DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I				
Degree	B.Tech.	**Course Title**	CONTROL SYSTEMS	
Course Code	EEPC20	**No. of Credits**	04	
Course Code of Pre-requisite subject(s)	MA102, MA205			
Session	JULY 2021	**Section**	A	
Name of Faculty	Dr. V. Sankaranarayanan	**Department**	EEE	
Name of Course Coordinator(s) (if, applicable)	--			
Email	vsankar@nitt.edu	**Telephone No.**	0431-2503268	
Course Type	√ Core course		Elective course	

SYLLABUS (APPROVED IN BoS)

Modelling of physical systems: Electrical systems - Electromechanical systems – Mechanical systems– Thermal systems.

Time domain analysis: Time-domain specifications - Generalized error series – various test signals and its importance- Routh-Hurwitz stability criterion.

Root Locus Technique: Definitions - Root locus diagram - Rules to construct root loci - Effect of polezero additions on the root loci.

Frequency domain analysis: Bode plot - Polar plot - Nyquist plot - phase-margin - gain margin – Nyquist stability criterion.

Controller design: Design of P, PI, PID, lag, lead, lead-lag compensator design.

COURSE OBJECTIVES

To equip the students with the fundamental concepts in control systems.

COURSE OUTCOMES (COs)	Aligned Programme Outcomes (POs)					
Upon completion of the course, the student will be able to 1. Understand the concept of linear time invariant system 2. Modeling of simple physical systems 3. Time-domain analysis and Frequency domain analysis 4. Stability of LTI systems 5. Simple controller design techniques.	COs / POs	Course outcomes(COs)				
		1	2	3	4	5
	1	M	H	H	M	M
	2	M	H	H	H	H
	3	H	H	H	H	H
	4	L	M	M	M	M
	5	L	M	M	M	M
	6	M	M	M	M	M
	7	M	M	M	M	M
	8	H	H	H	H	H
	9	L	M	M	M	M
	10	H	H	H	H	H
	11	H	H	H	H	H
	12	H	H	H	H	H
	13	H	H	H	H	H
	14	M	M	H	H	M

COURSE PLAN – PART II			
COURSE OVERVIEW			
This course on control systems involves time domain and frequency domain analysis of system. It also deals with stability analysis and various controller designs for a system.			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	**Week**	**Topic**	**Mode of Delivery**
1.	1st week of August '21 (2-6)	Introduction, historical perspective of control theory	Lecture / Tutorial C & T / PPT or any suitable mode
2.	2nd week of August '21 (9-13)	Concept of open loop, closed loop, LTI system, transfer functions	
3.	3rd week of August '21 (16-20)	Modeling of physical systems and its transfer functions	
4.	4th week of August '21 (23-27)	Importance of various signals such as impulse, step and ramp signals	
5.	5th week of August '21 and 1st week of September '21 (30-3)	Analysis of steady state error for various inputs based on types and order of the systems	
6.	2nd week of September '21 (6-10)	Stability of open-loop and closed-loop system BIBO stability	
7.	3rd week of September '21 (13-17)	Routh and Hurwitz conditions for stability	
8.	4th week of September '21 (20-24)	Introduction to Routh-locus method	
9.	5th week of September '21 And 1st week of October '21 (27-1)	Routh-locus method	Lecture / Tutorial C & T / PPT or any suitable mode
10.	2nd week of October '21 (4-8)	Introduction to frequency response analysis	
11.	3rd week of October '21 (11-15)	Bode-plot	
12.	4th week of October '21 (18-22)	Nyquist plot and Nyquist stability criterion	
13.	5th week of October '21	Introduction to controller design	

S.No.		Week/Date	Methodology	
		(25-29)		
14.	1st week of November '21 (1-5)	Controller design using time-domain methods		
15.	2nd week of November '21 (8-12)	Controller design using frequency-domain methods		
16.	3rd week of November '21 (15-19)	Introduction to PID controller		

C & T : Chalk and Talk and   PPT : Power Point

COURSE ASSESSMENT METHODS

S.No.		Week/Date	Duration	% Weightage
1	Assessment-1 (1st and 2nd Units) **(Written test)**	September first week	60 Minutes	25
2	Assessment-2 (3nd and 4th Units) **(Written test)**	October first week	60 Minutes	25
3	Assessment-3 Assignment / Open book test / Quiz	Details will be informed later		20
CPA	Compensation Assessment (First 4 Units) **(Written test)**	November second week	60 Minutes	25
4	Assessment-4 (All units) **(Written test)**	December	120 Minutes	30

Note:

1. Exact date and time for the assessments will be as per the Office of the Dean (Academic) instructions.
2. Attending all the assessments (i.e., Assessment 1 to 4) is MANDATORY for every student.
3. If any student is not able to attend Assessment-1 / Assessment-2 due to genuine reason, he/she is permitted to attend the Compensation Assessment (CPA) with 20% weightage (20 marks).
4. In any case, CPA will not be considered as an improvement test.

Grading the students

1. Grading will be based on the clusters (range) of the total marks (all the assessments i.e., Assessment 1 to 4, put together for each student) scored. For grading, Gap theory or Normalized curve method will be used to decide the clusters (range) of the total marks.

2. The passing minimum shall be as per the Office of the Dean (Academic) instructions. Hence, every student is expected to score the minimum mark to pass the course as prescribed by the Office of the Dean (Academic). Otherwise the student would be declared fail and 'F' grade will be awarded.

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc
1. Katsuhiko Ogata, 'Modern Control Engineering', Pearson Education Publishers, 5th Edition, 2010. 2. Nagrath I.J. and Gopal M, 'Control Systems Engineering', New Age International Publications, 5th Edition, 2010. 3. Richard C. Dorf and Robert H. Bishop. 'Modern control systems', Pearson Prentice Hall Publications, 12th Edition, 2010. 4. Gene F. Franklin, J. David Powell and Abbas Emami-Naeini, 'Feedback control of Dynamic Systems', Pearson Education India Publications, 6th Edition, 2008. 5. Benjamin C.Kuo and Farid Golnaraghi, 'Automatic Control Systems', John Wiley & Sons Publications, 8th Edition, 2002.
COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)
Feedback from the students during class committee meetings Anonymous feedback through questionnaire
COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)
CORRESPONDENCE 1. All the students are advised to check their NITT WEBMAIL regularly. All the correspondence (schedule of classes/ schedule of assessment/ course material/ any other information regarding this course) will be done through their webmail. 2. Queries (if required) may be emailed to me / contact me during 10.30 am to 11.30 am on Monday and Wednesday with prior intimation for any clarifications. **ATTENDANCE POLICY (**A uniform attendance policy as specified below shall be followed)

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

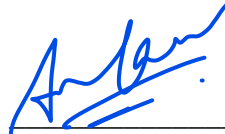## ACADEMIC DISHONESTY & PLAGIARISM

6. Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.

7. Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.

8. 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.

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

FOR APPROVAL

Course Faculty _____   **CC-Chairperson** _____   **HOD** _____