NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF INSTRUMENTATION & CONTROL ENGG

COURSE PLAN – PART I			
Name of the programme and specialization	B Tech in Instrumentation & Control Engg		
Course Title	Control System- I - (V Semester)		
Course Code	IC PC21	No. of Credits	4
Course Code of Pre-requisite subject(s)	--	--	--
Session	July 2019	Section (if, applicable)	A
Name of Faculty	Dr. K. Srinivasan	Department	ICE Department
Official Email	srinikkn@nitt.edu	Telephone No.	0431-2503363
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 steady-state, Stability of Linear Feedback Systems – Routh-Hurwitz criterion. The Root Locus Method, Feedback Control System Analysis & Performance Specifications in Time-Domain, Frequency Response Methods, Nyquist's Stability Criterion, Bode Plots, Performance Specifications in Frequency-Domain, Stability Margins. Design of Lag and PID controllers in Frequency Domain, Design of Lead,Lag, Lag-Lead and PID Controllers using time-domain and frequency-domain methods.

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	Programme Outcomes (PO)
1. Generate mathematical models of dynamic control system by applying differential equations	1
2. Analyze and characterize the behavior of a control system in terms of different system and performance parameters	3
3. Compute and assess system stability	5

4.	Evaluate and analyse system performance using frequency and transient response analysis	5
5.	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	4,5,6
6.	Critically analyse and outline the dynamic response of closed loop systems	6

COURSE PLAN – PART II			
COURSE OVERVIEW			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	**Week/Contact Hours**	**Topic**	**Mode of Delivery**
1	First – Sixth Week	Types of Systems, Mathematical Models Differential Equations, Linear Approximations and Transfer Functions, Block Diagram reduction and Signal Flow Graphs, Characteristics of Feedback Control System and Performance Specifications on transients and steady-state, Stability of Linear Feedback Systems – Routh-Hurwitz criterion.	Black/white board
2	End of Sixth Week	*Assessment –1 : Written exam*	*20% Weightage*
3	End of Seventh week	*Assessment –2 : Assignment based on Problem solving*	*10% Weightage*
4	Seventh - Twelfth week	The Root Locus Method, Feedback Control System Analysis & Performance Specifications in Time-Domain, Frequency Response Methods, Nyquist's Stability Criterion, Bode Plots, Performance Specifications in Frequency-Domain, Stability Margins	Black/ white board
5	Eleventh week	*Assessment -4 : Written exam*	*20 % Weightage*
6	End of Twelfth week	*Assessment –3 : Assignment based on Problem solving*	*10 % Weightage*
7	Thirteen - Fourteenth week	Design of Lead, Lag, Lag-Lead and PID Controllers using time-domain and frequency-domain methods.	Power Point Presentation

9	End of Fourteenth Week	*Compensation Assessment*	*20% Weightage*
8	Fifteenth week	*Assessment – 5 : Simulation based Assignment*	*10% Weightage*
12	End of Fifteenth week	*Final Assessment : Written Exam*	*30% Weightage*

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Written exam	Seventh Week	---	20%
2	Assignment based on Problem solving	End of Seventh week	One hour	10%
3	Written Exam	Twelfth week	---	20%
4	Assignment based on Problem solving	End of Twelfth week	One hour	10%
CPA	Compensation Assessment*	End of Fourteenth Week	One hour	20%
5	Simulation based Assignment	Fifteenth week	--	10%
6	Final Assessment *	End of Fifteenth week	Two hour	30%

*mandatory: refer to guidelines on page 4

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

1. Indirect feedback through questionnaire.
2. Direct feedback from the students by institute.
3. Feedback from the students during the class committee meetings.

COURSE POLICY (including compensation assessment to be specified)

Only one compensation will be conducted during the **Fourteenth week** for the students absent for assessment due to medical other genuine reasons. The course faculty decision will be the final to decide about a retest. The exam will be conducted based on the entire syllabus. The duration of the exam is 1 hour. If the student absents themselves for more than one assessment, other assessment marks will be awarded as zero.

Retest / Re-examination:

If the student got F grade (Failed) with satisfactory attendance requirement (Refer Attendance policy), he/she has to undergone retest / supplementary examination.

Retest / Supplementary examination will be conducted as per the institute norms.

Passing Criteria / Awarding Grades:

35% or (Class average/2) whichever is higher is the minimum passing criteria for this subject. If the student failed even after reexamination and absent for reexamination, he/ she should undergo formative assessment. Other grades are awarded based on relative grades as per institute norms.

ATTENDANCE POLICY (as per the institute norms)

> At least 75% attendance in each course is mandatory as per the Institute norms.

> 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.
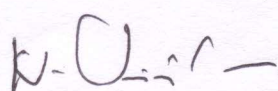
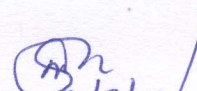## ACADEMIC DISHONESTY & PLAGIARISM (as per the institute norms)

> 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

1. Students can meet any time depends on their mutual availability.
2. The course faculty will be available in ICE department ground floor inside process control lab in his cabin.
3. Minor doubts will be clarified during the class hours. Any suggestions, Queries and feedback can be emailed to the course faculty at srinikkn@nitt.edu
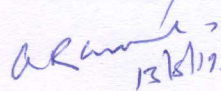

FOR APPROVAL

Course Faculty _____   CC- Chairperson _30/7/19_____   HOD _____

Dr. B. VASUKI
HEAD
Instrumentation and Control Engineering
National Institute of Technology
Tiruchirappalli - 620 015.

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.