

**Department of Biotechnology**

**Course Design Review**


**Action Taken Report of the University on the  
Feedback of Stakeholders**

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## Department of Biotechnology

### 1. Action Taken Report Approved in Board of Studies dated 08<sup>th</sup> April 2017 and implemented with effect from August 2017

Observations/ Recommendations based on feedback	POs impacted
<p><b>Employers Feedback:</b></p> <ol style="list-style-type: none"><li>1. Students need to improve the ability of problem solving skills.</li><li>2. Students need to improve the ability to usage /knowledge of modern tools.</li><li>3. Scale-up studies and concepts of SSF (Solid State Fermentation) need to include in the curriculum for enhanced employability.</li></ol> <p><b>Teachers Feedback (Pre-BoS and BOS MoM):</b></p> <ol style="list-style-type: none"><li>1. Students need to improve the ability to apply knowledge of mathematics and basic science.</li><li>2. The content of metabolism (Course: Enzyme Technology &amp; Metabolism) can be included in the Biochemistry course.</li><li>3. New concepts (kinetics &amp; applications of enzymes) related to enzyme technology can be included in this course.</li></ol> <p><b>Students Feedback:</b></p> <ol style="list-style-type: none"><li>1. The Department needs to provide opportunity for improving problem solving skills. The related courses need to be modified.</li></ol> <p><b>Alumni Feedback:</b></p> <ol style="list-style-type: none"><li>1. Students need to enhance capabilities for design and development of solution.</li><li>2. Application related content need to be included in Cell &amp; Molecular Biology course.</li></ol>	<p><b>PO1- Engineering Knowledge</b></p> <p><b>PO2- Problem Analysis</b></p> <p><b>PO3- Design / Development of solutions</b></p> <p><b>PO5- Conduct investigation of complex problems</b></p> 

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Actions taken	Course Revised/ Added	BoS approved Date
<p><b>Action 1:</b> To inculcate better problem solving skills for selected courses (e.g. Unit operations-I 17EBTF201), more problem solving sessions are planned.</p> <p><b>Action 2:</b> To strengthen problem analysis skills and interpretation skills, implementation of statistical analysis approach (regression analysis and ANNOVA) in Bioprocess Engineering lab course (15EBTP303).</p> <p><b>Action 3:</b> Content modification of few courses related to Molecular Biotechnology vertical was done to provide recent technical developments. Also conceptual problem solving exercise will be practiced for courses: Cell &amp; Molecular Biology (15EBTC 205) and Genetic Engineering and Applications (15EBTC301).</p>	<p><b>Content modification:</b>            Biochemistry            Enzyme Technology            Genetic Engineering &amp; Application            Biological            Thermodynamics</p> <p><b>Problem solving sessions:</b>            Unit Operations-I            Reaction Engineering            Biological            Thermodynamics            Bioprocess Engineering            Lab</p>	<p>08/04/2017</p>
<p><b>Action 4:</b> Implementation of project based learning in Bioinformatics Lab (15EBTP302) to enhance usage of modern tools for 3-Dimensional structure analysis of Biomolecules.</p> <p><b>Action 5:</b> Content modification for few courses to teach applications of modern tools used in Bioprocess Industry. Example, introduction of concepts of fluidization and fluidized bed bioreactor in course Unit Operations-II (17EBTF202). Introduction of a module on heterogeneous reaction system to address the Bioreactor configuration and their performance equations in course: Reaction Engineering (15EBTC303).</p>	<p><b>Content modification:</b>            Bioinformatics            Enzyme Technology            Unit Operation-II</p>	<p>08/04/2017</p>

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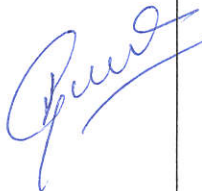
Actions taken	Course Revised/ Added	BoS approved Date
<p><b>Action 6:</b> A new pedagogical approach will be practised for Bioprocess Engineering course (15EBTC306) to provide conceptual problem solving skills for Bioprocess scale-up.</p>	<p><b>Content modification &amp; course delivery:</b> Molecular Biology</p> <p>Genetic Engineering &amp; Applications.</p> <p>Bioprocess Engineering</p>	<p>08/04/2017</p>

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### 2. Action Taken Report Approved in Board of Studies dated 07<sup>th</sup> April 2018 and implemented with effect from August 2018

Observations/ Recommendations based on feedback	POs impacted
<p><b>Employers Feedback:</b></p> <ol style="list-style-type: none"><li>1. Students need to demonstrate effectively; Team work and effective communication skills.</li><li>2. Students need to demonstrate effectively Good Laboratory Practices in the Laboratories.</li><li>3. Students need to demonstrate proficiency of Bioprocess Technology towards development of processes and products in global context.</li></ol> <p><b>Teachers Feedback (Pre-BoS and BOS MoM):</b></p> <ol style="list-style-type: none"><li>1. Students need to improve the ability of investigating the complex engineering problems (design of experiments, analysis and interpretation of data) considering the recent industrial developments.</li><li>2. Down Stream Process Technology Lab needs to focus towards single product purification approach for better learning experience.</li></ol> <p><b>Students Feedback:</b></p> <ol style="list-style-type: none"><li>1. Students wish to have better learning for design of experiments, analysis and interpretation of data.</li></ol>	<p><b>PO2- Problem Analysis</b></p> <p><b>PO3- Design / Development of solutions</b></p> <p><b>PO4- Investigations of complex problems</b></p> <p><b>PO9- Individual &amp; team work.</b></p> <p><b>PO10- Communication</b></p> <p><b>PO14- Process &amp; Product Development.</b></p> 

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**Alumni Feedback:**

1. Students need to improve the ability of problem solving skills.
2. Students need to improve the ability to usage /knowledge of modern tools.
3. Few advanced courses can be offered to strengthen Computational Biology.

**Actions taken**

**Action 1:** Introduction of new courses to address problem solving and design skills in Biotechnology like Biological Data Analysis (18EBTE301). The course highlights upon tools & methods used in genome sequencing data and fermentation data analysis. The course Bioprocess Modeling and Simulation (18EBTE401) addresses development of mathematical models in designing of Bioreactors and usage of various simulation tools (e.g. MATLAB and SuperPro).

**Action 2:**

Inclusion of case studies for problem analysis during course delivery. Example case studies on steps involved in purification of therapeutic proteins. New course Quality Assurance and Regulation (18EBTE403) highlights upon the methodologies / developments in regulation of in Pharmaceutical and Biopharmaceutical industry. Also the course outcomes include the methods of process development and validation.

**Course Revised/ Added**

**Content modification:**  
Bioprocess Engineering  
Downstream Process  
Technology

**New Courses:**  
Biological Data Analysis  
Bioprocess Modeling and  
Simulation  
Quality Assurance and  
Regulations.

**BoS Date**

07/04/2018



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Actions taken	Course Revised/ Added	BoS approved Date
<p><b>Action 3:</b> Providing lab sessions for structured enquiry and open-ended experiments to improve student's reasoning ability and experimental investigations. Hands-on sessions are planned for the few laboratory courses and project work.</p>	<p><b>Content modification:</b>            Biochemistry Lab            Enzyme Technology Lab            Mini Project            Minor Project</p>	<p><b>07/04/2018</b></p>
<p><b>Action 4:</b> Implementation of Minor project as flagship course to increase technical ability and team work among students. Example: Characterization of microorganisms based upon both biochemical and molecular characteristics in the execution of Minor project (15EBTW302).</p>	<p><b>Course teaching:</b>            Mini Project            Minor Project            Biopharmaceuticals</p>	

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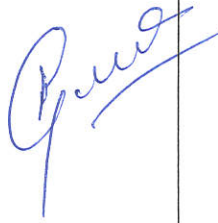
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### 3. Action Taken Report Approved in Board of Studies dated 13<sup>th</sup> April 2019 and implemented with effect from August 2019

Observations/ Recommendations based on feedback	POs impacted
<p><b>Employers Feedback:</b></p> <ol style="list-style-type: none"> <li>1. Students need to practice ethical and professional responsibilities effectively.</li> <li>2. Concepts of Bioethics and social issues relevant to Biotechnology Products need to be included in the curriculum.</li> <li>3. Students need to improve the ability of investigating the complex engineering problems (design of experiments, analysis and interpretation of data)</li> </ol> <p><b>Teachers Feedback (Pre-BoS and BOS MoM):</b></p> <ol style="list-style-type: none"> <li>1. Students need to improve the ability to apply the knowledge of engineering &amp; applied science to demonstrate research aptitude/skills in frontier areas of biotechnology.</li> <li>2. The content of Biostatistics course needs to be modified to include concepts of regression analysis and ANNOVA.</li> <li>3. Diverse microbiological applications need to be taught in the course: Microbiology.</li> </ol> <p><b>Students Feedback:</b></p> <ol style="list-style-type: none"> <li>1. More of structured enquiry and open ended experiments need to be included in the Laboratory Courses to get enhanced learning.</li> <li>2. More practical (hands-on) experience needs to be provided wherever possible.</li> </ol> <p><b>Alumni Feedback:</b></p> <ol style="list-style-type: none"> <li>1. The students should be able to apply research methodology and statistical analysis.</li> <li>2. Advanced Spectroscopic Techniques need to be introduced in the course Bioanalytical Techniques.</li> </ol>	<p><b>PO4-Investigations of complex problems</b></p> <p><b>PO8- Ethics</b></p> <p><b>PO14- Process &amp; Product Development</b></p> <div style="text-align: right; margin-top: 20px;">   <b>REGISTRAR</b>  <b>KLE Technological University</b>  <b>HUBBALLI-580 031</b> </div>

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Actions taken	Course Revised/ Added	BoS approved Date
<p><b>Action 1:</b> Laboratory curriculum focusing on structured enquiry and open-ended category of experiments to increase student's reasoning ability and experimental investigations. Inclusion of open-ended experiments in selected laboratory courses for enhanced experiential learning through laboratory practice.</p>	<p><b>Content modification:</b>            Biochemistry Lab            Enzyme Technology Lab            Cell and Molecular Biology Lab            Downstream Process Technology Lab</p>	<p>13/04/2019</p>
<p><b>Action 2:</b> Inclusion of concepts related to Bioethics in selected courses. Example. Genetic Engineering and Applications (15EBTC301) Introduction of the content on transgenic technology and ethical issues.</p> <p><b>Action 3:</b> To provide an ethical and professional awareness, we introduced rubrics based evaluation for plagiarism and copyright in the assessments of projects. The student's report will be assessed to minimize replication of scientific information.</p>	<p><b>Content modification:</b>            Genetic Engineering &amp; applications            Plant and Animal Biotechnology            Bioethics Safety &amp; IPR            Mini project            Minor project</p>	<p>13/04/2019</p>
<p><b>Action 4:</b> To inculcate research aptitude among the students, the content of few courses modified. In course Research Methodology (15EBTC305) introduction of quality of journals for publication, publication impact assessment, grant and funding agencies and impact of AI in Biotechnology research.</p>	<p><b>Content modification:</b>            Research Methodology</p>	

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