

| S.No. | Name of Books/ Author/Publisher |
|-------|---|
| 1. | S. P. Mahajan, "Pollution Control in Process Industries", Tata Mc Graw Hill Publications. |
| 2. | W. Wesley Eckenfelder Jr., "Industrial Water Pollution Control", Mc Graw Hill Publications. |
| 3. | Ronald W. Crites Sherwood C. Reed and Robert Bastion, "Land Treatment Systems for Municipal & Industrial Wastes" Mc Graw Hill Publications. |
| 4. | Neal K. Ostler, "Industrial Waste Stream Generation", Prentice Hall |
| 5. | Rao and Dutta, "Industrial waste treatment". Oxford and IBH Publishing Co. Pvt Ltd., New Delhi. |

BIOPROCESS PLANT DESIGNING

Details of course:-

| Course Title | Course Structure | | | Pre-Requisite |
|---|------------------|----|----|---------------|
| | L | T | P | |
| Bioprocess plant designing (BT429) | 03 | 01 | 00 | Nil |

Course Objective:

Subject deals with engineering principles for design of systems for processing biological materials into desired products.

Course Outcome (CO):

1. Outline the key technologies used in bioprocess plant design.
2. Discuss construction material for a bioprocess plant and its mechanical design.
3. Compare designs of bioreactor to ensure its sterility of equipment using different case study.
4. Knowledge of mass transfer equipment designing and utilities in Biotechnology.
5. Explain Production plants; Process economics; Bioprocess validation; Safety considerations. Case studies.

| S.No. | Content | Contact Hours |
|-------|---|---------------|
| 1. | Introduction, general design information; Mass and energy balance. | 6 |
| 2. | Materials of construction for bioprocess plants; Mechanical design of process equipment; Vessels for biotechnology application. | 9 |

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|-------|---|----|
| 3. | Design of fermenters; Design considerations for maintaining sterility of processing equipment; Piping and instrumentation; Penicillin case study. | 9 |
| 4. | Selection and specification of equipment for handling fluids and solids; Design of heat and mass transfer equipment; Design of facilities for cleaning of process equipment; Utilities for biotechnology. | 9 |
| 5. | Production plants; Process economics; Bioprocess validation; Safety considerations. Case studies. | 9 |
| Total | | 42 |

Books: -

| S.No. | Name of Books/ Author/Publisher |
|-------|---|
| 1. | Chemical Engineering by R.K. Sinnott, J.M. Coulson and J.F. Richardsons. Publisher: Butterworth-Heinemann. Vol-6, Butterworth Heinemann III edition |
| 2. | Applied Process Design for Chemical and Petrochemical Plants by E.E. Ludwig. Publisher: Butterworth-Heinemann |
| 3. | Chemical Engineers Handbook by R.H. Perry and D.W. Green. Publisher McGraw-Hill 8th edition |
| 4. | Process Biotechnology Fundamentals by S.N. Mukhopadhyay. Publisher: Viva Books |
| 5. | Plant Design and Economics for Chemical Engineers by M. Peters and K. Timmerhaus. Publisher: McGraw-Hill |

BIOETHICS AND INTELLECTUAL PROPERTY RIGHTS

Details of course: -

| Course Title | Course Structure | | | Pre-Requisite |
|---|------------------|----|----|---------------|
| | L | T | P | |
| Bioethics and intellectual property rights (BT431) | 03 | 01 | 00 | Nil |

Course Objective:

To discuss various aspects of biosafety regulations, IPR and bioethic concerns arising from the commercialization of biotech products.