Department of chemical Engineering

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	M.TECH chemical Engineering		
Course Title	COMPUTER CONTROL OF PROCESSES		
Course Code	CL 665	No. of Credits	3
Course Code of Pre-requisite subject(s)	nil		
Session	July 2019	Section (if, applicable)	----
Name of Faculty	Dr. S. Narayanan	Department	ICE
Email	narayanan@nitt.edu	Telephone No.	0431-2503364
Name of Course Coordinator(s) (if, applicable)	Not applicable		
E-mail	------	Telephone No.	
Course Type	☐ Core course	☑ Elective course	

Syllabus (approved in BoS)

Computer control – Introduction – Review of Z Transform, Modified Z Transform and Delta Transform. Relation between Discrete and Continuous Transfer function-Poles and Zeros of Sampled Data System (SDS) – Stability Analysis in Z domain.

Introduction to Pulse Transfer function- Open loop and closed loop response of SDS- Design and implementation of different digital control algorithm: Dead beat, Dahlin, Smith predictor and Internal Model Control algorithm with examples.

Different Models of Discrete System: LTI System: - Family of Discrete Transfer function Models- State Space models- Distributed Parameter Model. Models for Time varying and Non-linear System: Linear Time varying models- Non-linear State space models- Non-linear Black Box Models- Fuzzy Models.

Parameter Estimation Methods: General Principles- Minimizing Prediction errors- Linear Regression and the Least Square method- Statistical Frame work for Parameter Estimation and the Maximum Likely hood method- Instrument Variable method – Recursive and Weighted Least square method.

Adaptive Control: Introduction -Deterministic Self-Tuning Regulator: Indirect and Direct self-tuning regulator-Model reference Adaptive system: Design of MRAS using Lyapunov and MIT Rule- Auto tuning and Gain scheduling adaptive control design with examples.

COURSE OBJECTIVES

To impart knowledge on sampled-data control systems, various discrete control algorithms.

COURSE OUTCOMES (CO)	
Course Outcomes	**Aligned Programme Outcomes (PO)**
After completing this course, the student is exposed to	
1. The fundamentals of various discrete-time systems.	1,2,3,5,6,7,9,10,12
2. Employing a digital computer in the process loop.	1,2,3,5,6,7,9,10,12
3. Curve fitting from the data and estimation techniques.	1,2,3,5,6,7,9,10,12
4. Adaptive control paradigm.	1,2,3,5,6,7,9,10,12

COURSE PLAN – PART II

COURSE OVERVIEW

- Introduce the concepts of data-driven modeling.
- Discrete systems analysis.
- Deploy suitable control techniques.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	I , II , III & IV	Control problem, performance specifications, introduction to Modelling and Identification of Dynamical Systems (Control mathematics, such as matrix algebra, Laplace transform, z-transform, differential equations, and difference equations for control system modelling, analysis and design).	Chalk and talk, demonstrations
2	V,VI, VII, VIII, IX	Deploy suitable control design techniques.	Chalk and talk, demonstrations
3.	X &XI XII	Simulation practices	Demonstrations

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Test-1	5th Week	1 hour	20%
2	Test-2	8th Week	1 hour	20%

3	Assignment test	11th Week	1 hour	15%
CPA	Compensation Assessment*	One week before end sem	1 hour	20%
4	Final Assessment *	Last week	3 hours	45%

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc) email

COMPENSATION ASSESSMENT POLICY

Students who have missed the first or second cycle test can register with the consent of faculty for the Re-Test examination which shall be conducted soon after the completion of the second cycle test.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- **At least 75% attendance in each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HOD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

  The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION
The module will be delivered using a combination of lectures and tutorials/lab demonstrations involving example exercises. Concepts and the scope of a topic will be introduced in lectures. These will be supported by directed reading and experimental simulation laboratory based work. The lab sessions will enhance the understanding of students of real-world applications of the material delivered in the module. The students will learn through applying a variety of analysis methods, mathematical and simulation tools to real system models. Matlab will be incorporated into the module as an integral part of teaching and learning. In the teaching-learning process, the students will have opportunities to exercise both team work and independent effort.
FOR APPROVAL
S. Narayanan. **Course Faculty** _____ **CC-Chairperson** _____ **HOD** _____ 27/8/2019