DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	B.Tech Electronics and Communication Engineering		
Course Title	Analog Integrated Circuits		
Course Code	ECPC23	No. of Credits	3
Course Code of Pre-requisite subject(s)	ECPC17		
Session	July 2019	Section (if, applicable)	A and B
Name of Faculty	Dr. S S Karthikeyan	Department	ECE
Email	sskarthikeyan@nitt.edu	Telephone No.	8903859762
Name of Course Coordinator(s) (if, applicable)			
E-mail		Telephone No.	
Course Type	✓ Core course	☐ Elective course	

Syllabus (approved in BoS)

Operational Amplifiers, DC and AC characteristics, Typical op-amp parameters: Finite gain, finite bandwidth, Offset voltages and currents, Common-mode rejection ratio, Power supply rejection ratio, Slew rate, Applications of Op-amp: Precision rectifiers. Summing amplifier, Integrators and differentiators, Log and antilog amplifiers. Instrumentation amplifiers, voltage to current converters.

Active filters: Second order filter transfer function (low pass, high pass, band pass and band reject), Butterworth, Chebyshev and Bessel filters. Switched capacitor filter. notch filter, All pass filters, self-tuned filters

Opamp as a comparator, Schmitt trigger, Astable and monostable multivibrators, Triangular wave generator, Multivibrators using 555 timer, Data converters: A/D and D/A converters

PLL- basic block diagram and operation, Four quadrant multipliers. Phase detector, VCO, Applications of PLL:Frequency synthesizers, AM detection, FM detection and FSK demodulation.

CMOS differential amplifiers: DC analysis and small signal analysis of differential amplifer with Restive load, current mirror load and current source load, Input common-mode range and Common-mode feedback circuits. OTAs vs Opamps. Slew rate, CMFR, PSRR. Two stage amplifiers, Compensation in amplifiers (Dominant pole compensation).

COURSE OBJECTIVES	
To introduce the theoretical & circuit aspects of an Op-amp.	

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. Infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques	PO1, PO5, PO11, PO12- H PO2, PO3, PO4 -L
2. Elucidate and design the linear and non linear applications of an opamp and special application Ics.	PO1, PO8 - H PO2, PO3, PO4, PO5, PO9, P11 – M P12 - L
3. Explain and compare the working of multi vibrators using special application IC 555 and general purpose opamp	PO2, PO3, PO4-H PO1, PO5, PO9, P11 – M P12 - L
4. Classify and comprehend the working principle of data converters	PO1, PO5, PO8, PO9, PO11,PO12- H PO2, PO3, PO4 -L
5. Illustrate the function of application specific ICs such as Voltage regulators, PLL and its application in communication	PO1, PO5, P12 – H PO9, PO11 – M PO2, PO3, PO4- L

COURSE PLAN – PART II
COURSE OVERVIEW

This is a course on the design and applications of operational amplifiers and analog integrated circuits. This course introduces basic op-amp principles and illustrate how the op-amp can be used to solve a variety of application problems. Much attention is given to basic op-amp configurations, linear and non-linear applications of op-amp and active filter synthesis, including switched capacitor configurations. It also deals with oscillators, waveform generators and data converters.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	Week 1	Operational Amplifiers, DC and AC characteristics Typical op-amp parameters: Finite gain, finite bandwidth, Offset voltages and currents	Chalk & Talk /PPT

2	Week 2	Common-mode rejection ratio, Power supply rejection ratio, Slew rate	Chalk & Talk /PPT
3	Week 3	Applications of Op-amp: Precision rectifiers. Summing amplifier, Integrators and differentiators	Chalk & Talk /PPT
4	Week 4	Log and antilog amplifiers. Instrumentation amplifiers, voltage to current converters	Chalk & Talk /PPT
5	Week 5	Active filters: Second order filter transfer function (low pass, high pass band pass and band reject), Butterworth, Chebyshev and Bessel filters)	Chalk & Talk /PPT
6	Week 6	Switched capacitor filter. notch filter All pass filters, self-tuned filters	Chalk & Talk /PPT
7	Week 7	Opamp as a comparator, Schmitt trigger, Astable and monostable multivibrators Triangular wave generator, Multivibrators using 555 timer	Chalk & Talk /PPT
8	Week 8	Data converters: A/D and D/A converters	Chalk & Talk /PPT
9	Week 9	PLL- basic block diagram and operation, Four quadrant multipliers. Phase detector, VCO	Chalk & Talk /PPT
10	Week 10	Applications of PLL:Frequency synthesizers, AM detection, FM detection and FSK demodulation	Chalk & Talk /PPT
11	Week 11	CMOS differential amplifiers: DC analysis and small signal analysis of differential amplifer with Restive load,	Chalk & Talk /PPT
12	Week 12	current mirror load and current source load, Input common-mode range and Common-mode feedback circuits	Chalk & Talk /PPT
13	Week 13	OTAs vs Opamps. Slew rate, CMRR, PSRR. Two stage amplifiers,	Chalk & Talk /PPT

| 14 | Week 14 | Compensation in amplifiers (Dominant pole compensation). | | Chalk & Talk /PPT |

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test I	September Ist Week	1 Hour	20%
2	Cycle Test II	October Ist Week	1 Hour	20%
3	Assignment	October Last Week		10%
CPA	Compensation Assessment*	November Ist Week	1 Hour	20%
4	Final Assessment *	November Third Week	3 Hours	50%

*mandatory; refer to guidelines on page 4

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

Course Feedback is assessed through class committee meeting, frequently ask the questions in the class and analyze the responses and course exit survey

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

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 intimated in Class Only through Class representative.
2. Attending all the assessment is Mandatory for every student.
3. If any of the student is not able to attend the Cycle Test 1 and Cycle Test 2 due to genuine reasons (any academic related work through department or Medical grounds) may appear for compensation assessment.
4. There will not be any improvement test for the students who scores low in the cycle test
5. Mobile phones will not be allowed for all the assessments.

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.
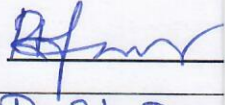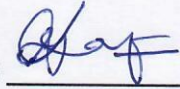
ADDITIONAL INFORMATION

FOR APPROVAL

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

(Dr. R. k. Jeyaelim)