NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF CHEMICAL ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	**M.TECH, PROCESS CONTROL AND INSTRUMENTATION**		
Course Title	**CONTROLLER TUNING**		
Course Code	**CL 676**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)			
Session	**January 2021**	**Section (if, applicable)**	**NA**
Name of Faculty	**Dr.Nagajyothi Virivinti**	**Department**	**Chemical Engineering**
Official Email	**jyothi@nitt.edu**	**Telephone No.**	
Name of Course Coordinator(s) (if, applicable**)**			
Official E-mail		**Telephone No.**	
Course Type (please tick appropriately**)**	☐ **Core course**	√ **Elective course**	

Syllabus (approved in BoS)	

Introduction to tuning of controllers. Classification of controllers. Open loop and closed loop tuning methods for SISO and MIMO systems

Fundamentals of fractional order control, Fractional-order PI, PID controller tuning, tuning of fractional order lead lag compensator, Auto-tuning of Fractional order controllers

Relay based tuning of PID controllers. Feedback - Experimental Design, Approximate Transfer Functions: Frequency-domain Modeling - Simple Approach, Improved Algorithm, Parameter Estimation. Approximate Transfer Functions: Time-domain Modeling. Shape of Relay, Improved Relay Feedback.

Auto tuning for Plant Wide Control Systems – Recycle Plant, Control Structure Design, Unbalanced Schemes, Balanced Scheme, Controllability, Operability, Controller Tuning for Entire Plant. Guidelines for Auto Tune Procedure. Applications to case studies.

Introduction to nonlinear PID controller design.

COURSE OBJECTIVES

This course is designed to learn the different tuning techniques for the controllers.

MAPPING OF COs with POs

Course Outcomes	Programme

	Outcomes (PO) (Enter Numbers only)
1. Design PID controllers using various design methods	**1,2,3,4,5,9,11**
2. Use right tuning method for tuning the PID controller	**1,2,3,4,5,9,11**
3. Design PID controllers for fractional order systems	**1,2,3,4,5,9,11**
4. Automate the control at plant level	**1,2,3,4,5,9,11**
5. Design PID controllers by incorporating process nonlinearity	**1,2,3,4,5,6,9,11**

COURSE PLAN – PART II			
COURSE OVERVIEW			
This course contains tuning methods of different controllers for different types of systems.			
COURSE TEACHING AND LEARNING ACTIVITIES			**(** Add more rows)
S.No.	**Week/Contact Hours**	**Topic**	**Mode of Delivery**
1	10 hours	Introduction to tuning of controllers. Classification of controllers. Open loop and closed loop tuning methods for SISO and MIMO systems	MS Teams
2	5 hours	Fundamentals of fractional order control, Fractional-order PI, PID controller tuning, Tuning of fractional order lead lag compensator, Auto-tuning of Fractional order controllers	MS Teams
3	6 hours	Relay based tuning of PID controllers. Feedback - Experimental Design, Approximate Transfer Functions: Frequency-domain Modeling - Simple Approach, Improved Algorithm, Parameter Estimation. Approximate Transfer Functions: Time-domain Modeling. Shape of Relay, Improved Relay	MS Teams

		Feedback.	
4	8 hours	Auto tuning for Plant wide Control Systems – Recycle Plant, Control Structure Design, Unbalanced Schemes, Balanced Scheme, Controllability, Operability, Controller Tuning for Entire Plant. Guidelines for Auto Tune Procedure. Applications to case studies.	MS Teams
5	4 hours	Introduction to nonlinear PID controller design.	MS Teams

COURSE ASSESSMENT METHODS (shall range from 4 to 6**)**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment-1	After 13th contact hour	One hour	20
2	Assessment-2	After 30th contact hour	One hour	20
3	Project	After 20th contact hour		20
4	Presentation			10
CPA	Compensation Assessment*			20
6	Final Assessment *			30

*mandatory; refer to guidelines on page 4

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

Feedback will be taken two times, one after the Assessment-I, the other at the end of the semester.

COURSE POLICY (including compensation assessment to be specified**)**

MODE OF CORRESPONDENCE (email/ phone etc)

Students may contact the faculty over mail (jyothi@nitt.edu) or over whatsapp 9985329988

COMPENSATION ASSESSMENT POLICY
All the assessments are compulsory. If any student is absent for any of the assessment-I or Assessment-II with genuine reason with prior approval, he/she can appear for the compensation assessment.

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, IF ANY

FOR APPROVAL

Course Faculty _____   **CC- Chairperson** _____   **HOD** _____
[Dr.Nagajyothi Virivinti]