

**DEPARTMENT OF ELECTRONICS**  
**MSc Electronics**

**ELE 459 - INTRODUCTION TO MUSIC TECHNOLOGY**

**Course Outcomes:**

1. To appreciate Science and Mathematics behind music theory like tone, semitone, octaves etc.
2. To appreciate the signal processing aspects of music and related technology.
3. To understand the methods and means to tune different musical instruments to the required key.
4. To appreciate the different file formats used to communicate the music files.

**UNIT I**

**Fundamentals of music signal:** Definition of music as an organized sound on time axis, sinusoidal signal, definitions of octave, cent, tone, semitone, frequency(shruthi) intervals, pitch, loudness, decibel, logarithmic behavior of human auditory system, Fourier analysis of signals, periodic and aperiodic signals, fundamental frequency, harmonics, beating phenomenon, names and frequencies of twelve notes of piano and electronic keyboard, concept of melody and harmony, circle of fifth, Pythagorean comma, concept of time keeping in music- tala and beats. Concept of That, melakartha ragas, ragas and janya ragas in Indian music, scales, modes and chord sequences in western music. Reading music notations in western and Indian music systems, musical note synthesis using MATLAB, the process of music composition, list and classification of popular musical instruments, tuning of guitar and violin, voice culture.

**16 Hours**

**UNIT II**

**Music Signal :** Analog signal, digital signal, analog to digital conversion(ADC), sampling theorem, Nyquist rate, oversampling, under-sampling, aliasing, digital to analog conversion(DAC), sound cards in a computer, frequency ranges of different musical instruments and human voice. Concept of bandwidth: signal spectrum, communication channel, FM radio station. Noise in audio range-their sources, power noise, filters(analog and digital), notch filter, Dolby system, digital audio effects, surround sound.

**10 Hours**

**UNIT III**

**Music Signal Recording and Reproduction :** Microphones , different classes of microphones and their classifications based on bandwidth, fidelity, noise performance, angle and range of

reception, sensitivity, mono versus stereo music, Digital audio workstations, signal mixing, audio amplifiers, speakers – classifications, power output, definition of PMPO, spectral equalizers, tracks and multitracks, Bass versus treble, Musical Interface Digital Interface(MIDI)

**10 Hours**

**Books:**

1. “The structure of music in RAGA and western systems”- Padma Vibhushan Dr. Raja Ramanna, Bharatiya Vidya Bhavan, 1993
2. “Speech and Audio Processing” - Dr. Shaila D. Apte, Wiley Precise textbook, Wiley India edition, 2013
3. “The Rags of North Indian Music” - N.A. Jairazbhoy, Popular Prakashana, 1995
4. “NAD – Understanding Raga Music”- Sandeep Bagchee, Eeshwar publisher, 1998
5. “Shyam Rao Gharana – Redefining Hindustani Music- Vols 1 and 2”- SvaraSagara Pt. Shyamrao Kulkarni, Prism Books, 2011
6. “Introduction to Music Theory”- Catherine Schmidt Jones, Russell Jones, CONNEXIONS, Rice University, Houston, Texas-2010
7. “The Science of Indian Music” – Nookala Chinna Satyanaraya, Sri Dattasai Graphics, Hyderabad, 2005
8. “The Structure of Music”-R.O. Morris, University Press, Oxford, 1985
9. “History and Evolution of Indian Music”- Khushboo Kulshreshtha, Shree Natraj Prakashan, Delhi,2010
10. “Indian Music” - Swami Rama, The Himalayan International Institute of Yoga science and Philosophy of U.S.A, Honesdale, Pennsylvania
11. Digital signal processing – Principles Algorithms & Applications, Proakis & Monalakis, Pearson education, 4th Edition, New Delhi, 2007.