

**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	IIIrd yr, B		
Name of Faculty	Dr. Ankur Singh Rana	Department	EEE		
Name of Course Coordinator(s) (if, applicable)	--				
Email	ankur@nitt.edu	Telephone No.	0431-2503276		
Course Type	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course				
SYLLABUS (APPROVED IN BoS)					
<p>Modelling of physical systems: Electrical systems - Electromechanical systems – Mechanical systems– Thermal systems.</p> <p>Time domain analysis: Time-domain specifications - Generalized error series – various test signals and its importance- Routh-Hurwitz stability criterion.</p> <p>Root Locus Technique: Definitions - Root locus diagram - Rules to construct root loci - Effect of polezero additions on the root loci.</p> <p>Frequency domain analysis: Bode plot - Polar plot - Nyquist plot - phase-margin - gain margin – Nyquist stability criterion.</p> <p>Controller design: Design of P, PI, PID, lag, lead, lead-lag compensator design.</p>					
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 concepts of closed loop control systems 2. Analyze the stability of closed loop systems 3. Apply the control techniques to any electrical systems 4. Design the classical controllers such as P, PI, etc., for electrical systems	COs / POs	Course Outcomes (COs)			
		1	2	3	4
	PO 1	3	3	3	3
	PO 2	3	3	3	3
	PO 3	3	2	2	3
	PO 4	3	1	1	1
	PO 5	3	2	3	2
	PO 6	NA	NA	NA	NA
	PO 7	3	3	3	3
	PO 8	3	3	3	3
	PO 9	2	2	2	2
	PO10	2	2	1	1
PO11	2	2	3	3	
PO12	3	3	3	2	

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.	Week 1 31 Jul - 4 Aug 2023 (4 Contact hour)	Introduction to Control Systems with Examples Concept of open loop, closed loop, LTI system, transfer functions	Lecture / Tutorial C & T / PPT or any suitable mode
2.	Week 2 07-11 Aug 2023 (4 Contact hours)	Modeling of physical systems and its transfer functions - Mechanical systems	
3.	Week 3 14 - 18 Aug 2023 (4 Contact hours)	Modelling of physical systems: Electrical systems - Electromechanical systems, Thermal systems.	
4.	Week 4 21 - 25 Aug 2023 (4 Contact hour)	Time domain analysis: Time-domain specifications	
5.	Week 5 28 Aug - 1 Sep 2023 (4 Contact hours)	Analysis of steady state error for various inputs based on types and order of the systems	
6.	Week 6 4- 8 Sep 2023 (4 Contact hours)	Routh and Hurwitz conditions for stability	
7.	Week 7 11 – 15 Sep 2023 (4 Contact hours)	Routh and Hurwitz conditions First Assessment	
8.	Week 8 18 – 22 Sep 2023 (4 Contact hour)	Introduction to Routh-locus method Routh-locus method	
9.	Week 9 25 -29 Sep 2023 (0 Contact hours)	Academic Break	
10.	Week 10 2 – 6 Oct 2023 (3 Contact hours)	Introduction to frequency response analysis	
11.	Week 11 9 – 13 Oct 2023 (4 Contact hours)	Bode-plot	
12.	Week 12 16 – 20 Oct 2023 (4 Contact hours)	Nyquist plot and Nyquist stability criterion	
13.	Week 13 23 – 27 Oct 2023 (3 Contact hours)	Introduction to controller design	
14.	Week 14 30 Oct – 3 Nov 2023 (4 Contact hours)	Controller design: Design of P, PI, PID Second Assessment	
15.	Week 15 6 – 10 Nov 2023 (4 Contact hours)	lag, lead, lead-lag compensator design	

16.	Week 16 13 – 17 Nov 2023 (4 Contact hours)	Numerical Solving/Tutorial	
17.	Week 17 20 – 24 Nov 2023	Numerical Solving/Tutorial Compensation Assessment	
18.	Week 18 27 Nov - 01 Dec 2023	----	
19.	Week 19 & 20 04 - 15 Dec 2023	End Semester Examination (Final Assessment)	

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

COURSE ASSESSMENT METHODS

S.No.		Week/Date	Duration	% Weightage
1	I st Class Test	Week 7 11 – 15 Sep 2023	60 minutes	20
2	II nd Class Test	Week 14 30 Oct – 03 Nov 2023	60 minutes	20
3	Assignment: 1 Surprise-quiz: 2	Throughout semester <ul style="list-style-type: none"> Assignment: Solutions for the questions (from first class to last class) needs to be submitted in Week 17 Surprise-quiz: Out of 2, best 1 will be considered Note: No compensation for surprise-quiz		5+15=20
CPA	Compensation Assessment	Week 1 7 20 – 24 Nov 2023	60 minutes	20
4	Final Assessment	Week 18/19/20	180 minutes	40

Note:

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

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

- Katsuhiko Ogata, 'Modern Control Engineering', Pearson Education Publishers, 5th Edition, 2010.
- Nagrath I.J. and Gopal M, 'Control Systems Engineering', New Age International Publications, 5th Edition, 2010.
- Richard C. Dorf and Robert H. Bishop. 'Modern control systems', Pearson Prentice Hall Publications, 12th Edition, 2010.
- 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 (Mid of the semester & End of the semester)
- End semester feedback on course outcomes

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

1. Attending all the assessments mandatory for every student
2. One compensation assessment will be conducted for those students who are being physically absent for the assessment 1 and/or 2, only for the valid reason.
3. At any case CPA will not be considered as an improvement test.
4. Absolute/Relative grading will be adopted for the course.

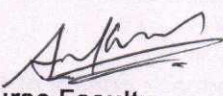
ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

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

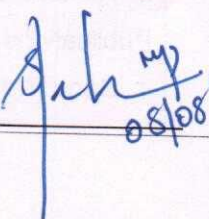
ACADEMIC DISHONESTY & PLAGIARISM

1. Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
2. Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
3. 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.
4. The above policy against academic dishonesty shall be applicable for all the programmes.

FOR APPROVAL


Course Faculty _____


CC-Chairperson _____


HOD _____
08/08/23