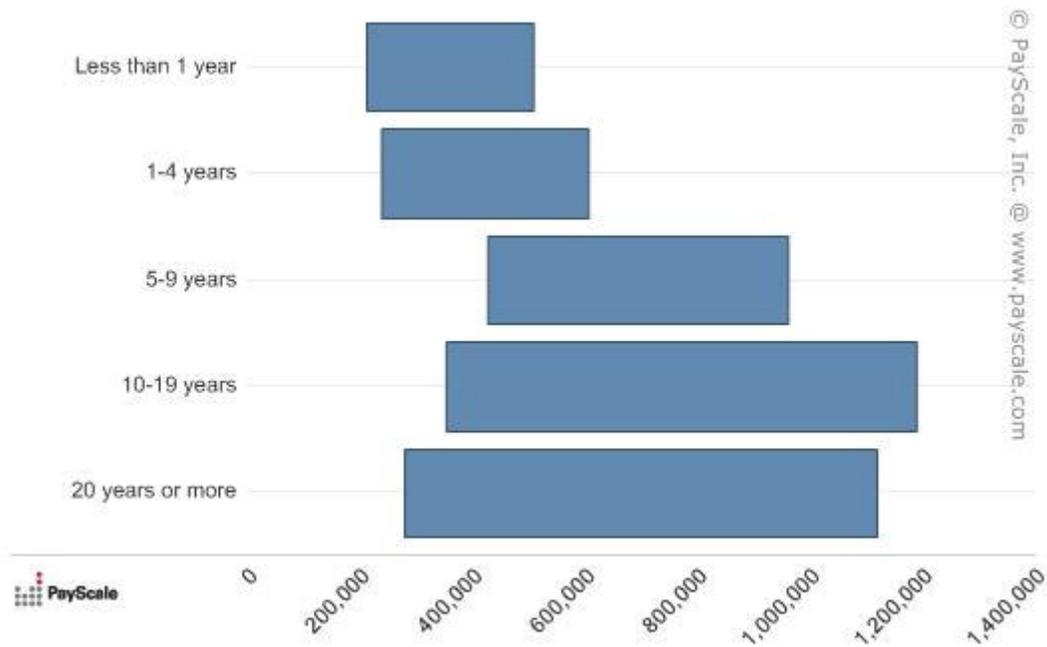
The major companies, which hire biotechnologists, are

- Hindustan Lever,
- Thapar Group,
- Indo American Hybrid Seeds,
- Biocon India Ltd.,
- IDPL
- Hindustan Antibiotics etc.

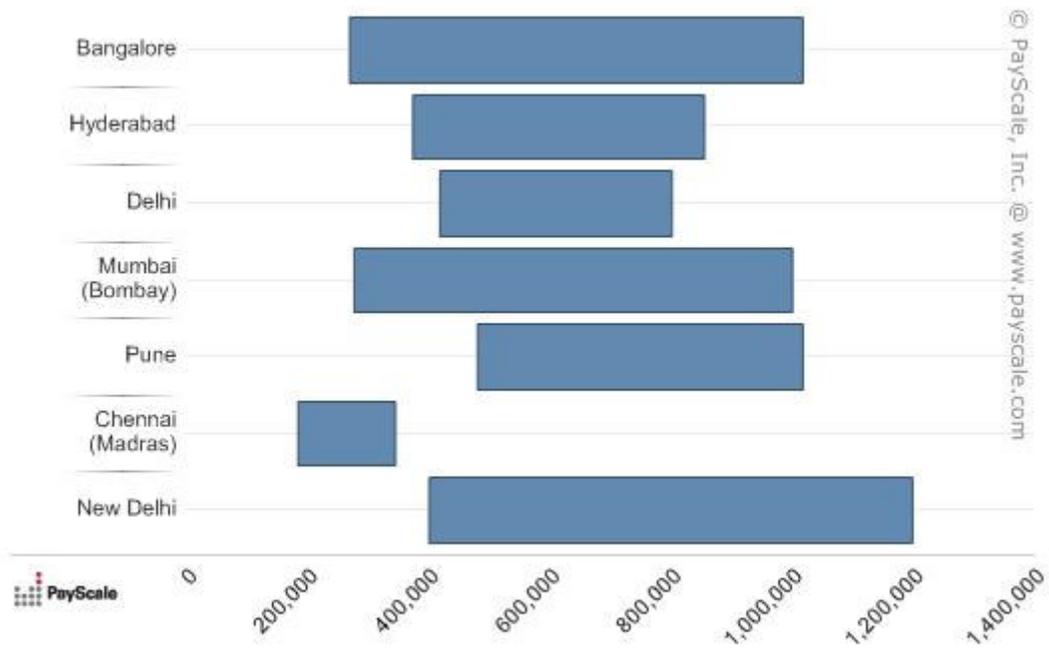
## Salary Profile

This section provides salary profile of biotechnology engineers in India based on years of experience, city of employment, type of employer.

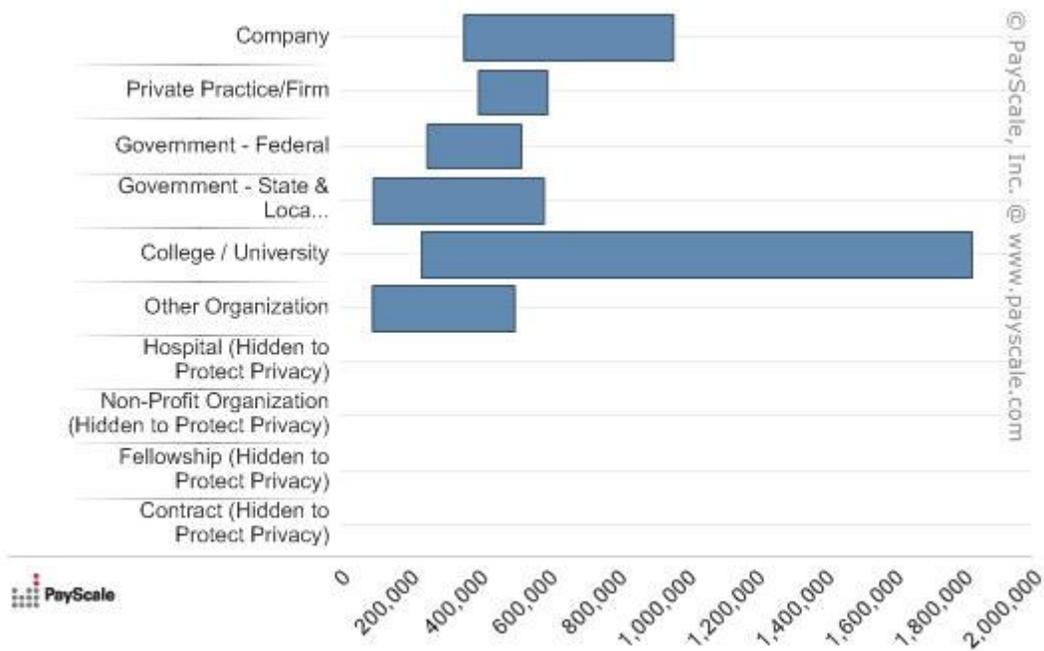
### Salary Range for Biotechnology Engineers (Years of experience)



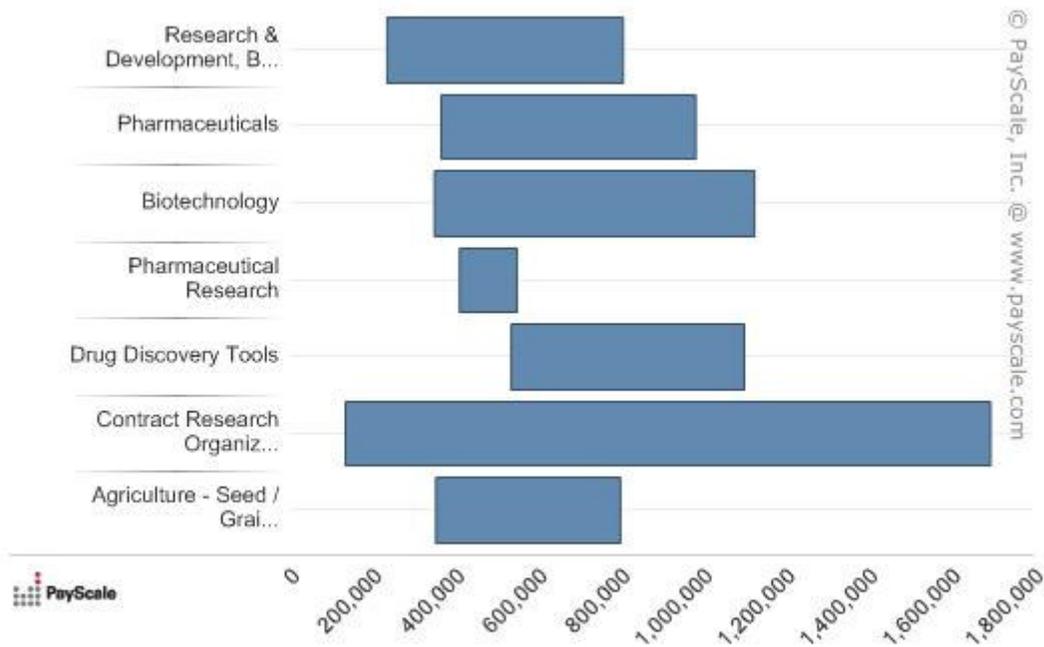
### Salary Range for Biotechnology Engineers (by City)



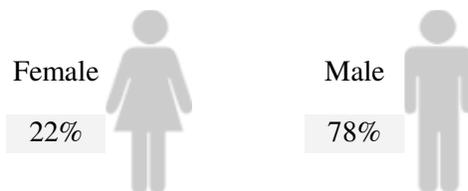
### Salary Range by Type of Employer for Biotechnology



## Popular Industry & Salary Range



## Gender Profile



## Current state of Biotechnology sector leadership vacuum

Managers who understand marketing and financial planning, as well as the day-to-day realities of the laboratory, are essential for the successful growth of the biotech industry. Recently, much has been written about the "management vacuum" now faced by the biotech industry. Industrialised countries around the world have reported a serious lack of leadership skills that holds back the growth of biotech business there as well.

Studies show that an unprecedented number of PhDs - approximately 95% of life science doctorates - are moving from the purely academic realm into the workforce. Although being a successful researcher is an important part of the job, this alone does not guarantee success in the ever-growing biotech industry. According to the Biotechnology Industry Organization, the 1,500 biotech companies in the U.S. have combined earnings of over \$40 billion - and business is booming. The need for skilled workers who are able to bridge the gap between science and business is overwhelming.

As Nature Jobs writer Virginia Gerwin puts it, "You may be an expert on recombinant DNA, but the business world is about making a return on an investment."

Leaders in the biotech business are lamenting on the lack of such talents as basic leadership and communications skills, competitive budgeting, and viable analysis. In short, most biotech scientists are simply out of the loop when it comes to the question of what customers want - or will pay for. There is a tendency not to look to the scientists whose discoveries make the company's success possible. When a scientist wants to move to a position of management within his or her own company, the "let them stay in the lab" mentality rears its head. Often, this arises from fear of losing a good scientist. Yet, who better than a scientist - who understands the products from the ground up - with a little business acumen to help fill the gaps in the biotech leadership sector?

Understanding business is valuable even for a scientist who has no desire to enter the world of entrepreneurship. In one way or another, at some point in a biotechnology career, scientists will face or be affected by business decisions. One way to gain experience in this area is through business courses, many are offered jointly by various universities and companies. For more business-minded scientists, a biotechnology MBA offers a comprehensive grounding in the two fields.

## Reference

This report has been compiled based on the following publications.

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- <http://www.worldwidelearn.com/online-education-guide/science/biotechnology-major.htm>
- <http://studyindenmark.dk/study-programmes/programmes-in-english/biotechnology-engineering>  
<http://www.naukrihub.com/india/>
- <http://www.indiastudychannel.com/resources/9625-Biotechnology-its-career-prospects.aspx>
- <http://www.aiu.edu/Bachelor%20of%20Biotechnology.htm>
- [http://www.payscale.com/research/IN/Job=Research\\_Scientist%2c\\_Biotechnology/Salary/by\\_Industry](http://www.payscale.com/research/IN/Job=Research_Scientist%2c_Biotechnology/Salary/by_Industry)

## About Gajendra Circle

Gajendra Circle (GC) Initiative is a subset of IITM alumni association, and is aimed at building the IIT Madras brand and strengthening the Institute resources. It has been structured as a collection of city specific cells. GC Hyderabad was constituted in April 2010 with the aim to take up activities which strengthen IIT Madras and have a good resonance with the core team.

## About Adayana

Adayana is a leading Human Capital Development organization with its headquarters in Indianapolis, IN, USA and offices across Americas, EMEA, Asia. Adayana provides comprehensive learning services that leverage best-of-class and proprietary technologies and processes.

For four subsequent years, from 2006 to 2009, TrainingOutsourcing.com recognized us as one of the "Top 20 Companies in the Training Outsourcing Industry" for its unique and diverse capabilities. In 2007, 2008 and 2009 Adayana has been named to the Inc. 500 list of America's 500 fastest growing

companies. Adayana offers e-Learning, instructor-led training, mobile learning, gameware and performance support tools to its customers for improving human capital performance.

Adayana India (based in Hyderabad) focuses on India and Asia markets - serving large multinationals in the Automotive, IT/ITES, Healthcare, Agriculture & Food and other verticals. Adayana is a leading player in skill development and capacity building and has partnered with leading universities and colleges to provide finishing school content to improve employability of students.

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