

## Microbial Bioprocess Engineering

### Educational Modules

- 1) Growth Rate Theory (15:09) - This module explains how cells grow in a batch culture from the lag phase until a nutrient becomes limiting and the culture enters the stationary phase.  
<https://youtu.be/x1P-c3OhB24>
- 2) Maximum Specific Growth Rate Calculations (13:05) - This module explains the measurement of optical density, and the use of time course collection of optical density data for the calculation of specific growth rate.  
<https://youtu.be/a0MxX-twtA8>
- 3) Yield Coefficients and Medium Design (18:23) - This module focuses on the meaning of a biomass yield coefficient, and how this value can be used for each element to design a medium.  
<https://youtu.be/1kAvowjsWBE>
- 4) Batch Cultivation Theory I (24:20) – This module describes the consumption of a carbon source/energy substrate toward maintenance, cells and products.  
<https://youtu.be/eVhdB69DHIQ>
- 5) Mass Transfer Theory (25:25) – This module defines mass transfer, and explains what various mass transfer coefficients represent.  
<https://youtu.be/PfVELhhhpmo>
- 6) Oxygen Uptake Rate (18:45) – This module is a follow-up to “Mass Transfer Theory” and focuses on the theory of cellular oxygen consumption in a bioreactor.  
<https://youtu.be/Vh8RzNbD8v0>
- 7) Heat Balance on a Bioreactor (23:18) - This module focuses on the three principal sources of heat in a bioreactor: metabolism, evaporation, and agitation. The presentation briefly discusses heat exchangers (such as coils) used for the removal of heat.  
<https://youtu.be/CCCjeBfdjok>
- 8) Oxygen Transfer Rate (16:40) - This module is a follow-up to “Mass Transfer Theory” and focuses on the theory of oxygen transfer in a bioreactor.  
<https://youtu.be/XUkVPMWFSPe>
- 9) Batch Cultivation Theory II (26:22) - This module continues “Batch Cultivation Theory I” but focuses on the effect of oxygen uptake on batch kinetics. It addresses how OUR changes during the course of a process, and when a culture might become oxygen limited.  
[https://youtu.be/c\\_InZSOqSxQ](https://youtu.be/c_InZSOqSxQ)
- 10) Measurement of Mass Transfer Coefficient (18:08) - This module provides the theory of the measurement of  $k_L a$  using static gas sparging. The methodology for collection data and calculating the value of  $k_L a$  in a bioreactor is presented.  
<https://youtu.be/8UJeqODaD2k>
- 11) Continuous Culture Theory (26:18) – This module provides the theory of steady-state continuous culture.  
<https://youtu.be/fRBgBdC44vM>
- 12) Continuous Culture Calculations (25:05) - This module covers several calculations that can be made from data obtained in a steady-state, continuous process.  
<https://youtu.be/rrP2RCURNeI>
- 13) Fed-Batch Theory (22:58) - This module focuses on the motivation for a fed-batch process, different ways to conduct a fed-batch process, and the theory of an exponential fed-batch process.  
[https://youtu.be/5WFgkO\\_DBKo](https://youtu.be/5WFgkO_DBKo)