

Elixir

“The potential for Biotechnology and synthetic biology is vast, we all have an opportunity to create the future together.” - Ryan Bethencourt

Biotechnology refers to any technology, process or practice that modifies or harnesses any living organism or system to be useful to any human purpose. Biotechnology is all around us and is already a big part of our lives, providing breakthrough products and technologies to combat disease, reduce our environmental footprint, feed the hungry, and make useful products.

Problem Statement

Participants are invited to come up with innovative new Prototype or Ideas that will help in efficiently solving one or more Problems mentioned below.

Note:

The following Sectors are just guidelines to help you. You are free to think like an unconventional thinker and come up with great innovations. So do not limit yourselves to these problem statements.

Sectors

1. Health Care (Red Biotechnology):

Biotech is helping to heal the world by harnessing nature's own toolbox and using our own genetic makeup to heal and guidelines of research. Biotechnology has offered modern medical devices for diagnostic and preventive purposes, which include point of care diagnostic test kits, Bio transfer Mechanisms and radio-labelled biological therapeutics used for imaging and analysis. Human health is a major growing concern worldwide because of infectious diseases. Biotechnology has played a dynamic role in improving the challenges regarding human health as it has flexibility to reduce global health differences by the provision of promising technologies.

Eg: Filter created for Cigarettes, which minimizes the chemicals in Smoke.

2. Food and Agriculture (Green Biotechnology) :

Agricultural biotechnologies are required in large extent in crops, livestock, forestry, fisheries and aquaculture and agro-industries, to alleviate hunger and poverty, assist in adaptation to climate change and maintain the natural resource base. Biotech improves crop insect resistance, enhances crop herbicide tolerance and facilitates the use of more environmentally sustainable farming practices.

Eg:Development and release of genetically modified organisms (GMO).

3. Environmental Conservation and Industry (White Biotechnology):

Biotechnological tools are required for conservation of energy crisis, global warming, and climate changes, endangered plant species, controlling environmental pollution restoring environmental quality, developing cleaner technologies etc.

Sub-Themes:

- a. Application of synthetic biology, including cell and molecular biology and systems biology, such as tissue culture, genetic engineering, DNA-based breeding.
- b. Biomass production, including biomass enhancement methods such as abiotic stress tolerance, cultivation, harvest and drying, storage, transportation, logistics, and biomass management..
- c. Separation and process technology, including separation and purification of biofuels and chemicals.
- d. Biomass bio refinery, including the production and recovery of bio based byproducts or coproducts with high values
- e. Industrial development, including system approaches to cultivation, harvest, supply, and biomass process into bio products.
- f. Economic and environmental analysis of biomass and bioenergy production, including life cycle assessment, environmental impact assessment, net energy efficiency of biofuels systems, and cost-benefit analysis.

4. Aquaculture and Fisheries (Blue Biotechnology):

Aquaculture, or the farming of aquatic animal and plants species, represents one of the fastest-growing food production sectors. Along with important issues including environmental impact concerns and the promotion of aquaculture as a successful long-term industry, producers are increasingly examining the role biotechnology can play in sustained growth. Appropriate research areas include disease control, and reproduction, growth, development and nutrition of the cultured species, water management etc. Potential commercial applications include enhanced growth rates, appropriate stock maturity regimes, more efficient food conversion, improved disease resistance and control, and efficient selective breeding programmes.

4. Bio sensing technology:

A Biosensor is an analytical device, used for the detection of an analyte, that combines a biological component with a physicochemical detector. The sensitive biological element (e.g. tissue, microorganisms, organelles, cell receptors, enzymes, antibodies, nucleic acids, etc.) is a biologically derived material or biomimetic component that interacts (binds or recognizes) with the analyte under study. Bio-sensing technologies are of increasing importance in healthcare, agro-food, environmental and security sectors, and this is reflected in the continued growth of global markets for such technologies.

Sub-Themes:

a. Biomarkers: Development and discovery of new biological molecules and systems for integration in bio-sensing applications. For example, novel molecules integrated with silicon components at the micron and Nano-scales; biological targets for sensing technologies.

b. Sensor technology

Novel sensing technologies developed for bio-sensing applications including **point of care devices** like optical, electrochemical, piezoelectric or magnetic measurements; novel sensors for bio imaging. Micro and Nano fabrication technologies used to develop and manufacture bio/sensors.

c. Instrumentation and data processing

Challenges associated with measuring signals generated by biosensor technologies to enable the utilization of bio-sensing systems. Potential solutions relating to the development of new Instrumentation, signal and image processing, data analysis and communications.

d. System Integration

Issues associated with integrating technologies to produce a working bio-sensing system. This could include technical interfacing challenges such as sample introduction and handling through to aspects of commercialisation and adoption of bio-sensing technology into chosen markets.

5. Biomimicry:

The vast opportunities for biomaterials design and functionality enabled by mimicking nature continue to stretch the limits of imagination. As both biological understanding and engineering capabilities develop, more sophisticated biomedical materials can be synthesized that have multifaceted chemical, biological and physical characteristics designed to achieve specific therapeutic goals. Mimicry is being used in the design of polymers for biomedical applications that are required locally in tissues, systemically throughout the body, and at the interface with tissues.

6. Drug Delivery Mechanisms:

Drug delivery is becoming a whole interdisciplinary and independent field of research and is gaining the attention of pharmaceutical makers, medical doctors and industry. The existing drug delivery mechanism suffers from some specific problems that researchers are trying to address. For example, many drugs' potencies and therapeutic effects are limited or otherwise reduced because of the partial degradation that occurs before they reach the desired target in the body. The **goal** of all sophisticated drug delivery systems, therefore, is to deploy medications intact to Specifically targeted parts of the body through a medium that can control the therapy's Administration by means of either a physiological or a chemical trigger.

7. DNA Fingerprinting:

DNA fingerprinting is based on the distribution of small repetitive elements called "minisatellites" that are contained in the cellular DNA, or deoxyribonucleic acid, of an organism. Since each cell of an organism contains the same DNA, the technique can be used to identify individuals. Several techniques are available to visualize the distribution pattern of mini-satellites with applications in genetic research, paternity testing, family genealogy, agriculture and forensic genetics for crime investigation.

8. Sanitation:

Sanitation is a complex sector having direct impact on the health and well-being of this world's future generations. Sanitation Biotechnology is directed towards developing appropriate bacteriophage and similar biocontrol technologies of disinfection catering to the needs of developing nations where poor sanitation causes huge malnutrition problem. Water treatment has also assumed importance in recent years with the increasing demand on this limited resource and pollution parameters arising out of discharge from untreated/partially treated effluents.

Septic tank management, Bio-Toilet and Bio digester, Toilet and Surface Cleaning Agents are also some fields which is in need of new innovations for the society.

Importance and Motivation

Biotechnology can be a **great solution** to humankind struggles. Because of the advancement of thorough research and development, the importance of biotechnology has come to existence. It is a field in biology that is extensively used in engineering, medicine, science and technology, agriculture and other valuable form of applications.

Eligibility

- 1) Individuals or teams from the following categories are allowed:
 - a. Students/research scholars of authorised institutions (Students have to Show their Valid College ID).
 - b. Early stage start-ups OR up to 3 years old college passouts.
- 2) A team is allowed to have maximum 4 members.
- 3) If the participating team feels that their idea requires more participants in their team, they can forward their request, with suitable reasons, to elixir@techfest.org with the subject "Ideate: Team number increase request".

Registration and Submission

The Participants have to register on the official Techfest Website and fill all the necessary details : www.techfest.org > Ideate >Elixir> Register.

Abstract Submission:

Teams will be required to submit one report to elixir@techfest.org. This report should contain the idea they are looking forward to work on.

Abstract Format

1. Title
2. Sectors
3. Background and Research:
 - a. Present methods of tackling the problem (if any)
 - b. Limitations of present solutions.
 - c. Alternate approaches
 - d. Proposed Solution
 - e. Novelty of Approach: How is or will be your solution better than existing products and overcome Previous limitations?

4. Problems it solves and its Beneficiaries
5. Plan (with timeline) and current status
6. Technical Details:
 - a. Technical aspect of the proposed solution.
 - b. Detailed technical specifications and Pictorial representations (block diagrams/ flow chart).
 - c. Description of the flow of operations demonstrating key features and functionality.
 - d. Performance estimate of the solution.
 - e. Experimentation done to establish the workability of the above.
7. A link of the Google Drive Folder, which contains Pictures and Video of the working model/ prototype.
8. Results
 - a. Actual findings, significant output of tests and analysis (Must be readable)
 - b. Include problems encountered, credibility of results, accuracy estimates
 - c. Pros and cons of your solution
 - d. Utility of results
9. Future prospects and research in it and further development (in brief)
10. Any other Details: (Patent/ Business plan etc.)

Submission Format:

The project report should be emailed to elixir@techfest.org with the subject Ideate: elixir Project Report: Team Id (For example Ideate: Elixir XYZ1234). Teams must follow the following details for the submission:

1. The abstract must be submitted in pdf format only
2. Font: Arial
3. Size: 11
4. Spacing between two lines: 6 pts
5. Spacing between two paragraphs: 10 pts
6. Bottom margin: 1 inch

EVALUATION

- 1. Creativity and novelty:** How novel is the idea? How different is it from the current solutions available? The innovation must be ingenious and novel in its area of application and should have a high potential for leaving an impact on the society.
- 2. Originality:** The innovation should not, by any means, be or include copied or stolen work, such applications will be disqualified immediately.
- 3. Performance**
- 4. Cost/Market Value and Acceptance**
- 5. Durability and Usability:** Durability of the prototype/method proposed.
- 6. Implementation ability:** Is the solution implementable as described? Is it repeatable? Is the solution feasible for diverse and changing conditions?
- 7. Scalability:** Is the solution scalable to a higher level? how easy is it to scale up and what are the factors affecting it
- 8. Potential of Impact:** How does it benefit society? The Scale of problem it solves, Intensity of the solution and number of people catered from the solution directly and indirectly.
- 9. Design:** has the design been considered? How optimized is the product?
- 10. Ergonomics** (if the team decides to make a well-designed product)

In case of any discrepancies, the decision of the organizers or Judges will final and binding on all.

SHORTLISTING

Top 20 teams will be selected and would get the chance to present their model/idea in the Final Round at Techfest, IIT Bombay which is from 29th-31st December, 2017.

General Rules

1. All projects being displayed will have a fair chance of receiving further development opportunities offered by funding organizations and Venture capitalists.
2. Every team has to register online on our website for the competition. A Team ID will be allocated to the team on registration, which shall be used for future references.
3. A team can register at any point of time before 9th November 2017 and can submit final abstract and video (as mentioned in the structure).
4. The decision of the organizers or judges shall be treated as final and binding on all. Techfest has all the rights to verify the identity and accuracy of the details provided by the participants.
5. No responsibility will be held by Techfest, IIT Bombay for any late, lost or misdirected entries.
6. The idea presented by the teams should be original (not protected by means of patent/copyright/technical publication by anyone).
7. Note that at any point of time the latest information will be that which is on the website. However, registered participants will be informed through mail about any changes on the Website.
8. All mode of official communication will be through the Techfest's e-mail.

International Participants

All international participants will have to register before 9th November 2017, and will have to submit the complete report along with video prototype before 9th November 2017. The shortlisted international teams details will be put up on the website by 14th November 2017.

Certificate policy

Only those teams that are shortlisted for the finals and give a final presentation about their work during Techfest 2017-18 would be awarded a Certificate of Participation. The top entries from this event would be provided with Certificate of Excellence.

Timeline

First Project Report Submission	8th September 2017	Submission of First Draft Report
Mentorship Stage	25th September to 24th October 2017	Mentors will be allocated for the guidance of the participants.
Last Date of Registration	9th November 2017	Participants need to register before this date.
Final Project Report Submission	9th November 2017	Submission of final project report along with video prototype (if any) has to be submitted before this date.
Declaration of Result	27th November 2017	Declaration of shortlisted teams for final presentation at Techfest, IIT Bombay based on final report and the supporting materials.
Improvisation Stage	27th November to 14th December 2017	Shortlisted participants are to improve upon their model and prepare a presentation for the final round.
Final Presentation and Video submission	15th December 2017	Participants have to submit the final video of prototype and presentation to be displayed during the festival before this date.
Presentation Stage	29th-31st December 2017	Final presentation along with demonstration of working prototype.