

**DEPARTMENT OF Instrumentation and Control Engineering**  
**NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

COURSE PLAN – PART I			
Name of the programme and specialization	B.Tech Instrumentation and Control Engineering		
Course Title	Analog Signal Processing		
Course Code	ICPC18	No. of Credits	3
Course Code of Pre-requisite subject(s)	Nil		
Session	Jan 2019	Section (if, applicable)	A
Name of Faculty	Dr. S. Narayanan	Department	ICE
Email	narayanan@nitt.edu	Telephone No.	0431-2503364
Name of Course Coordinator(s) (if, applicable)	NA		
E-mail	-----	Telephone No.	
Course Type	<input checked="" type="checkbox"/> Core course <input type="checkbox"/> Elective course		
<b>Syllabus (approved in BoS)</b>			
<p>Introduction to analog signals and systems, Random signal analysis, application of statistical methods to the measurement of waveforms.</p> <p>Analog signal processing circuits: amplifiers, analog multipliers, integrators, differentiators, active and passive filters. Universal Filters and their application.</p> <p>Current-to-voltage and voltage-to-current converter, analog-to-digital converter, digital-to-analog converter, voltage-to-frequency converter, frequency-to-voltage converter.</p> <p>Switched capacitor filter, Phase locked loop, Schmitt trigger, automatic gain control, regulators, wave form generators, oscillators.</p> <p>Case studies: bridge linearization, PLL design using divider and multipliers, regulator design with low voltage dropout, transmitter design and realization of controllers.</p>			
<b>COURSE OBJECTIVES</b>			
<p>This course emphasizes intuitive understanding and practical implementations of the theoretical concepts of amplifiers, filters and other circuits which are essential for signal conditioning.</p>			
<b>COURSE OUTCOMES (CO)</b>			



Course Outcomes	Aligned Programme Outcomes (PO)
On completion of this course, the students will be able to 1. understand the implications of the properties of systems and signals. 2. design and simulate various analog signal conditioning circuits. 3. implement various analog signal conditioning circuits in real time. 4. trouble shoot analog signal conditioning circuits.	1,2,3,4,5,6,7 1,2,3,4,5,6,7 1,2,3,4,5,6,7 1,2,3,4,5,6,7

**COURSE PLAN – PART II**

**COURSE OVERVIEW**

Real world looks for system-level design skills in both analog and digital domains. The main focus of the course is analog system design. It will cover the design and test of practical circuits based on op-amps and other ICs.

Real world signals are processed for a variety of reasons, such as to remove unwanted noise, to correct distortion, to make them suitable for transmission. Analog signal processing unit comprises of various blocks which includes the theory of amplification, filtering, analyzing, transmitting and reproducing the analog signals.

**COURSE TEACHING AND LEARNING ACTIVITIES**

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	I, II, III & IV	<b>Introduction to system and system analysis</b>  Introduction to various forms of systems. Frequency domain analysis application: op-amp static characteristics, study of various parameters like bandwidth slew rate, input and output impedance, CMRR	Chalk and talk
2	V & VI	<b>Study of various feedback circuits and its features.</b>  1. Various modes of amplifier design 2. Various applications using various resistive feedback circuits and its implementation issues	Chalk and talk
3.	VI & VII	<b>Analysis of dynamic feedback</b>  1. Filter design. – various methodologies- list of specification and its implementation issues switched capacitor filter	Chalk and talk



4.	VIII & IX	<b>Waveform generators and oscillators, regulators</b>	Chalk and talk
5.	X & XI	<b>V to F converter, F to V converter, PLL, Multiplier</b> <b>A/D converter and D/A Converter</b> Concepts. Selection of suitable converters	Chalk and talk
6.	XII	<b>Random signal analysis.</b>	Chalk and talk

**COURSE ASSESSMENT METHODS (shall range from 4 to 6)**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Test-1 & Tutorials	5 <sup>th</sup> Week	1 hour	15% + 5%
2	Test-2 & Tutorials	8 <sup>th</sup> Week	1 hour	15% + 5%
3	Assignment test & Tutorials	11 <sup>th</sup> Week	-----	10% + 5%
CPA	Compensation Assessment*	One week before end sem	1 hour	15%
4	Final Assessment *	Last week	3 hours	45%

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

**COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)**

**MODE OF CORRESPONDENCE (email/ phone etc)** email

**COMPENSATION ASSESSMENT POLICY**

Students who have missed the first or second cycle test can register with the consent of faculty for the Re-Test examination which shall be conducted soon after the completion of the second cycle test.

**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**

Course Outcomes	Aligned Programme Outcomes (PO)
After lecture series 1, students should know Various forms of system representation and its analysis. From experimental analysis, study the characteristics of op-amp. Further, the various modes of static feedback and its properties. Application of static feedback. In continuation, students can able to analyze the various static feedback circuits which have been reported in literature.	1,2,3,4,5,6,7
After lecture series 2, students should know dynamic feedback, list of specifications and methodologies.	1,2,3,4,5,6,7
After lecture series 3, students should understand regenerative feedback concepts. By using regenerative feedback concepts, Design of triangular, students can able to analyze waveform generator and various oscillators.	1,2,3,4,5,6,7
After lecture series 4, students should know PLL, V to F converter, VCO and multipliers.	1,2,3,4,5,6,7
After lecture series 5, students should analyze various analog to digital converter and digital to analog converter circuits.	1,2,3,4,5,6,7
After lecture series 6, students should be able to analyze random signal.	1,2,3,4,5,6,7

**FOR APPROVAL**

S. N. N. N. N. N.  
Course Faculty

CC-Chairperson *[Signature]*

HOD *[Signature]*