

UNIVERSITY OF MUMBAI
No.UG/ 147 of 2007

CIRCULAR :

A reference is invited to this office Circular No.UG/135 of 2005 dated 12th April, 2005 and the Principals of the affiliated colleges in Engineering are hereby informed that detail syllabus in the subject : 7.4 Process Dynamics & Control at the B.E. (Bio-Technology) Sem.VII is now enclosed in the syllabus of B.E. (Bio-Technology) (Sem. III to VIII) degree course which has been circulated vide Circular No.UG/135 dated 12th April, 2005.

Mumbai 400 032
13th April, 2007

for I/C REGISTRAR.

To,

The Principals of the affiliated colleges in Engineering.

No.UG/ 147-A of 2007

13th April, 2007

Copy forwarded with compliments to the Dean, Faculty of Technology, for information.

for I/C REGISTRAR.

Copy to :

The Director, Board of College and University Development, Deputy Registrar (Eligibility and Migration), the Director of students Welfare, the Personal Assistants to the Vice-Chancellor, the Pro-Vice-Chancellor, the Registrar and the Assistant Registrar Administrative sub-centre, Ratnagiri, for information.

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Nsk/Cir.2/120407

Course: B.E. (Biotechnology)
Year: B.E. Semester VII
Subject: 7.4 Process Dynamics & Control

LOAD PER WEEK:	Lectures	: 4 Hrs.
	Practicals	: ---
	Tutorials	: ---

EVALUATION SYSTEM:	Theory Examinations	: 100 Marks
	Practical Examinations	: ---
	Oral Examinations	: ---
	Term work	: 25 marks
	TOTAL	: 125 Marks

Syllabus:

1) **Unit I** | 10 Hrs. |

Modeling Of Dynamic Systems

Introduction , Dynamic system, Dynamic system models, Different dynamic systems: Translation mechanical system, Rotational mechanical system, Electrical system, Electromechanical system. Pneumatic, hydraulic & fluid systems, Thermal system, Biochemical & Biotechnological systems. [Modeling for linear time invariant MIMO Systems].

2) **Unit II**

| 16 Hrs. |

State Variable Formulation

Introduction, Concept of state. State space representation of multivariable systems, Set of minimal state variable representation, State equation from transfer function, Canonical form, Dual representation, Linear transformation, Similarity transformation, Invariance of transfer function, Properties of linear transformation, diagonalization, Vandermonde matrix, Vandermonde matrix for multiple eigenvalues, Important properties of eigenvalues of a matrix, time - domain solution, State transition matrix - forced response, Methods for evaluation of STM, Power series method, Cayley-Hamilton theorem, STM of linear time- varying system.

Unit III

[8 Hrs.]

Analyses Of Control System

Introduction, Concept of controllability & observability, Controllability & observability criteria for LTI systems, Duality property of MIMO systems.

Unit IV

[12.hrs.]

Design of Control Systems

State Feedback law, Output Feedback law, Pole placement in state feedback, Pole placement in output feedback, RGA and decoupling, Introduction to state observers.

Unit V

[6 Hrs.]

Relay controllers and programmable logic controller

Introductions, Ladder diagram elements, Ladder diagram examples, relay sequences, Programmable logic controller design, PLC operation problems.

References:

Author G.O. Mutambara – Design And Analysis Of Control Systems, CRC press.

Franklin, Powell & Abbas Emami – Naeimi – Feedback Control Of Dynamic Systems, Pearson education.

D. Roy Choudhary – Modern Control Engineering, Prentice – Hall, India.

C. D. Johnson – Process Control Instrumentation Technology, seventh Edition, Pearson Edition.

M. Gopal – Digital Control And State Variable Methods, Tata McGraw Hill, New Delhi.

Control Systems Engineering By Norman S. Nise John Wiley 2003, (₹ 37.95)