Course Code	Course Name	Credits
MTC405	**Application of Integrated Circuits**	**03**

Prerequisite: MTC304Basic Electronics and Digital Circuit Design, MTC305 Electrical Circuits and Machines

Objectives:
1. To teach fundamental principles of standard linear integrated circuits.
2. To develop a overall approach for students from selection of integrated circuit, study its specification, the functionality, design and practical applications

Outcomes: Learner will be able to..
1. Demonstrate an understanding of fundamentals of integrated circuits.
2. Analyze the various applications and circuits based on particular linear integrated circuit.
3. Select and use an appropriate integrated circuit to build a given application.
4. Design an application with the use of integrated circuit

Module	Detailed Contents	Hrs.
01	**Fundamentals of Operational Amplifier** 1.1 Ideal Op Amp, characteristics of op-amp, op-amp parameters, high frequency effects on op-amp gain and phase, single supply versus dual supply op-amp 1.2 Operational amplifier open loop and closed loop configurations, Inverting and non-inverting amplifier	6
02	**Linear Applications of Operational Amplifier** **2.1 Amplifiers**: Adder, subtractor, integrator, differentiator, current amplifier, difference amplifier, instrumentation amplifier and application of Op-Amp **2.2 Converters:** Current to voltage converters, voltage to current converters **2.3 Active Filters:** First order filters, low pass, high pass, band pass and band reject filters. **2.3 Sine Wave Oscillators:** RC phase shift oscillator and Wien bridge oscillator.	9
03	**Non-Linear Applications of Operational Amplifier** **3.1 Comparators:** Inverting comparator, non-inverting comparator, zero crossing detector, window detector and level detector. **3.2 Schmitt Triggers**: Inverting and non-inverting Schmitt trigger **3.3 Waveform Generators:** Square wave generator and triangular wave generator with duty cycle modulation **3.4 Precision Rectifiers:** Half wave and full wave precision rectifiers and their applications. **3.5 Peak Detectors**, Sample & Hold Circuits, voltage to frequency converter, frequency to voltage converter, logarithmic converters and antilog converters	8
04	**Data Converters** **4.1 Analog to Digital:** Performance parameters of ADC, Single Ramp ADC, ADC using DAC, Dual Slope ADC, Successive Approximation ADC, Flash ADC. **4.2 Digital to Analog:** Performance parameters of DAC, Binary weighted register DAC, R/2R ladder DAC, Inverted R/2R ladder DAC	5
05	**Special Purpose Integrated Circuits** 5.1 Functional block diagram, working, design and applications of Timer 555. 5.2 Functional block diagram, working and applications of VCO 566, XR 2206, power amplifier LM380.	5

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06	**Voltage Regulators** 6.1 Functional block diagram, working and design of three terminal fixed (78XX, 79XX series) and three terminal adjustable (LM 317, LM 337) voltage regulators. 6.2 Functional block diagram, working and design of general purpose 723 (LVLC, LVHC, HVLC and HVHC) with current limit and current fold-back protection, Switching regulator topologies	6

Assessment:

Internal Assessment for 20 marks: Consisting Two Compulsory Class Tests First test based on approximately 40% of contents and second test based on remaining contents (approximately 40% but excluding contents covered in Test I). Duration of each test shall be one hour.

End Semester Theory Examination:

1. Question paper will comprise of total 06 questions, each carrying 20marks.
2. Total 04 questions need to be solved.
3. Question No: 01 will be compulsory and based on entire syllabus wherein sub- questions of 2 to 5 marks will be asked.
4. Remaining questions will be mixed in nature.(e.g. Suppose Q.2 has part (a) from module3 then part (b) will be from any module other than module 3)
5. In question paper weightage of each module will be proportional to number of respective lecture hrs as mentioned in the syllabus.

Text Book

Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson Prentice Hall, 4th Edition.

References:

1. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", Tata McGraw Hill, 3rd Edition.
2. William D. Stanley, "Operational Amplifiers with Linear Integrated Circuits ", Pearson, 4th Edition
3. D. Roy Choudhury and S. B. Jain, "Linear Integrated Circuits", New Age International Publishers, 4th Edition.
4. David A. Bell, "Operation Amplifiers and Linear Integrated Circuits", Oxford University Press, Indian Edition.
5. R. P. Jain, "Modern Digital Electronics," Tata McGraw Hill, 3rd Edition.
6. Ron Mancini, "Op Amps for Everyone", Newnes, 2nd Edition.
7. J. Millman and A. Grabel, "Microelectronics", Tata McGraw Hill, 2nd Edition.
8. R. F. Coughlin and F. F. Driscoll, "Operation Amplifiers and Linear Integrated Circuits", Prentice Hall, 6th Edition.
9. J. G. Graeme, G. E. Tobey and L. P. Huelsman, "Operational Amplifiers- Design & Applications", NewYork: McGraw-Hill, Burr-Brown Research Corporation.

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