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 2023**		**Section**	**A**	
Name of Faculty	**Dr. V. Sankara Narayanan**		**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 their importance- Routh-Hurwitz stability criterion.
Root Locus Technique: Definitions - Root locus diagram - Rules to construct root loci - Effect of pole zero 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)

Upon completion of the course, the student will be able to

1. Understand the concepts of closed loop control system.
2. Analyze the stability of closed loop control system.
3. Apply the techniques to any electrical system.
4. Design the classical controllers for electrical system.

Aligned Program Outcomes (POs)

COs / POs		Course outcomes (COs)			
		1	2	3	4
Program Outcomes (POs)	1	H	H	H	H
	2	H	H	H	H
	3	H	M	M	H
	4	H	L	L	L
	5	H	M	H	M
	6	-	-	-	-
	7	H	H	H	M
	8	H	H	H	H
	9	M	M	M	M
	10	M	M	L	L
	11	M	M	H	H
	12	H	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 '23 July 31, Aug (1- 4)	Introduction, historical perspective of control theory	Lecture / Tutorial C & T / PPT or any suitable mode
2.	2nd week of August '23 (7-11)	Concept of open loop, closed loop, LTI system, transfer functions	
3.	3rd week of August '23 (14-18)	Modeling of physical systems and its transfer functions	
4.	4th week of August '23 (21-25)	Importance of various signals such as impulse, step and ramp signals	
5.	5th week of August '23 (28-31) and 1st week of September '23 Sep 1st	Analysis of steady state error for various inputs based on types and order of the systems	
6.	2nd week of September '23 (4-8)	Stability of open-loop and closed-loop system BIBO stability	
7.	3rd week of September '23 (11-15)	Routh and Hurwitz conditions for stability	
8.	4th week of September '23 (18-22)	Introduction to Routh-locus method	
9.	1stweek of October '23 (3-6)	Routh-locus method	Lecture / Tutorial C & T / PPT or any suitable mode
10.	2nd week of October '23 (9-13)	Introduction to frequency response analysis	
11.	3rd week of October '23 (16-20)	Bode-plot	
12.	4th week of October '23 (25-27)	Nyquist plot and Nyquist stability criterion	
13.	5th week of October '23 (30-31) and 1st week of november'23 (1-3)	Introduction to controller design	

14.	2nd week of November '23 (6-10)	Controller design using time-domain methods	
15.	3rd week of November '23 (13-17)	Controller design using frequency-domain methods and introduction to PID controllers	
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 second week	60 Minutes	20
2	Assessment-2 (3rd and 4th Units) **(Written test)**	October first week	60 Minutes	20
3	Assessment-3 Assignment / Open book test / Quiz	Details will be informed later		10
CPA	Compensation Assessment (First 4 Units) **(Written test)**	November second week	60 Minutes	20
4	Assessment-4 (All units) **(Written test)**	December	180 Minutes	50

Note:

1. The exact date and time for the assessments will be as per the Office of the Dean (Academic) instructions. (Academic Calender)
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.

both ?

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 from 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** on 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 a '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 to 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 programs.

FOR APPROVAL

Course Faculty_____ **CC-Chairperson**_____ **HOD** _____ 08/08/23