B.Tech AIML

COURSE PLAN: THEORY COURSE

Department :	**Computer Science & Engg.**		
Course Name & code :	**Speech Processing**		**CSE 4430**
Semester & branch :	**VI Sem**	**AIML**	
Name of the faculty :	**Ashwath Rao B**		

No of contact hours/week:	**L**	**T**	**P**	**C**
	3	**0**	**0**	**0**

Course Outcomes (COs) to PO, PSO, BL Mapping

At the end of this course, the student should be able to:		**No. of Contact Hours**	**Marks**	**Program Outcomes (POs)**	**PSOs**	**BL (Recommended)**
CO1	Comprehend the mechanism of production of human sound	8	22	PO1	PSO1	2
CO2	Understand the various techniques for analysis of speech signals	8	22	PO2, PO4	PSO3	4
CO3	Learn the mechanism of speech modeling	7	20	PO3, PO5	PSO4	5
CO4	Understand continuous speech recognition	8	22	PO3, PO4	PSO2	5
CO5	Specify the techniques involved in Speech synthesis	5	14	PO1, PO2, PO3, PO4	PSO1, PSO4	5
	Total					

Course Articulation Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
CO1	3															
CO2		3		2												
CO3			1		3											
CO4			3	2												
CO5	2	2	3	1												
Average Articulation Level	2.5	2.5	2.33	1.66	3											

ICT Tools used in delivery and assessment

Sl. No	Name of the ICT tool used	Details of how it is used
1	Python's audio package	To capture audio.
2	MATLAB Signal Processing Tools	To carry out spectral analysis.

Course Outcomes (COs)/Course Learning Outcomes (CLOs) to PO, PSO, LO, BL Mapping

At the end of this course, the student should be able to:		No. of Contact Hours	Marks	Program Outcomes(POs)	Learning Outcomes (LOs)	BL (Recommended)
CLO1	Comprehend the mechanism of production of human sound	8	22	PO1	PSO1	2

CLO2	Understand the various techniques for analysis of speech signals	8	22	PO2, PO4	PSO3	4
CLO3	Learn the mechanism of speech modeling	7	20	PO3, PO5	PSO4	5
CLO4	Understand continuous speech recognition	8	22	PO3, PO4	PSO2	5
CLO5	Specify the techniques involved in Speech synthesis	5	14	PO1, PO2, PO3, PO4	PSO1, PSO4	5
	Total	**36**	**100**			

 # Applicable to IET Accredited Programs

Delivery and assessment Plan of LOs #

Learning Outcome (LO) mapped to the course		**Delivery and assessment Plan**
LO	**LO statement**	
NA	NA	**NA**

 # Applicable to IET Accredited Programs

Assessment Plan

IN – SEMESTER ASSESSMENTS									
Sl. No.	**Assessment Mode**		**Assessment Method**	****Time Duration**	****Marks**	**** Weightage**	**Typology of Questions (Recommended)**	****Schedule**	****Topics Covered**
1	**MISAC**	**1**	**Quiz**	**L9**	**10**	**Objective:** 5M 10 MCQs × ½ = 5 marks **Descriptive:** 5 M (1 Question of 2 marks +1 Questions of 3 marks)	Bloom's taxonomy (B) level of the question should be L3 and above.	L9 L17	Unit 1 Unit 2
		2	**Mid-Term Test**	**L17**	**30**	10 MCQs × ½ = 5	Bloom's taxonomy (BT) level of the question should be L3 and above.	Mar 18-Mar 23	L1 – L18
2	**FISAC**	**1**	**Surprise Quiz**	**L25**	**5**	**Objective: 5M**	Bloom's taxonomy (BT) level of the question should be L3 and above.	L25	L19-L24
		2	**Mini-project**	**L32**	**5**	**Demo: 5 M**	Bloom's taxonomy (BT) level of the question should be L3 and above.	L32	L1-L32
END – SEMESTER ASSESSMENT									

1	**Regular/Make–Up Exam**	180 Mins	50	Answer all 5 full questions of 10 marks each. Each question can have 3 parts of 2/3/4/5/6 marks.	Bloom's taxonomy (BT) level of the question should be L3 and above.		

Note: Fine tune the assessment plan as per the guidelines, issued by AD(A), notified from time to time.

******* ***Individual faculty will be entering the details***

****** Individual faculty shall identify the assessment method from FISAC Assessment method (Table 1 below) and fill in the details.***

NOTE: ***Information provided in the table is as per the In-semester assessment plan notified by Associate Director (Academics).***

Lesson Plan

L No	Topics	Course Outcome Addressed
1	Articulatory Phonetics	CO1
2	Production of Speech sounds	CO1
3	Classification of Speech sounds	CO1
4	Acoustics of Speech Production	CO1
5	Review of Digital Signal Processing	CO1
6	Short-time Fourier Transform	CO1
7	Bank of Filters method	CO1
8	LPC Method	CO1
9	Speech Distortion measures	CO2
10	Log spectral Distance, Cepstral Distance	CO2
11	Likelihood Distortion	CO2
12	Spectral Distortion using a Warped scale	CO2
13	LPC, PLP and MFCC coefficients	CO2
14	Time Alignment and Normalization	CO2
15	Dynamic Time Warping	CO2
16	Multiple Time-alignment Paths	CO2
17	HMM Processes	CO3
18	HMM Evaluation	CO3
19	Optimal State Sequence	CO3
20	Viterbi Speech	CO3
21	Baum-Wealch Parameter	CO3
22	Parameter Re-estimation	CO3
23	Implementation issues	CO3
24	Continuous speech recognition	CO4
25	Large vocabulary speech recognition	CO4
26	Acoustics models	CO4
27	Langauge models	CO4
28	Language models-ngrams	CO4
29	Language models – sub-word units	CO4
30	Context dependent sub-word units	CO4
31	Applications and present status	CO4
32	Concatenative synthesis methods	CO5
33	Waveform synthesis methods	CO5
34	Sub-word units for TTS	CO5
35	Role of Prosody	CO5
36	Applications and present status	CO5

Faculty members teaching the course (if multiple sections exist):

Faculty	Section	Faculty	Section
NA	NA	NA	NA

References:

1. **Lawrence Rabinerand Biing-Hwang Juang, "Fundamentals of Speech Recognition", Prentice Hall, 1993.**

2. **Daniel Jurafsky and James H Martin, "Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", 2nd edition, Pearson Education, 2008.**

Submitted by: Ashwath Rao B

(Signature of the faculty)

Date: 3-1-2025

Approved by:

(Signature of HOD)

Flexible In-semester Assessment Component (FISAC):

i) The FISAC 1 & FISAC 2 may be any of the types given in Table 1. However, the two components should be of different type.
ii) The type of assessment should be informed to the students well in advance.
iii) Syllabus for the last component of In-semester Assessment (ISAC) i.e. FISAC 2 should cover the topics mentioned for self-study if any / topics which are not covered till MISAC 4: In-Semester Exam 2.

Table 1: Flexible In-semester Assessment Component (FISAC)

No	Type	Description
A.	Quiz/MCQs	Same as MISAC 2: Quiz/MCQs
B.	Surprise Assignment	Same as MISAC 3: Surprise assignment.
C.	Take Home Assignment	*10 questions are to be given to each student. *Questions must be of Blooms Taxonomy Level 3 for first year and Level 4 for higher semesters. *Questions are to be given TWO weeks in advance. *Students have to write the answers to all the questions.
D.	Group Assignment	*The students are to be grouped in such a way that there are 3 – 4 students in each group. *Each group is to be given one question. *The questions should be of Blooms Taxonomy Level 4 for first year and Level 5 for higher semesters. *Questions are to be given TWO weeks in advance. *The questions may be in the form of case studies, design, report writing, etc.
E.	Seminar	*Students may be given the topics for seminar relevant to the course of study. *Topics are to be given TWO weeks in advance. *Should be of Blooms Taxonomy Level 4 for first year and Level 5 for higher semesters. *Topics should be related to the courses of study. *Topics should be in the field of recent developments in the courses of study. *Students have to collect the data regarding the seminar topic and submit a report. *Students should make a presentation for about TEN minutes using Power Point.
F.	Quiz / Assignment based on invited talks	*Faculty have to arrange for the invited talk in the emerging areas in the courses of study. *Quiz / Assignment is to be conducted on the topic of the invited talk. *Questions should be at Blooms Taxonomy Level 4 for first year and Level 5 for higher semesters.
G.	Development of Software / Apps	*Faculty has to define the problem statement. *Problem Statements are to be given TWO weeks in advance. *Should be at Blooms Taxonomy Level 4 for first year and Level 5 for higher semesters. *Students have to develop the software / mobile apps using the appropriate software language / platform.
H.	Mini Project	*Faculty has to define the problem statement. *Problem Statements are to be given TWO weeks in advance. *Should be at Blooms Taxonomy Level 4 for first year and Level 5 for higher semesters. *Students have to develop prototypes.