NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF INSTRUMENTAION AND CONTROL ENGG

COURSE PLAN – PART I			
Name of the programme and specialization	**B.Tech**		
Course Title	CONTROL SYSTEMS		
Course Code	**ICPC16**	**No. of Credits**	**4**
Course Code of Pre-requisite subject(s)	**NIL**		
Session	**January 2021**	**Section (if, applicable)**	**A**
Name of Faculty	**Dr. D. Ezhilarasi**	**Department**	**ICE**
Official Email	**ezhil@nitt.edu**	**Telephone No.**	**9444878908**
Name of Course Coordinator(s) (if, applicable**)**	**NA**		
Official E-mail	**NA**	**Telephone No.**	**NA**
Course Type (please tick appropriately**)**	√ **Core course**	☐ **Elective course**	

Syllabus (approved in BoS)
Review of Systems, Mathematical Models – Differential Equations, Linear Approximations and Transfer Functions, Block Diagrams and Signal Flow Graphs Feedback Control System Characteristics, and Performance Specifications on transients and steadystate, Stability of Linear Feedback Systems – Routh-Hurwitz criterion. The Root Locus Method, Feedback Control System Analysis & Performance Specifications in TimeDomain, Design of Lead, Lag, and PID Controller using Root Locus. Frequency Response Methods, Nyquist's Stability Criterion, Bode Plots, Performance Specifications in Frequency-Domain, Stability Margins. Design of Lead, Lag and PID controller in Frequency Domain.

COURSE OBJECTIVES

1. To introduce the concept of feedback control system.
2. To impart knowledge in mathematical modeling of physical systems.
3. To impart knowledge in characteristics and performance of feedback control system.
4. To teach a variety of classical methods and techniques for analysis and design of control systems.

MAPPING OF COs with POs

Course Outcomes On completion of this course, the students will be able to	Programme Outcomes (PO) (Enter Numbers only)
1. Generate mathematical models of dynamic control system by applying differential equations.	1,3,4,5,6
2. Analyze and characterize the behavior of a control system in terms of different system, performance parameters and assess system stability.	1,3,4,5,6
3. Evaluate and analyses system performance using frequency and transient response analysis.	1,3,4,5,6

4. Design and simulate control systems (linear feedback control systems, PID controller, and multivariable control systems), using control software, to achieve required stability, performance and robustness.	1,3,4,5,6	

COURSE PLAN – PART II

COURSE OVERVIEW

It is the first course on Control theory and Control System Design ; in understanding of concepts and fundamentals of system dynamics and control. The course focuses on the modelling, analysis and design of systems control. Emphasis will be on linear, time-invariant, single-input single-output continuous time systems. A strong background in Laplace transformation and differential equations is highly recommended. Suitable computer software package will extensively assist in the analysis and design of control systems.

COURSE TEACHING AND LEARNING ACTIVITIES   **(** Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1st week/4 Hours	Introduction and overview of Control system.	online
2	2nd & 3rd week/8 Hours	Review of Systems, Mathematical Models – Differential Equations, Linear Approximations, Principles behind mathematical modelling of Electrical and mechanical systems. Transfer Functions, Block Diagrams and Signal Flow Graphs	online
3	4th & 5th week/8 Hours	Feedback Control System Characteristics, and Performance specifications on transients and steady state, Stability of linear feedback systems- Routh Hurwitz criterion.	online
4	6th ,7th & 8th week/6 Hours	The Root Locus Method, Feedback Control System Analysis & Performance Specifications in Time Domain, Design of Lead, Lag, and PID Controller using Root Locus.	online

| 5 | 9th &10th week/8 Hours | Frequency Response Methods, Nyquist's Stability Criterion, Bode Plots, Performance Specifications in Frequency-Domain, Stability Margins | online |
| 6 | 11th & 12th week/8 Hours | Design of Lead, Lag and PID controller in Frequency Domain. | online |

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Continuous Assessment 1 Quiz	Aug-Sep	6 Weeks	20
2	Continuous Assessment 2 Quiz	Oct-Nov	6 Weeks	20
3	Assignment - Numerical	Second week of Oct		15
4	Assignment - Matlab	Third week of Nov		15
5	Final Assessment -Written Exam	First Week of Dec	1 1/2 Hours	30

*mandatory; refer to guidelines on page 4

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

Written feedback from students
Students' performance in tests

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

COMPENSATION ASSESSMENT : Compensation assessment will be conducted for students who miss Assessment 1 or Assessment 2. Students should get permission from the faculty by giving valid reason in written form to write compensation assessment.

REASSESSMENT:
- Refer to B. Tech Regulations B.10.1 and B.12

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

02.02.2021

Course Faculty _____   **CC- Chairperson** _____   **HOD** _____ 10-02-2021

Guidelines

a) The number of assessments for any theory course shall range from 4 to 6.

b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.

c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.

d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	**2017**	**2016**	**2015**	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.

f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.

g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.