INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITDM) KANCHEEPURAM

<table>
<tr><td>Course Title</td><td>Acoustic & Audio Signal Processing</td><td>Course No</td><td colspan="4"></td></tr>
<tr><td rowspan="2">Department/ Specialization</td><td rowspan="2">Electronics & Communication Engineering</td><td rowspan="2">Credits</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>3</td></tr>
<tr><td>To be offered for</td><td>PG/Ph.D.</td><td>Status</td><td colspan="4">Core □ Elective ■</td></tr>
<tr><td>Faculty proposing the course</td><td>Dr. Asutosh Kar</td><td>Type</td><td colspan="4">New □ Revision ■</td></tr>
<tr><td colspan="2">Recommendation from DAC - Yes</td><td>Date of DAC</td><td colspan="4">17th March 2021</td></tr>
<tr><td>External Experts</td><td colspan="5">Prof. CS Ramalingam, Dept. of EE, IIT Madras<br>Prof. Trilochan Panigrahi, Dept. of ECE, NIT Goa</td></tr>
<tr><td>Prerequisite</td><td>Signal & Systems & DSP</td><td>Submitted for approval</td><td colspan="4">46th Senate</td></tr>
<tr><td>Learning Objectives</td><td colspan="5">This course covers various aspects of acoustic and audio signal processing along with applications in audio algorithm design, and audio signal analysis. Acoustic signal processing algorithms are of high priority in monophonic and stereophonic echo cancellation in both wired and wireless communication, active noise control and feedback reduction which are of prime focus in audio signal processing industries all over the world.</td></tr>
<tr><td>Learning Outcomes</td><td colspan="5">• Students will come to know state-of-the-art applications of acoustic signal processing algorithms, and audio signal analysis for solving real-time industrial problems which will motivate them for further research in the field of signal processing, and acoustics.<br>• This course also covers the development of acoustic echo cancellers, noise measurement, hearing aids, active noise cancellation techniques. The design aspects of these state-of-the-art algorithms will help to increase the interest of students on application based studies.</td></tr>
<tr><td>Course Contents (with approximate breakup of hours for lecture/tutorial)</td><td colspan="5">Background and preview: Audio signal recording, analysis and representation techniques, audio measurement, sound intensity, noise signal analysis and characterization, stationary and nonstationary signals, probabilistic signal processing techniques with applications for the acoustic & audio signal analysis, digital filters for audio enhancement.<br>(14L+4T)<br><br>Acoustic and audio signal processing techniques: Characteristics of widely interfaced acoustic signals, multiple sub-filters different error, common error and combined error algorithms, monophonic and stereophonic acoustic echo cancellation, active noise suppression, feedback cancellation.<br>(14L+6T)<br>Applications: Digital hearing aid system design, headphone noise cancellation, acoustic signal enhancement for audio conferencing, variable tap-length filter applications with convergence and steady-state analysis.<br>(14L+4T)</td></tr>
<tr><td>Text Books</td><td colspan="5">4. Jacob Benesty, Israel Cohen, Jingdong Chen, Fundamentals of Signal Enhancement and Array Signal Processing, Wiley & Sons, 2018<br>5. Udo Zolzer, Digital Audio Signal Processing, Wiley & Sons, 2008.<br>6. Steven L. Gay, Jacob Benesty, Acoustic Signal Processing for Telecommunication, Springer, 2001.</td></tr>
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| Reference Books | 1. D. Manolakis, M. Ingle, S. Kogon, Statistical and Adaptive Signal Processing, McGraw-Hill, Revised Edition 2014.<br>2. Simon Haykin, Adaptive Filter Theory, Pearson, Fourth Edition, 2011.<br>Selected Latest Research Papers from:<br>• IEEE Transactions of Audio, Speech and Language Processing.<br>• Elsevier Applied Acoustic Journal.<br>• Elsevier Signal Processing.<br>• Springer, Circuits, Systems and Signal Processing. |