All India Institute of Speech and Hearing
(An autonomous Institute under the
Ministry of Health and Family Welfare, Govt. of India)
Center of Excellence - Assessed & Accredited by NAAC with 'A' Grade
ISO 9001:2015 Implemented Institute
Manasagangothri, Mysuru-570006

ಅಖಿಲ ಭಾರತ ವಾಕ್ ಮತ್ತು ಶ್ರವಣ ಸಂಸ್ಥೆ
ಮಾನಸಗಂಗೋತ್ರಿ, ಮೈಸೂರು–570006

अखिल भारतीय वाक् श्रवण संस्थान
मानसगंगोत्री, मैसूरु - 570 006

SH/ACA/UOM.BOS(AUD)/2025-26 22.05.2025

The Registrar
University of Mysore
Crawford Hall
Mysore 570 005

Sub: Proceedings of Board of Studies in Audiology (PG) meeting – reg.

Madam,

With reference to the above, please find enclosed hard copy the proceedings of the Board of Studies in Audiology (PG) held at the institute on 15.05.2025.

Kindly acknowledge the receipt.

Thanking you,

Sincerely yours,

M. Pushpavathi

Dr. M Pushpavathi
Chairperson - BOS in Audiology (PG)

Encl: As above.

Phone : 0821-2502000 / 2502100 Toll Free No. 18004255218 Fax : 0821-2510515
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UNIVERSITY OF MYSORE

M.Sc. (Audiology) CBCS and CAGP Regulations – 2025

1.0 Title and Commencement

1.1 These Regulations shall be called the University of Mysore regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for M.Sc. (Audiology) Programme**.** These Regulations shall come into force from the Academic Year **2025-26**.

2.0 Duration of the program

2.1 Duration of the program: 4 Semesters

Note: Each semester shall extend over a minimum period of **eighteen weeks, excluding examination days.**

3.0 Definitions

3.1 Course Every course offered will have three components associated with the teaching-learning process of the course, namely (i) Lecture – L (ii) Tutorial- T (iii) Practicum (Clinical) - P, where

L stands for Lecture session.

T stands for Tutorial session consisting participatory discussion / self study/ desk work/ brief seminar presentations by students and such other novel methods that make a student to absorb and assimilate more effectively the contents delivered in the Lecture classes.

P stands for Practicum (Clinical) which would involve hands-on experience involving persons with communication disorders in clinical and other setups such as hospitals/clinics/ outreach centres.

A course shall have either or all the above components.

The total credits earned by a student at the end of the semester upon successfully completing the course are L + T + P. The credit pattern of the course is indicated as L: T : P.

Different courses of study are labelled and defined as follows:

3.2 **Core Course**

A course which should compulsorily be studied by a **student** as a core requirement is termed as a Core course.

3.2.1 A Core course may be a **Soft Core** if there is a choice or an option for the **student** to choose a course from a pool of courses from the main discipline / subject of study or from a sister/related discipline / subject which supports the main discipline / subject. In contrast to the phrase Soft Core, a compulsory core course is called a **Hard Core** Course**.**

3.3 **Elective Course**

Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline / subject of study or which provides an extended scope or which enables an exposure to some other discipline / subject/domain or nurtures the **student**'s proficiency/ skill is called an Elective Course. Elective courses may be offered by the main discipline / subject of study or by sister / related discipline / subject of study. A Soft Core course may also be considered as an elective.

An elective course chosen generally from an unrelated discipline / subject, with an intention to seek exposure is called an **open elective**.

An elective course designed to acquire a special/advanced knowledge, such as Supplement study/support study to a project work, and a **student** studies such a course on his own with an advisory support by a teacher is called a **Self Study Elective**.

A core course offered in a discipline / subject may be treated as an elective by other discipline / subject and vice versa.

3.4 **Dissertation** is a soft core of 9 credits involving **research on a specific topic and scientific report writing**

4.0 Eligibility for admission.

4.1 Students with a B.ASLP / B.Sc. (Speech & Hearing) degree fulfilling all the following criteria are eligible for admission:

4.1.1 Degree from the University of Mysore or any other University/ Institute considered as equivalent.

4.1.2 The B.ASLP / B.Sc. (Speech & Hearing) degree program should have been **approved by Rehabilitation Council of India (RCI) excluding Institutes of National Importance and Foreign Programs.**

4.1.3 An average of not less than 55% of marks or **Equivalent CGPA** in the qualifying examination.

[**Note:** 'Average' refers to the average of the aggregate marks/**CGPA** of all the years/semesters of B.ASLP/ B.Sc. (Speech & Hearing)/equivalent programme].

4.2 Admission shall be made only on the basis of the marks obtained in the entrance examination conducted by the training institutes for this purpose as per their stipulated rules and regulations.

4.3 Entrance Examination

4.3.1 The objective of entrance examination is to assess the knowledge and skill of the students in the subjects of B.Sc. (Speech & Hearing)/B.ASLP or equivalent.

4.3.2 The entrance examination shall be conducted as notified from time-to-time as per the rules and regulations of the training institute.

4.3.3 The selection committee shall consist of the Head of the Institution, as Chairperson, one faculty member of the institution nominated by Head of the Institution, and one member nominated by the Vice-Chancellor of University of Mysore.

5.0 Scheme of Instruction

5.1 Details of the structure of the programme including the number of hours for the L:T:P components is provided in **Annexure I.**

5.2 The syllabus of every course is divided into four units.

5.3 Students shall attend camps/extension programs tour conducted by the institution.

5.4 A Master's Degree program is of 4 semesters duration. A **student** can avail a maximum of 8 semesters – 4 years (in one stretch) to complete the Master's Degree (including blank semesters, if any). Whenever a **student** opts for blank semesters, he /she has to study the prevailing courses offered by the department when he / she continues his / her studies.

5.5 A **student** has to earn a minimum of 80 credits for successful completion of the master's degree. The credits shall be earned by the **student** by studying **Hard Core, Soft Core, Electives, and Clinical Practicum,** as specified in the program. The students shall obtain additional 4 credits through SWAYAM course as per their choice of course available in the SWAYAM list under Open Elective. The degree shall be awarded on **successful completion of the program.**

5.6 Only such **student**s who register for a minimum of credits per semester as detailed in the Course Structure-2025 and complete successfully with 80 credits in 4 successive semesters shall be considered for declaration of ranks, medals and are eligible to apply for student fellowship, scholarship, free ships and hostel facilities.

6.0 Attendance

6.1 Each course shall be taken, as a unit for purpose of calculating attendance and a **student** shall be considered to have put in the required attendance for the course, if he/she has

attended not less than 80% in case of theory classes and 90% in case of clinical practicum.

6.2 A **student**, who fails to satisfy the requirement of attendance in a course, shall reregister for the same in case of HC, register for the same or alternative course in case of SC/OE when it is offered next. Such students can take the exam for that particular course in the next odd or even semester as the case may be, after fulfilling the required attendance. However, the completion of the degree should not exceed double the duration of the programme. The re-registration facility shall be available only **once** in the entire programme.

6.3 If a student represents his/her Institution in Sports/NSS/Cultural or any official activities, he/she is permitted to avail to a maximum of 15 days in a semester, based on the recommendation and prior permission of the Head of the Institution.

7.0 Medium of Instruction

The Medium of instruction shall be English.

8.0 Continuous assessments, earning of credits and award of grades

The evaluation of the students shall be based on continuous assessment. The structure for evaluation is as follows:

8.1 Assessment and evaluation processes happen in a continuous mode. However, for reporting purposes, a semester is divided into 3 discrete components identified as C_1, C_2, and C_3.

8.2 The performance of a student in a course shall be assessed for a maximum of 100 or 60 marks as explained below.

8.2.1 The first component (C_1), of assessment is for 25% of the total marks. This shall be based on test/ assignment/ seminar etc. C1 shall be assessed after completion of **first 8 weeks** of the semester with completion of the 50% of syllabus.

8.2.2 The second component (C_2), of assessment is for 25% marks. This shall be based on test/ assignment/ seminar etc. C2 shall be assessed at the completion of the semester and syllabus.

8.2.2.1 The outline for continuous assessment activities for Component-I (C_1) and Component-II (C_2) will be proposed by the teacher (s) concerned before the commencement of the semester and will be discussed and decided in the respective Departmental Council. The **student**s should be informed about the modalities well in advance. The evaluated courses/assignments during component I (C_1) and component II (C_2) of assessment are immediately returned to the **student**s after obtaining acknowledgement in the register maintained by the concerned teacher for this purpose.

8.2.3 During the 18^{th} -20^{th} week of the semester, a semester-end examination of 2 hours or 1 hour 30 min duration (as relevant) shall be conducted for each course. This forms the third/final component of assessment (C_3) and the maximum marks for the final component shall be 50 or 30 (as relevant). **Note:** Model question paper pattern is as given in **Annexure - II**

8.3 Clinical Practicum

8.3.1 The clinical practicum examinations shall be in the main subjects of study, i.e., in Audiology.

8.3.2 Clinical practicum is part of all the semesters. The internal assessment shall be conducted continuously, **throughout** the semesters. In the C_1 and C_2, student shall be assessed for Clinical skill/repertoire, **planning for assessment and management,** preparation and maintenance of clinical documents (test protocols, diary, lesson plans and progress report), efficient use of time/skills in clinical work and Professional attitude/motivation/ aptitude for clinical work. C_3 shall be based on clinical viva-voce. In the **Odd Semester**, viva-voce **shall be** conducted by two **internal examiners consisting of *one clinical staff and one faculty***, who shall examine the **students'** clinical skills. In the **Even Semester**, viva-voce shall be conducted by one internal and one external faculty to examine the **students'** clinical skills.

8.4 Dissertation work

8.4.1 Dissertation shall be conducted by each candidate over a period of 2 semesters (III and IV semesters). Dissertation I of the semester III and Dissertation II of the semester IV shall be in the same course.

8.4.2 Right from the initial stage of defining the problem, the **student** has to submit progress reports periodically and also present **the progress and hold** regular discussions with the guide. Components of evaluation are as follows:

In the **III Semester, C_1 will be based on** Preparation of research proposal, and C_2 will be **based on Presentation of** research proposal. Both C1 and C2 shall be evaluated by **the guide. C_3 will be based on viva voce** and awarded by a panel of two members consisting of the guide and an internal examiner. The evaluation shall carry a weightage of 50% by the guide and 50% by the internal examiner.

In the IV Semester, C_1 will be based on periodic progress and progress report. C_2 will be based on results of the study and draft report. Both C_1 and C_2 will be awarded by the guide. C_3 will be based on viva-voce and evaluation of the report. This will be awarded by a panel of two members consisting of the guide and an external examiner. Report evaluation shall be by the guide and shall carry 50% of marks, and viva-voce examination shall be of 50% weightage and shall be awarded equally by the guide and the external examiner. **The maximum marks for** Dissertation I **and** Dissertation II are detailed in the Course Structure-2025.

8.4.3 The **student**s shall submit three copies of dissertation before the commencement of theory examination of that semester. **Student**s who fail to submit their dissertations on or before the stipulated date shall not be permitted to appear for the final **dissertation viva voce.**

8.4.4 A student who is said to have DROPPED dissertation work has to re-register for the same subsequently within the stipulated period.

8.5 In case a **student** secures less than **40%** in C_1 and C_2 put together in a course, the **student** is said to have DROPPED that course, and such a **student** is not allowed to appear for C_3 in that course.

In case a **student**'s attendance in a course is less than the stipulated percentage, the **student** is said to have DROPPED that course, and such a **student** is not allowed to appear for C_3 in that course.

Teachers offering the courses will place the above details in the Department Council meeting during the last week of the semester, before the commencement of C_3, and subsequently a notification pertaining to the above will be brought out by the Chairman of the Department before the commencement of C_3 examination. A copy of this notification shall also be sent to the office of the Registrar & Registrar (Evaluation).

In case a **student** secures less than **40% in C_3,** he/she may choose DROP/MAKEUP option.

In case a **student** secures more than or equal to **40%** in C_3, but his/her grade **(G) = 5**, as per section **8.9** below, then he/she may be declared to have been conditionally successful in this course, provided that such a benefit of conditional clearance based on G = 5 shall not be availed for a maximum of 8 credits for the entire programme of Master's Degree.

In case a **student** secures more than **40%** in C_3 but G=5, then he/she may choose DROP/MAKE-UP option. The **student** has to exercise his/her option immediately within 10 days from the date of notification of results. **A MAKEUP examination for odd semester courses will be conducted along with next regular odd semester examinations and for even semester courses along with the next regular even semester examinations. If a student is still unsuccessful, he/she may opt to DROP or again take up a MAKE-UP examination. However, not exceeding double the duration norm in one stretch from the date of joining the course.**

A **student** has to re-register for the DROPPED course when the course is offered again by the department, if it is a hard core course. The **student** may choose the same or an alternate core/elective in case the dropped course is soft core / elective course. A **student** who is said to have DROPPED **the course** has to re-register for the same subsequently within the stipulated period. The details of any dropped course will not appear in the grade card.

However, if a candidate secures less than 50% in C_3 of the clinical courses, no make-up examination would be given and candidate shall be considered to have dropped the course and re-register for the course.

8.6 Setting questions papers and evaluation of answer scripts.

8.6.1 I. Questions papers in three sets shall be set by internal / external examiners for a course.

II. The Board of Examiners shall scrutinize and approve the question papers and scheme of valuation.

III. There shall be single valuation for all theory papers by internal examiners. In case, the number of internal examiners falls short, external examiners may be invited. The marks awarded by the internal examiners shall be taken as the final marks for that particular course. The examination for **clinical** work/**dissertation** work will be conducted jointly by two internal examiners. However, the BoE on its discretion can also invite external examiners, if required.

IV. Challenge valuation: A student who desires to apply for challenge valuation shall obtain a photocopy of the answer script by paying the prescribed fee within 10 days after the announcement of the results. He / She can challenge the grade awarded to him/her by surrendering the grade card and by submitting an application along with the prescribed fee to the Registrar (Evaluation) within 15 days after the announcement of the results. This challenge valuation is only for C_3 component.

The answer scripts for which challenge valuation is sought for shall be sent to another examiner. The marks awarded will be the higher of the marks obtained in the challenge valuation and in maiden valuation.

8.6.2 If a course has both theory and practical components with credit pattern L : T : P, then as parts of (C_1 and C_2) both theory and practical examinations shall be conducted for 50 marks each. The final (C_3) component marks shall be decided based on the marks secured by the student in the theory examinations. If **X** is the marks scored by the student out of 50 in C3 in theory examination, if **Y** is the marks scored by the student out of 50 in C3 in Practical examination, and if **Z** is the marks scored by the student out of 50 in C3 for a course of (L=0):T:(P=0)type that is entirely tutorial based course, then the final marks M in C3 is decided as per the following table.

L.T.P distribution	**Find mark M in C3**
L:T:P	$\frac{[(L+T)*X]+[(T+P)*Y]}{L+2T+P}$
L:(T=0):P	$\frac{(L*X)+(P*Y)}{L+P}$
L:T:(P=0)	X
L:(T=0):(P=0)	X
(L=0):T :P	Y
(L=0): (T=0):P	Y
(L=0): T:(P=0)	Z

8.6.3 The details of continuous assessment are summarized in the following Table.

Component	Syllabus in a course	Weightage	Period of Continuous assessment
C_1	First 50% (2 units of total units)	25%	First half of the semester. To be consolidated by 8th week
C_2	Remaining 50% (Remaining units of the course)	25%	Second half of the semester. To be consolidated by 16th week
C_3	Semester-end examination (All units of the course)	50%	To be completed during 18th -20th Week.

Final grades to be announced latest by 24th week

8.6.4 A student's performance from all 3 components will be in terms of scores, and the sum of all three scores will be for a maximum of 100 marks (25 + 25 + 50)/ 60 marks (15 + 15 + 30).

8.6.5 **Finally, awarding the grades should be completed latest by 24th week of the semester**.

8.7 The tentative / provisional grade card will be issued by the Registrar (Evaluation) at the end of every semester indicating the courses completed successfully. This statement will not contain the list of PENDING or DROPPED courses.

8.8 Upon successful completion of Masters degree, a final grade card consisting of grades of all courses successfully completed by the student will be issued by the Registrar (Evaluation).

8.9 The grade and the grade point earned by the candidate in the course will be as given below.

P	G	GP = V x G
40-49	5	V*5
50-59	6	V*6
60-64	6.5	V*6.5
65-69	7	V*7
70-74	7.5	V*7.5
75-79	8	V*8
80-84	8.5	V*8.5
85-89	9	V*9
90-94	9.5	V*9.5
95-100	10	V*10

Here, P is the percentage of marks (P=[(C1+C2)+M]) secured by a student in a course which is rounded to nearest integer. V is the credit value of course. G is the grade and GP is the grade point.

8.10 A student also has an option to withdraw a course even after final examination, if he / she feels that he / she should improve in the course in terms of grade. The withdrawal of a course can be either only for C_3 components, in which the student has to reappear for only C3 component to improve, carrying the marks of C_1 and C_2 components (this option is called PENDING option), or for the entire course where the student has to reenrol for the course afresh or can chose an

alternative course if the withdrawal course is a soft/elective core (this option is called DROPPED option). This act of withdrawing should be immediately within seven days after the announcement of final results.

8.11 Overall cumulative grade point average (CGPA) of a student after successful completion the required number of credits (76) is given by

CGPA = Σ GP / Total number of credits (calculated up to 4 decimal places)

9. Classification of results:

The final grade point (FGP) to be awarded to the student is based on CGPA secured by the student and is given as follows.

CGPA	FGP	
	Numerical Index	**Qualitative Index**
4 <= CGPA < 5	5	SECOND CLASS
5 <= CGPA < 6	6	
6 <= CGPA < 7	7	FIRST CLASS
7 <= CGPA < 8	8	
8 <= CGPA < 9	9	DISTINCTION
9 <= CGPA < =10	10	

Overall percentage = 10*CGPA

10.0 Provisions for Repeaters

10.1 A **student** is allowed to carry all the previous uncleared **courses except clinical practicum** to the subsequent semester/semesters subject to Regulation 8.5

11 Provision for appeal

11.1 If a student, is not satisfied with the evaluation of C1 and C2 components, he / she can approach the grievance cell with the written submission together with all facts, the assignments, test papers etc, which were evaluated. He/she can do so before the commencement of semester-end examination. The grievance cell is empowered to revise the marks if the case is genuine and is also empowered to levy penalty as prescribed by the university on the student if his/her submission is found to be baseless and unduly motivated. This cell may recommend taking disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the grievance cell is final.

11.2 For every program there will be one grievance cell. The composition of the grievance cell is as follows.

1. The Registrar (Evaluation) ex-officio Chairman / Convener
2. One senior faculty member (other than those concerned with the evaluation of the course concerned) drawn from the department/discipline and/or from the sister departments/sister disciplines.
3. One senior faculty members / subject experts drawn from outside the University department.

12.0 Barring of simultaneous study

12.1 No student admitted to the degree programme in a College/Institution under the jurisdiction of this University shall be permitted to study simultaneously in any other programme leading to a degree (regular, evening & morning) offered by this or any other University.

12.2 If a student gets admitted to more than one programme, the University shall cancel without giving prior notice, his/her admission to all the programmes to which he/she has joined.

13.0 Miscellaneous

13.1 These revised regulations will apply to students admitted for the academic year 2025-26 and onwards.

13.2 Any other issue, not envisaged above, shall be resolved by the Vice Chancellor in consultation with the appropriate bodies of the university, which shall be final and binding.

REGISTRAR **VICE-CHANCELLOR**

ANNEXURE I

M.Sc. (Audiology) CBCS and CAGP Course Structure– 2025

Sl. No.	Course No.	Credit L:T:P	Credits	Total Credits	No. of Hrs (Hr*Cr=Hr)	No. of hrs/wk	Total hrs/wk	HC/ SC/OE	Title of the Course	C1	C2	C3	Total
I	1.1	2:2:0	4	21	L=1x2=2 T=1x2=2	4	16 + 20	HC	Auditory Physiology	25	25	50	100
	1.2	2:2:0	4		L=1x2=2 T=1x2=2	4		HC	Auditory Disorders	25	25	50	100
	1.3	2:1:0	3		L=1x2=2 T=1x1=1	3		HC	Research Methods, Epidemiology & Statistics	25	25	50	100
	1.4	2:1:0	3		L=1x2=2 T=1x1=1	3		HC	Technology in Audiology	25	25	50	100
	1.5a 1.5b	1:1:0	2		L=1x1=1 T=1x1=1	2		SC	Minor Optional- a. APD b. Pharmacology	15	15	30	60
	1.6	0:0:5	5		P=4x5=20	20		HC	Clinicals in Audiology - I	25	25	50	100
				21			**36**			**140**	**140**	**280**	**560**
II	2.1	2:2:0	4	21	L=1x2=2 T=1x2=2	4	16 + 20	HC	Hearing Sciences	25	25	50	100
	2.2	2:2:0	4		L=1x2=2 T=1x2=2	4		HC	Physiological Assessment of Hearing	25	25	50	100
	2.3	2:2:0	4		L=1x2=2 T=1x2=2	4		HC	Advances in the Management of Auditory Disorders	25	25	50	100
	2.4	1:1:0	2		L=1x1=1 T=1x1=1	2		HC	Advances in Paediatric Audiology	15	15	30	60
	2.5	1:1:0	2		L=1x1=1 T=1x1=1	2		SC	Minor Optional- a. APD b. Pharmacology	15	15	30	60
	2.6	0:0:5	5		P=4x5=20	20		HC	Clinicals in Audiology - II	25	25	50	100
				21			**36**			**130**	**130**	**260**	**520**

Sl. No.	Course No.	Credit L:T:P	Credits*	Total Credits	No. of Hrs (Hr*Cr=Hr)	No. of Hrs/wk	Total hrs/Wk	HC/ SC/ OE	Title of the Course	C1	C2	C3	Total
III	3.1	2:2:0	4	18	L=1x2=2 T=1x2=2	4	12+4+20	HC	Auditory Implants	25	25	50	100
	3.2	2:2:0	4		L=1x2=2 T=1x2=2	4		HC	Vestibular System & its Disorders	25	25	50	100
	3.3	1:1:0	2		L=1x1=1 T=1x1=1	2		HC	Geriatric Audiology	15	15	30	60
	3.4	1:1:0	2		L=1x1=1 T=1x1=1	2		HC	Genetics of Hearing	15	15	30	60
	3.5a 3.5b 3.5c 3.5d 3.5e	0:0:1	1		P=4x1=4	4		SC	Dissertation I (in one of the following) a. Basic Hearing Science b. Rehabilitative Audiology c. Audiological Evaluation d. Vestibular Sciences e. Implantable hearing devices	15	15	30	60
	3.6	0:0:5	5		P=4x5=20	20		HC	Clinicals in Audiology - III	25	25	50	100
				18			**36**			**120**	**120**	**240**	**480**
IV	4.1	2:2:0	4	16	L=1x2=2 T=1x2=2	4	4 + 17+16	HC	Speech Perception	25	25	50	100
	4.2 a 4.2b 4.2c 4.2d 4.2e	0:5:3	8		T=1x5=5 P=4x3=12	17		SC	Dissertation II (in one of the following) a. Basic Hearing Science b. Rehabilitative Audiology c. Audiological Evaluation d. Vestibular Sciences e. Implantable hearing devices	25	25	50	100
	4.3	0:0:4	4		P=4x4=16	16		HC	Clinicals in Audiology - IV	25	25	50	100
				16			**37**			**75**	**75**	**150**	**300**
				76			**145**			**465**	**465**	**930**	**1860**

*Swayam course (Credit: 4) will be offered as per UOM regulations (Open Elective) in the 3rd Semester.

ANNEXURE II-A

MASTER OF SCIENCE (Audiology/Speech-Language Pathology)
CBCS SCHEME (MODEL QUESTION PAPER PATTERN)
(All Units are Compulsory)

Paper Title: ……. **Marks: 30**
Paper Code: ……. **Time: 1 ½ Hours**

Unit No.	Question Number	Question/s	Marks
I	1	xxxxxxxxxxxxxxxxxxxxxxxxxxxxx	10
		OR	
	2	xxxxxxxxxxxxxxxxxxxxxxxxxxxxx	10
II	3	xxxxxxxxxxxxxxxxxxxxxxxxxxxxx	10
		OR	
	4	xxxxxxxxxxxxxxxxxxxxxxxxxxxxx	10
III	5	xxxxxxxxxxxxxxxxxxxxxxxxxxxxx	05
		OR	
	6	xxxxxxxxxxxxxxxxxxxxxxxxxxxxx	05
IV	7	xxxxxxxxxxxxxxxxxxxxxxxxxxxxx	05
		OR	
	8	xxxxxxxxxxxxxxxxxxxxxxxxxxxxx	05

ANNEXURE II-B

MASTER OF SCIENCE (Audiology/Speech-Language Pathology)
CBCS SCHEME (MODEL QUESTION PAPER PATTERN)
(All Units are Compulsory)

Paper Title: ……. **Marks: 50**
Paper Code: ……. **Time: 2 Hours**

Unit No.	Question Number	Question/s	Marks
I	1)	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	10
		OR	
	2(a)	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	05
	2(b)	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	05
II	3(a)	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	10
	3(b)	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	05
		OR	
	4)	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	15
III	5(a)	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	05
	5(b)	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	05
	5(c)	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	05
		OR	
		xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	10
	6(a)	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	05
	6(b)		
IV		xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	05
	7(a)	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	03
		xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	02
	7(b)		
		OR	
	7(c)	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	10

M.Sc. (Audiology) Syllabus

Course: 1.1 (HC) Auditory Physiology		
Objectives	a) identify and describe the macro- and microanatomic structures of the peripheral as well as central auditory system b) describe the physiology of the peripheral as well as central auditory system c) Knowledge of methods to study the physiology of the different components of the auditory system, and d) apply the knowledge of auditory physiology to take appropriate clinical decisions.	
Unit 1	**Anatomy and Physiology of Outer and Middle Ear** a) Anatomy of external ear b) Resonance properties of external ear and its significance to hearing and sound localization c) Head related transfer function (HRTF) d) Bone conduction hearing: theories, factors affecting, skull properties e) Anatomy of Middle ear and middle ear cleft. f) Middle ear transformer action	**15 Hours**
Unit 2	**Cochlear Anatomy and Physiology** a) Macro & microanatomy of cochlea b) Innervations and Blood supply to cochlea c) Cochlear fluids: Generation, composition, and dynamics d) Cochlear transduction and electrophysiology, Cochlear potentials their generation and properties. e) Basilar membrane mechanics and non-linearity f) Hair cell micromechanics and nonlinearity g) Proteins and nutrients related to cochlear physiology Hair cell regeneration	**15 Hours**
Unit 3	**Anatomy and Physiology of the Auditory Nerve and Efferent Auditory Pathways** a) Structure and tonotopic organization of VIII cranial nerve b) Action potential: Generation, properties and conduction	**15 hours**

	c) Physiology of the auditory nerve: • Non-linearity seen at the auditory nerve. • Stimulus coding - frequency, intensity, and temporal coding. • Coding of complex signals at the auditory nerve d) Synapse: Neuro-transmitters vs. neuro-modulators, properties, and function of neurotransmitters, afferent and efferent neurotransmitters. e) Efferent auditory pathways: olivocochlear bundle, corticofugal pathway, cortico-cortical connections f) Physiology of auditory efferent pathways and its influence on auditory physiology Application in understanding concerned auditory disorders	
Unit 4	**Anatomy and Physiology of Auditory Brainstem, subcortical and cortical Regions** a) Auditory nuclei and their interconnections • Cochlear nucleus • Superior olivary complex • Lateral leminiscus • Inferior colliculus • Medial geniculate body b) Tonotopic organization c) Coding of signals at the brainstem and subcortical levels • Simple and complex signals • Speech • Role in sound localization d) Role of the brainstem in sound localization e) Application in understanding concerned auditory disorders f) Anatomy of primary and secondary auditory cortex. g) Tonotopic organization • Neurobiological relationship between auditory cortex and other cortical areas. h) Coding of signals in the auditory cortex • Simple and complex signals • Speech • Role in sound localization	**15 Hours**

Practicum	Observe specimens of various auditory structures and make notes of observations	
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Course: 1.2 (HC) **Auditory Disorders**		
Objectives	After completing this course, the student will be able to a. explain the pathophysiology of auditory disorders b. assess and accurately diagnose auditory disorders, and c. Synthesize the findings from various audiological and non-audiological tests and their importance in diagnosis of auditory disorders.	
Unit 1	**Disorders of the External and Middle Ear** a) Aetiology, pathophysiology, audiological and non-audiological profile, assessment methods (audiological & non-audiological) and intervention methods of • Congenital malformations of the external and middle ear • Otitis media and its complications • Otosclerosis, neoplasms, ossicular chain discontinuity • Disorders of Eustachian tube Reconstruction of external and middle ear hearing mechanisms: reconstructive and rehabilitation procedures	**15 Hours**
Unit 2	**Disorders of the Cochlea** a) Aetiology, pathophysiology, audiological and non-audiological profile, assessment methods (audiological & non-audiological) and management of • Congenital cochlear anomalies • Ototoxicity, Meniere's disease, sudden sensorineural hearing loss, • Infectious cochlear disorders	15 hours

	• Hearing loss secondary to autoimmune disorders and hearing loss secondary to systemic diseases Noise-induced hearing loss and Acoustic trauma, Hearing conservation - national and international guidelines	
Unit 3	**Disorders of Auditory Nerve and Central Auditory Pathways** a) Aetiology, pathophysiology, audiological and non-audiological profile, assessment methods (audiological & non-audiological) and management of • Space-occupying lesions of the auditory nerve and brainstem • Hidden hearing loss • Auditory neuropathy spectrum disorder • Hearing loss due to vascular loop • Hearing loss due to temporal bone fractures • Infectious neural disorders • Effect of systemic diseases on synaptic, auditory nerve and central auditory pathway function • Neurodegenerative disorders • Nutritional Disorders affecting the auditory system	**15 Hours**
Unit 4	**Radiological and Lab tests in assessment of auditory disorders** a. Clinical neurological examination b. Radiological Tests • X-rays • CT scan • MRI • FMRI • fNIRS • PET • SPECT c. Lab tests for differential diagnosis of auditory disorders	**15 hours**
Practicum		

References	**Unit 1** • Sataloff, R., & Sataloff, J. (1993). *Hearing loss*. USA: Informa Health Care. • Hall, J. W., & Mueller, H. G. (1997). *Audiologists' desk reference. Volume 1: Diagnostic audiology principles, procedures and protocols*. San Diego, CA: Singular Publishing Group. • Hull, R. H. (1995). *Hearing in aging*. San Diego, CA: Singular Publishing Group Inc. • Mencher, G. T., Gerber, S. E., & McCombe, A. (1997). *Audiology and auditory dysfunction*. Boston, MA: Allyn and Bacon. • Musiek, F. E., Baran, J. A., & Pinherio, M. L. (1994). *Neuroaudiology: Case studies*. San Diego, CA: Singular Publishing Group. • Roland, P. S., Marple, B. F., & Meyerhoff, W. L. (1997). *Hearing loss*. New York, NY: Thieme Medical Publishers. • Roser, R. R., Valente, M., & Hosford-Dunn, D. (Eds.). (2000). *Audiology: Diagnosis*. New York, NY: Thieme Medical Publishers. • Ross, R. J. (1996). *Roeser's audiology desk reference: A guide to the practice of audiology*. New York, NY: Thieme Medical Publishers • Van De Water, T. R., Popper, A. N., & Fay, R. R. (Eds.). (1996). *Clinical aspects of hearing*. New York, NY: Springer. **Unit 2** • Sataloff, R., & Sataloff, J. (1993). *Hearing loss*. Informa Health Care. • Hall, J. W., & Mueller, H. G. (1997). *Audiologists' desk reference. Vol. 1: Diagnostic audiology principles, procedures and protocols*. San Diego, CA: Singular Publishing Group. • Hull, R. H. (1995). *Hearing in aging*. San Diego, CA: Singular Publishing Group Inc. • Willams, P. J. (2004). *Genetic hearing loss*. New York, NY: Marcel Decker Inc • Hayes, D., & Northern, J. L. (1996). *Infants and hearing*. San Diego, CA: Singular Publishing Group. • Musiek, F. E., Baran, J. A., & Pinherio, M. L. (1994). *Neuroaudiology: Case studies*. San Diego, CA: Singular Publishing Group. • Roland, P. S., Marple, B. F., & Meyerhoff, W. L. (1997). *Hearing loss*. New York, NY: Thieme Medical Publishers. • Roser, R. R., Valente, M., & Hosford-Dunn, D. (Eds.). (2000). *Audiology: Diagnosis*. New York, NY: Thieme Medical Publishers. • Ross, R. J. (1996). *Roeser's audiology desk reference: A guide to the practice of audiology*. New York,	

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Course: 1.3 (HC) **Research Methods, Epidemiology & Statistics**		
Objectives	After completing this course, the student will a) Have the skills to frame research questions and design experiments, b) Decide on the appropriate statistical methods to test hypotheses and interpret the results, b) Be aware of epidemiological issues and its relevance in speech-language research, c) Undertake evidence-based practice in audiology and Speech-Language Pathology d) Apply statistics in the field of Speech- Language Pathology and Audiology. e) Observe ethical practices in research	
Unit 1	**Experimental Designs and Their Applicability in Speech-language and Hearing Research and Epidemiology** a) Types of research- Ex post facto research, normative research, standard group comparison, experimental research (Bivalent, Multivalent, and Parametric), clinical and applied research, sample surveys, evaluation research b) Methods of observation and measurement, strategies and designs in research c) Experimental designs, single-subject experimental designs, and group designs d) Validity of research designs (Internal validity e) & External validity) f) Critical analysis of the research methods employed in speech-language pathology and audiology. g) Documentation and research writing h) Ethical considerations in research – National and international guidelines (Organization, Formatting and Writing styles) i) Epidemiology: Definition, basic concepts – scope and function of epidemiology j) Describe criteria for characterizing the causality of associations k) Application of epidemiological concepts in evaluation and screening procedures employed in speech-language pathology and audiology	**12 Hours**

	Application and impact of epidemiology on national and local policy; influence of epidemiology on ethical and professional issues	
Unit 2	**Statistical Measures and Their Features** a) Review of descriptive statistics (Numerical and graphical summaries) b) Concept of probability c) Estimation of Confidence Interval for mean d) Statistical Inference – Basic concepts related to hypothesis testing – null and alternative hypothesis, significance level and p-value, critical value and acceptance/rejection region, power of the test, types of errors: Type I and Type II errors, one-sided (one-tailed) test and two-sided (two-tailed test) e) Compare and contrast Parametric and non-parametric approaches to hypothesis testing f) Applications of Nonparametric tests - Mann-Whitney U test, Kruskal-Wallis test, Wilcoxon's signed-rank test, Friedman's test (with numerical) g) Categorical data analysis - contingency tables, Chi-square test for independence of attributes (with numerical) h) Measures of association (Contingency coefficient, Cramer's V), Kappa coefficient (with numerical) i) Measures in epidemiology and diagnostic accuracy – Relative risk, odds ratio, positive and negative likelihood ratios; positive predictive value, negative predictive value	**10 Hours**
Unit 3	**Regression, Univariate and Multivariate Analysis** a) Correlation – Karl Pearson's and Spearman's coefficient, regression analysis, and prediction (simple linear with numerical) b) Introduction to - multiple linear regression, logistic regression, and path analysis c) Analysis of Variance (ANOVA)- Basic models, assumptions, one-way ANOVA (with numerical); Introduction to two-way ANOVA and posthoc tests; d) Consequence of failure of assumptions underlying ANOVA; e) Concept of - Tests for additivity, homogeneity and transformation, f) Introduction to Analysis of Covariance (ANCOVA), Repeated measure ANOVA g) Introduction to effect size and interpretation h) Multivariate data analysis (concept only) • Need for multivariate data analysis • Introduction to various methods	**13 Hours**

	• Principal component analysis • Discriminant analysis • MANOVA i) Evaluation of the application of statistics to different research designs	
Unit 4	**Evidence-Based Research** a) Introduction to Evidence-Based Practice (EBP) and Steps to EBP from formulating foreground questions, finding best current evidence, critical appraisal of best current evidence, summarizing evidence, integrating evidence, and tracking progress. b) Levels of evidence: For experimental and non-experimental designs; treatment efficacy- randomized control study, quasi-experimental study, correlation and case study, single-subject designs, expert committee report, consensus conference c) Challenges in the implementation of EBP in Speech-language Pathology and audiology in India and future directions d) Concepts related to randomized control trials: Comparative groups- allocation concealment / random allocation; the importance of participation and follow-up in understanding, evaluating, and applying randomized controlled trial results e) Methods of carrying out therapy trials; execution, indexing, and reporting of therapy trials – efficacy studies; Conventions to study outcomes – • Absolute risk reduction, • Absolute benefit increase, • Absolute risk increase, and • Absolute benefit reduction Systematic review and meta-analysis; importance of research publications in systematic review, meta-analysis, clinical practice guidelines, and health technology assessments.	**10 Hours**
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Course: 1.4 (HC) **Technology in Audiology**		
Objectives	a) have the skills to acquire signals and process them b) develop and apply software-based tools, c) develop and apply tele-technology strategies, and d) decipher the technology of amplification devices e) Understand the basic technology used in hearing aids & cochlear implants. f) Lay the foundation of Information and Communication Technology (ICT) concepts and illustrate	

	its applications in *Audiology*, Speech & Language Sciences & Pathology.	
Unit 1	**Transducers and Signal Processing** a) Transducers used in speech, language and hearing • Microphones: Basic structure & principle of operation of dynamic, condenser and electret microphones. • Essential characteristics of microphones for sound recording, sound measurement and hearing aids. • Loudspeakers: Basic structure & principle of operation of moving coil and balanced armature type. • Essential characteristics of headphones and insert receivers b) Digital signal processing (DSP) • Basic structure of a digital signal processing system • Analog to digital conversion and D to A conversion – influencing parameters • Basic concepts of digital signal processing: signal decomposition, processing and synthesis • Implementation of filters using DSP – FIR and IIR c) Speech signal processing • Converting a speech signal from time domain to frequency domain Feature extraction using short time analysis techniques	**11 Hours**
Unit 2	**Information and Communication Technology & Power Supply** a) Information and communication technology • Computer architecture • Role of operating system, RAM and hard disk in the performance of a computer • Implementation of computer networks in clinics • Introduction to Cloud based computing b) Tele-practice • Technology for tele-diagnosis in audiology • Technology for tele-rehabilitation c) Basic concepts of Artificial intelligence, machine learning and their application in Audiology. d) Power supply • Requirements for mains supply to clinics, electrical grounding – general and special, measures to	**11 Hours**

	reduce electro-magnetic interference (EMI) • Safety of medical electrical instrument – standards and classes, degree of protection • Uninterrupted power supply for entire clinic vs. individual instruments	
Unit 3	**Instrumentation in Hearing Science** a) Instrumentation in audiology • Audiometer • Middle ear analyzer • Otoacoustic emission analyzer • Instrumentation for auditory evoked potentials • Multichannel EEG and ERP systems b) Calibration and maintenance of Audiological equipment • Audiometer • Middle ear analyzer • Otoacoustic emission analyzer • Instrumentation for auditory evoked potentials c) Acoustic measurements • Sound level meter – concept of frequency weighting, averaging time • Noise auditing – traffic noise, ambient noise in audiometric test room and class rooms • Measurement of reverberation time	**11 Hours**
Unit 4	**Technology Involved in Hearing Aids, Cochlear Implants and Speech Processing** a) Technology involved in hearing aids • Basic architecture of digital hearing aids • Technologies for channel separation • Technologies for non-linear amplification • Technologies for noise suppression • Technologies for feedback cancellation b) Technology involved in cochlear implants • Basic architecture of a cochlear Implant • Speech processing strategies	**12 Hours**

	c) Software for speech analysis • LPC analysis Cepstrum analysis • Software packages and applications in hearing diagnostics and research - MATLAB, Adobe audition, Audacity, PRAAT • Stimuli generation software packages • Editing audio files, applying effects in waveform editor, amplitude compression and modulation effects, filter and equalizer effects, noise reduction/ restoration effects, basic multi track controls, saving and exporting • Computer based assessment and intervention programs relating to hearing d) Applications of speech processing • Speaker recognition • Automatic speech recognition • Speech synthesis	
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	Course: 1.5 (SC) **Auditory Processing Disorders**	
Objectives	After completing this subject, the candidate should be able to a) Explain the definitions, classification, and physiology of the CAPD. b) List the signs and symptoms of CAPD and correlate them with different central auditory processes. c) List the diagnostic tests of CAPD and independently design appropriate test protocols for individuals with different signs and symptoms. d) List and explain the factors affecting the assessment and management of CAPD. e) Explain the construction and standardization of the test of CAPD. f) Explain management strategies and techniques for improving different central auditory processes.	
Unit 1	**Introduction to Central Auditory Processing Disorder (CAPD) and Screening of CAPD** a) Overview of CAPD • Critical evaluation of definitions of CAPD • Causes of CAPD • Different processes and cognition involved in CAPD b) Neural maturation and auditory processing; c) Neural degeneration and auditory processing d) Signs and symptoms in individuals with specific central auditory deficits e) Classification of auditory processing disorder; CAPD as a co-morbid disorder f) Screening for CAPD • Need/utility of screening for CAPD • Screening questionnaires/check lists for children and adults; Sensitivity and specificity • Screening tests for children and adults; Sensitivity and specificity	**06 Hours**
Unit 2	**Diagnostic assessment of CAPD** a) Electrophysiological assessment in assessment of CAPD:	**09 Hours**

	• Complex-ABR, ALLR, P300 and other potentials • Contralateral suppression of OAEs b) Behavioural tests in assessment of CAPD and its performance on children, young adults and older adults • Binaural integration/separation • Temporal processing • Auditory separation/closure • Binaural interaction including spatial perception • Auditory memory and sequencing • Assessment of CAPD in subjects with peripheral hearing loss c) Factors affecting assessment of CAPD & Team approach for assessment of CAPD • Factors related to the subjects • Factors related to procedure d) Relation between behavioural and physiological tests in different processes e) Test battery Principles and consideration with examples from case studies	
Unit 3	**Overview of the management of CAPD** a) Overview of the management of CAPD (Bottom-up and Top-Down process) b) Environmental modifications in school set-ups, workplace c) Compensatory strategies for children and adults with CAPD including meta-cognitive and meta-linguistic approaches d) Devices used in management for subjects with CAPD; e) Computer-based auditory training and software f) Importance of Evidence-based practice and treatment efficacy	**06 Hours**
Unit 4	**Direct remediation techniques and outcome of Process specific management of CAPD** a) Role of auditory plasticity in the management of CAPD b) Auditory perceptual training for binaural integration/ separation c) Auditory perceptual training for temporal processing d) Auditory perceptual training for auditory closure e) Auditory perceptual training for binaural interaction & **s**ound localization and lateralisation	**09 Hours**

	Factors affecting management of CAPDs; Team approach for management of CAPD	
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	Course: 1.6 (HC) **Clinicals in Audiology - I**	
	General Considerations • The student should be able to carry out complete audiological evaluation and management of persons with hearing impairment. • After completion of clinical postings, the student will have the ability to apply, show (in a clinical diary/log book), and perform the following on patients/clients:	
	Know • Observe the various auditory structures from the specimens • Gather, review, and examine the information from referral sources to facilitate the audiological assessment process. • Record BC ABR in case of Anotia and Atresia • Perform ABR in anesthetized patients. • Differentially diagnose among middle ear pathologies based on pure-tone audiogram and immittance evaluation • The operations of different transducers **Knowhow** • Check electrical grounding • Calibrate audiometer/EGG • Integrate audiological and non-audiological (radiological and lab tests) in conductive, sensory, and neural hearing loss **Do**	

	• Administer and interpret various audiological tests on individuals with conductive pathology (5 participants). • Administer and interpret various audiological tests on individuals with cochlear pathology (5 participants). • Administer and interpret various audiological tests on individuals with various retrocochlear pathology (3 participants). • Based on the signs and symptoms of CAPD, select the appropriate CAPD tests and list the possible results with justification. • Administer any two CAPD screening tools on 5 children. • Administer at least 2 CAPD diagnostic tests on 2 adults and children. • Based on the CAPD test results, plan for deficit-specific management of CAPD. Write activities for different meta-cognitive and meta-linguistic strategies	
Course: 2.1 (HC) **Hearing Sciences**		
Objectives	After completing this course, the student will be able to a) understand psychophysical components of sound and their measurement, b) analyse and critically evaluate the different methods of estimation of thresholds, frequency analysis and application of masking, and c) conduct experiments to estimate thresholds, and measure pitch, loudness and temporal aspects.	
Unit 1	**Introduction to Psychoacoustics and Pitch Perception** a) Physical properties of sound b) Theory of signal detection: Basic concepts and applications c) Psychophysical procedures d) Absolute and differential hearing sensitivity e) Pitch • Scales • Spectral (place) and temporal (rate) theories of pitch perception of simple and complex	**15 Hours**

	tones Pitch perception in hearing-impaired	
Unit 2	**Loudness and Temporal processing** **Loudness** a) Scales b) Spectral, temporal, and intensity effects c) loudness perception in hearing-impaired d) Models of Loudness **Temporal Processing** a) Concept of temporal processing: Temporal resolution, Temporal integration b) Methods to assess temporal resolution and factors affecting them: Gap detection and discrimination, temporal modulation transfer function, tests for temporal fine structure sensitivity c) Factors affecting temporal integration Models of temporal resolution and integration	**15 Hours**
Unit 3	**Masking** a) Peripheral masking: • Critical band concept and power spectrum model • Estimating the shape of the auditory filter: Psychophysical tuning curve; notched noise; non-simultaneous masking • Auditory filter shapes in normal hearing and hearing-impaired • Masking patterns and excitation patterns in normal hearing and hearing-impaired b) Non-Peripheral masking: • Central masking • Informational masking • Co-modulation masking release Effect of hearing loss on non-peripheral masking	**15 Hours**
Unit 4	**Spatial Perception and Auditory Scene Analysis** a) Basic principles of auditory localization and lateralization b) Cues for auditory localization: binaural cues, HRTFs, head movements c) Binaural release from masking d) Precedence effect	**15 hours**

	e) Models of binaural hearing f) Auditory spatial perception abilities in hearing-impaired g) Basic principles of auditory perceptual organization h) Perceptual cues for auditory grouping/segregation i) Models of auditory scene analysis	
References	**Unit 1** • Gelfand, S, A. (2005). Introduction to psychological and physiological acoustics. New York: Marcel Dekker. • Moore, B. C. J. (1995). Hearing. San Diego: Academic Press. • Moore, B. C. J. (1997). Introduction to psychology of hearing, San Diego: Academic Press. • Warren, R. M. (2008). Auditory Perception: An Analysis and Synthesis. Cambridge: Cambridge University Press. • Yost, W. A. (1994). Fundamentals of hearing: An introduction. San Diego: Academic Press. • Lentz, J. J. (2020). *Psychoacoustics: Perception of normal and impaired hearing with audiology applications*. Plural Publishing Inc. • Zwicker, E., & Fastl, H. (1999). Psychoacoustics-Facts and models. Springer Verlag: Berlin Heidelberg. • Brain C.J., Moore (2007). Cochlear Hearing Loss: Physiological, Psychological and Technical Issues. England: John Wiley and Sons Ltd. • Gelfand, S, A. (2005). Introduction to psychological and physiological acoustics. New York: Marcel Dekker. • Howard, D and Angus, J (2013). Acoustics and Psychacoustics. Oxford: Taylor & Francis • Lass, N.J. (2023). Hearing science fundamentals. (2nd Edition). Plural Publishing • Tan, S. L., Pfordresher, P., & Harré, R. (2017). Psychology of music: From sound to significance. (2nd edition). Routledge. • Van Dijk, P., Başkent, D., Gaudrain, E., De Kleine, E., Wagner, A., & Lanting, C. (2016). Physiology, psychoacoustics and cognition in normal and impaired hearing. Springer Nature. **Unit 2** • Gelfand, S, A. (2005). Introduction to psychological and physiological acoustics. New York: Marcel Dekker.	

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Course: 2.2 (HC) **Physiological Assessment of Hearing**		
Objectives	After completion of this course, the students will be able to a) Administer multi-component/frequency tympanometry, wideband tympanometry and advanced OAE tests, and interpret the results, b) Record different auditory evoked potentials and describe their clinical applications and generator sites. c) Choose the appropriate AEP to record in any given clinical situation, and d) Set the parameters for recording and analysing various AEPs.	
Unit 1	**Middle Ear Immittance Measures and Otoacoustic Emissions** a) Middle ear immittance measures: multicomponent & multifrequency tympanometry, wideband tympanometry, reflexometry b) Otoacoustic emissions: • Cochlear mechanisms in the generation of OAEs • The influence of ear canal acoustics and round trip gain of the middle ear • Mechanism-based taxonomy of OAE • Stimulus frequency OAEs, methods of recording, its applications	**15 Hours**

	• Fine structure OAEs and their applications • Suppression of OAEs: ipsilateral, contralateral, and bilateral	
Unit 2	**Principles of Recording AEPs** a) Stimuli for recording AEPs and the various stimulus paradigms used for AEP recording b) Neurophysiological mechanism: electrical dipole, action potential versus postsynaptic potentials, open versus closed neural circuitry, volume conduction, scalp distribution c) Acquisition of EEG signal • Common mode rejection • A/D conversion • Amplification • Antialasing filter d) Signal processing techniques • Analog filters & digital filters • Time-locked acquisition • Amplitude-based techniques for artifact rejection • Unweighted and weighted time domain averaging • Unweighted and weighted frequency domain averaging e) Rationale for nomenclature and generators of auditory evoked potentials f) Continuous acquisition of EEG g) High-density EEG recording h) Recording AEPs for intraoperative monitoring	**15 Hours**
Unit 3	**Early and Middle latency AEPs** a) Acquisition, analysis, and applications of • Electrocochleography • Chirp evoked ABRs • Frequency-specific ABRs • CHAMP • Stacked ABRs • EABR	**15 Hours**

	• Complex ABRs • frequency following responses and envelope following responses b) Factors influencing middle latency responses and FFRs: Stimuli related, acquisition-related, subject related	
Unit 4	**Late Latency AEPs, Endogenous AEPs** a) Acquisition, analysis, and applications of • Late latency responses (P1, N1, P2, N2) • ACC b) Factors influencing late latency responses: Stimuli-related, acquisition-related, subject-related c) Overview of endogenous potentials d) Acquisition, analysis, factors affecting and application of • MMN • P300 • N400 • P600 • CNV • Other endogenous potentials e) Multi-modality stimulation f) Special techniques involved in acquisition and analysis of endogenous potentials	**15 Hours**
References	**Common** • Katz, J. (Ed.). (1994). *Handbook of Clinical Audiology*. Baltimore: Williams and Wilkins. • Hall, J.W., & Mueller, H.G. (1997) *Audiologists' Desk Reference* Volume 1: Diagnostic Audiology Principles, Procedures and Protocols. San Diego: Singular Publishing Group. • Rintleman, W.F. (1991). *Hearing Assessment*. Boston: Allyn and Bacon. • Roser, R.R., Valente, M., & Hosford-Dunn, D (Eds.) (2000*). Audiology: Diagnosis*, New York, Thieme. • Van De Water, T.R., Popper, A.N., & Fay, R.R. (Ed) (1996). *Clinical aspects of hearing.* New York: Springer **Unit 1** • Gelfand, S. A. (2009). *Essentials of Audiology*. New York: Thieme Medical Publishers.	

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	Course: 2.3 (HC) **Advances in the Management of Auditory Disorders**	
Objectives	a) Understand the different amplification / assistive devices and their advances in technology b) Decide on the approach to device selection and optimization of hearing aids. c) To develop need-based programs and intervention strategies for persons with different types of hearing impairment across age groups, d) To list specific needs and know psychosocial and communicative demands and strategies to solve these and to advice and counsel the needy on strategies for optimal utilization of devices. e) To provide appropriate management strategies for individuals with tinnitus and hyperacusis.	
Unit 1	**Advances in Hearing Aid and Hearing Assistive Technology** a) Application of recent advances in hearing aids and hearing assistive technology: Compression and expansion, microphone directionality, advanced signal processing techniques including noise reduction algorithms, wireless assistive technology, data logging, trainable hearing aids, occlusion reduction, application of nanotechnology in hearing aids. b) Techniques to control acoustic feedback, distortion, circuit noise. Electromagnetic interference – measurement, solutions; techniques to improve compatibility of hearing aids with mobile phones. c) Application of LASER technology in earmold production, earmold modifications for enhancing listening comfort and occlusion reduction– physical and acoustic modifications. d) Variables affecting electroacoustic measurements and its implications. e) Comparison of International and Indian standards/legislations for hearing aids and ALDs.	**15 Hours**
Unit 2	**Selection and Fitting of Hearing Aid and Hearing Assistive Devices**	**15 Hours**

	a) Selection, verification and validation of hearing aids and hearing assistive devices. • Behavioral measures, speech in noise test. • Objective measures- real ear insertion gain measures; Physiological measures- acoustic reflexes, (ABR, ALLR, ASSR and others) b) Hearing aid programming, optimization, verification and validation, fine tuning. c) Special consideration for fitting hearing aids for persons with different types of hearing loss (Sudden hearing loss, unilateral hearing loss, High frequency hearing loss, Cochlear dead region, auditory neuropathy spectrum disorder. d) Current and Future trends in hearing aids and hearing aid fitting: Technology and fitting strategies	
Unit 3	**Speech Perception Through Hearing Aids and Rehabilitation of Individuals with Hearing Impairment** a) Factors affecting speech perception through hearing aids and hearing devices: Auditory plasticity b) Methods to improve speech perception through hearing aids and hearing devices: Speech cue enhancement – spectral shape, duration, intensity, enhancement of CVR, speech simplification, re-synthesis, enhancement of perception of telephone speech c) Emerging technology for better speech perception d) Effect of noise reduction algorithms and advanced hearing aid technology on speech perception Rehabilitation of Individuals with Hearing Impairment a) Overview of counselling theories/techniques. b) Counseling of users of hearing aid and hearing assistive devices: techniques: Realistic expectations, adjusting to hearing device, other management options. c) Counseling caretaker/significant other of hearing device users. d) Care, maintenance and troubleshooting of hearing aid and hearing assistive devices e) Quality of life of persons with hearing impairment and its enhancement. f) Measuring Outcomes of different management strategies for different age groups.	**18 Hours**
Unit 4	**Management of Tinnitus and Hypersensitivity of Hearing** a) Characteristics, assessment of tinnitus, pathophysiological and neurophysiological models to explain tinnitus, and management of tinnitus. b) Overview of non-audiological management techniques for tinnitus.	**12 Hours**

	c) Audiological management techniques for those with normal hearing and different degrees of hearing loss (TRT, counselling, others) and their outcomes. d) Models to explain hypersensitivity of hearing (hyperacusis, misophonia, phonophobia). e) Audiological management of persons with hypersensitivity of hearing. Overview of non-audiological management techniques for the management of persons with hypersensitivity of hearing.	
References	**Unit 1** • Atcherson, S. R., Franklin, C. A., & Smith-Olinde, L. (2015). *Hearing assistive and access technology*. San Diego, CA: Plural Publishing Inc. • Dillon, H. (2012). *Hearing aids* (2nd ed.). Australia: Boomerang Press. • Hersh, M. A., & Johnson, M. A. (2003). *Assistive technology for the hearing-impaired, Deaf, and Deaf-blind*. Nottingham, UK: Springer-Verlag London Ltd. • Metz, M. J. (2014). *Sandlin's textbook of hearing aid amplification* (3rd ed.). San Diego, CA: Plural Publishing Inc • Moser, P. J. (2009). *Electronics and instrumentation for audiologists*. United States: Taylor & Francis Group. • Salvi, R. J., Henderson, D., Franco, F., & Vittorio, C. (1996). *Auditory system plasticity and regeneration*. New York, NY: Thieme Medical Publishers Inc. • Sandlin, R. E. (2000). *Textbook of hearing aid amplification*. London, UK: Singular Publishing Group. • Schaub, A. (2008). *Digital hearing aids*. New York, NY: Thieme Medical Publishers. • Tyler, R. S., & Schum, J. (1995). *Assistive devices for persons with hearing impairment*. United States: Allyn & Bacon. • Valente, M., & Hosford-Dunn, H. (2000). *Audiology treatment*. New York, NY: Thieme Medical Publishers. • Valente, M. (1996). *Hearing aids: Standards, options & limitations*. New York, NY: Thieme Medical Publishers. **Unit 2** • Dillon, H. (2012). Hearing Aids, 2 ndedn. Australia: Boomerang press. • Goldenberg, R.A. (1996). Hearing aids- A manual for clinicians. New York: Lippincott-Raven Publishers.	

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Course: 2.4 (HC) **Advances in Pediatric Audiology**		
Objectives	a) Design protocols and recommend guidelines for hearing screening in pediatric population b) Select appropriate tests/protocols to diagnose hearing loss in children c) Employ appropriate strategies to manage hearing loss in children d) Advice the parents on the different communication options available for young children with hearing impairment e) Identify factors that affect acoustic accessibility and strategies to manage them at home and in classroom and address them, and f) To assess hearing and manage hearing loss in children with multiple disabilities.	
Unit 1	**Paediatric Hearing Assessment- 7 hours** a) National and international guidelines for screening the hearing of neonates, infants, and school children, as well as challenges. b) Choosing appropriate test battery for assessing children's hearing-value-added tests, including factors to consider. c) Choosing appropriate tests for assessing children's speech perception—factors to be considered.	**07 Hours**

	d) Differentiating auditory maturation delay, auditory neuropathy spectrum disorder, and cochlear hearing loss. **Issues related to assessment and diagnosis of hearing loss in children.**	
Unit 2	**Management of Hearing Loss in Children- 8 hours** a) Choosing appropriate communication options and parent support counseling. b) Fitting appropriate listening devices (hearing aids, cochlear implants) and optimizing hearing potential through these devices. c) Hearing aid fitting for children – special considerations while fitting hearing aids for infants and children regarding pre-selection, selection, verification (including advanced features), and validation. d) Overview of listening and spoken language approach, auditory training design principles, and manual approach. e) Measuring auditory and spoken language outcomes and identifying red flags. f) Adapting auditory verbal strategies for late-identified children and providing group listening training activities for children with different listening skills. Counseling parents/caregivers regarding hearing impairment, sequelae, and managing children with unilateral and mild hearing loss.	**08 Hours**
Unit 3	**Intervention at school-age- 7 hours** a) Intervention at school age: Functional hearing assessment, communication assessment. b) Creating optimum listening and learning environments at home and school. **Role of educational audiologists in the management of school-going children.**	**07 Hours**
Unit 4	**Assessment and Management of Hearing Loss in Children with Additional Needs and Vestibular disorders in children- 8 hours** a) Assessment of children with multiple disabilities: choosing appropriate test battery, modifications needed while assessing and interpreting results of behavioral and electrophysiological tests while assessing hearing of children with visual problems, cognitive problems, and neuro-motor problems. b) Management of children with multiple disabilities: hearing aid fitting considerations, strategies used, and the outcome with different strategies for children with hearing impairment and visual problems, cognitive problems, and neuro-motor problems.	**08 Hours**

	Vestibular disorders in children: prevalence, causes, and need to assess vestibular dysfunction.	
Practicum	**Unit 1** • Finitzo, T., Sininger, Y., Brookhouser, P., & Village, E. G. (2007). Year 2007 position statement: Principles and guidelines for early hearing detection and intervention programs. • Paediatrics, 120(4), 898–921. http://doi.org/10.1542/peds.2007-2333 • http://www.jcih.org/JCIH_2019_Executive_Summary.pdf • Bess, F.H. & Gravel, J.S. (2006). Foundations of Pediatric Audiology. San Diego:Plural Publishing Inc • Cole, E.B., & Carol, F. (2007).Children with hearing loss- Developing Listening & Talking. United States of America: Plural Publishing Inc. • Driscoll, C. & McPherson, B (2010). Newborn Screening Systems: The complete perspective. San Diego: Plural Publishing Inc • Flexer C A (2008).Pediatric Audiology: Diagnosis, Technology, and Management. New York: Thieme Medical Publishers. • Jack, Katz., Marshall, Chasin., Kristina, English., Linda, J., Hood., Kim, L., Tillery. (2014). Handbook of clinical audiology: • Jane, R., Madell., Carol, Flexer. (2019). Pediatric Audiology: Diagnosis, Technology, and Management. • Martini, A, et al.(1996) Genetics and Hearing impairment, London: Whurr Publishers. • Northern, J. L. & Downs, M. P. (2014). Hearing in Children. San Diego: Plural Publishing Inc • Shprintzen, R.J. (1997). Genetic, Syndromes and communication disorders. San Diego: Singular Publishing Group Inc. • Thorpe, A.M. & Seewald, R (2016). Comprehensive Handbook of Pediatric Audiology. San Diego: Plural Publishing Inc **Unit 2** • McCreery, R. W., & Walker, E. A. (2017). *Pediatric amplification: Enhancing auditory access*. San Diego, CA: Plural Publishing Inc. • Estabrooks, W., MacIver-Lux, K., & Rhoades, E. A. (Eds.). (2016). *Auditory-verbal therapy: For young children with hearing loss and their families, and the practitioners who guide them*. Plural Publishing. • Estabrooks, W., Morrison, H. M., & MacIver-Lux, K. (Eds.). (2020). *Auditory-verbal therapy: Science,*	

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Course: 2.5 (HC) **Pharmacology**		
Objectives	After completing this course, the student will be able to a) identify and explain age related changes in the peripheral and central auditory system b) modify assessment protocols and interpretation of results depending on the age of the client c) recommend hearing devices depending on the age of the client, and d) plan rehabilitative strategies considering the age of the client.	
Unit 1	**Overview of Pharmacology- 5 hours** e) Definition, significance, and application in clinical practice. f) Introduction to pharmacodynamics and pharmacokinetics.	**07 Hours**

	g) The role of the audiologist in pharmacology management. h) General mechanisms of drug action. Routes of drug administration and absorption in relation to the auditory system.	
Unit 2	**Pharmacokinetics and Drug Interaction in Audiology- 5 hours** g) Pharmacokinetics: Absorption, distribution, metabolism, excretion (ADME). h) Factors affecting drug distribution to the ear and vestibular system. i) The impact of liver and kidney function on drug metabolism in audiology patients. Drug interactions and their potential impact on auditory and vestibular health.	**08 Hours**
Unit 3	**Pharmacodynamics and Ototoxicity- 10 hours** c) Pharmacodynamics: How drugs produce their effects, dose-response relationships. d) Mechanisms of ototoxicity: Cellular and molecular effects on the auditory and vestibular systems. e) Common ototoxic drugs: Antibiotics (e.g., aminoglycosides), chemotherapy agents, loop diuretics, and NSAIDs. f) Risk factors for ototoxicity and patient monitoring. Management and prevention of ototoxicity in clinical settings.	**07 Hours**
Unit 4	**Regulatory Processes and Clinical Applications in Audiology- 10 hours** c) Overview of drug regulatory bodies: FDA, EMA, and their role in drug safety and approval. d) Drug labeling and safety guidelines relevant to audiologists. e) Methods and measurements in pharmacology. f) Clinical trials and evidence-based practices in the context of hearing loss treatment. g) Ethical considerations in pharmacological interventions for audiology patients. h) Practical application: Monitoring hearing and balance in patients taking ototoxic drugs. Individual variation, pharmacogenomics and personalised medicine	**08 Hours**
References	**Unit 1** • Allen, J. B., & Fausti, S. A. (2019). Pharmacology and ototoxicity in audiology. In J. M. D. Humes, A. A. Popelka, & M. L. R. Dubno (Eds.), Audiology: Treatment and rehabilitation (pp. 173–191). Plural Publishing. • Fausti, S. A., & Allen, J. B. (2018). Ototoxicity and pharmacological management in audiology. In L. M. J. Tyler (Ed.), Comprehensive Handbook of Auditory Research: Auditory and Vestibular Pharmacology (pp. 89–106). Plural Publishing. • Nelson, M. L., & Reynolds, S. J. (2021). Introduction to pharmacokinetics and pharmacodynamics in	

	audiology. In A. M. Greco & S. L. Chia (Eds.), Pharmacology and pharmacodynamics for audiology (pp. 35–62). Oxford University Press **Unit 2** • Simons, L., & Jones, R. (2021). Pharmacology and clinical implications for audiologists. In L. Simons & R. Jones (Eds.), The role of pharmacology in audiology and audiometric management (pp. 57–78). Oxford University Press. • Kern, D. S., & Cote, S. J. (2022). Pharmacology in the audiology clinic: Integrating pharmacokinetics, pharmacodynamics, and ototoxicity management. In S. D. Allen (Ed.), Pharmacological principles for audiologists (pp. 115–145). Wiley-Blackwell. • Jones, R. P., & Mason, P. R. (2021). Clinical pharmacology and its implications for audiologists. In P. R. Mason (Ed.), Clinical audiology: Basic principles and applications (pp. 94–118). Elsevier. **Units 3** • Bainbridge, K. E., & Coyle, B. (2020). Ototoxicity and pharmacology: Implications for the audiologist. Journal of the American Academy of Audiology, 31(9), 754–762. https://doi.org/10.3766/jaaa.19147 • Gopinath, B., & Schneider, E. (2017). Effects of medications on hearing and balance: A clinical perspective for audiologists. Seminars in Hearing, 38(4), 320–333. https://doi.org/10.1055/s-0037-1602569 • McFadden, S. L., & Cawthra, E. M. (2018). The pharmacology of hearing and balance: Impact of drugs on the auditory and vestibular systems. Journal of Clinical Pharmacology, 58(4), 421–428. https://doi.org/10.1002/jcph.1052 • Berman, S. S., & Seidman, M. D. (2020). Pharmacology and ototoxicity in audiology. In M. D. Seidman & S. S. Berman (Eds.), Clinical management of hearing and balance disorders (3rd ed., pp. 105–132). Thieme Medical Publishers. • Schoenfeld, J. D., & Russell, A. L. (2020). Pharmacological approaches in the treatment of auditory and vestibular disorders. In S. S. Wang (Ed.), Pharmacology for the audiologist (pp. 78–104). Springer. **Unit 4** • Allen, J. B., & Fausti, S. A. (2019). *Pharmacology and ototoxicity in audiology*. In J. M. D. Humes, A. A. Popelka, & M. L. R. Dubno (Eds.), *Audiology: Treatment and rehabilitation* (pp. 173–191). Plural Publishing.	

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	Course: 2.6 (HC) **Clinicals in Audiology - II**	
	General Considerations: a) The student should be able to carry out complete audiological evaluation and management of persons with hearing impairment. b) After completion of clinical postings, the student will have the ability to apply, show(in a clinical diary/log book), and perform the following on patients/clients: **Know** • Protocol to record and analyse multicomponent and multi frequency tympanometry • Protocol to record and analyse all types of OAEs • To interpret multicomponent and multi frequency tympanometry, and OAEs • Understand the principles and purpose of hearing assessments in infants • Understand the principles and purpose of hearing assessments in infants and toddlers. • Recognize the significance of test battery approaches, including ABR, OAE, tympanometry, and behavioral observations, for evaluating hearing in children. • Learn the communication principles and techniques for discussing audiological findings with caregivers, considering their emotional state and the child's condition. **Know How** • To record and analyse multi-component and multi frequency tympanometry • To record and analyse all types of OAEs • Plan and conduct a complete hearing assessment for infants and toddlers using appropriate instrumentation and protocols. • Analyze and compare ABR waveforms from children in different age groups, identifying age-specific norms and deviations. • Draft clear and comprehensive audiological reports, detailing the methods, results, and clinical interpretations.	

	• Prepare role-play scripts for counseling caregivers based on the child's audiological findings and diagnosis. • To carry out electro-acoustic measurements of digital hearing aids including directionality, group and phase delay, DNR algorithms, compression, and HATs. (1 hearing aid). **Show** • Demonstrate the ability to administer hearing assessment tests on infants and toddlers, ensuring accurate and ethical practices. • Present the interpretation of ABR waveforms for cases across different age groups, showcasing analytical skills. • Perform a role-play session illustrating caregiver counseling for: o A child referred for hearing screening with high-risk factors. o A child with chronic middle ear disease. o A child with CAPD. o A child with severe bilateral hearing impairment. o A child with multiple disabilities. • Comparison of EAC across different standards and write down the observations • Earmold modifications • Visible speech mapping **Do** • Record multi-frequency and multi-component tympanogram (20 ears) and interpret the results • Record wideband tympanogram and interpret the findings (10 ears) • Vary different stimulus and procedure-related parameters and note their effect on test results. E.g., probe tone frequency, rate of pressure change, direction of pressure change, number of trials, probe insertion depth, sneezing before measurement, speaking while measurement (10 ears) • Record TEOAEs, SOAE, and DPOAE and note the amplitude, SNR, noise floor, and reproducibility at octave and mid-octave frequencies. Note the stimulus stability and the overall SNR (10 ears each). • Perform and report the test battery for hearing assessment of 5 infants and 5 toddlers. Write a report detailing the instrumentation, procedure, and interpretation. • Interpret and Compare ABR waveforms of children across different age groups, ranging from birth	

	to 24 months. Apply skills to interpret the ABR waveforms in diverse clinical scenarios and integrate findings into comprehensive clinical reports. • Counsel caregivers effectively, addressing their concerns and ensuring understanding of the child's audiological condition and management plan. • To program digital hearing aids (2 no) and explore advanced features and recent technologies. • To carry out insertion gain and RECD measurements (2 individuals). • Administer tinnitus assessment and treatment on 5 individuals with tinnitus To collect and observe the videos of counseling the patients with tinnitus and hyperacusis.	
Course: 3.1 (HC) **Auditory Implants**		
Objectives	At the end of the course, the student should be able to a) Identify and describe the types of implantable hearing devices, b) Describe the purpose of different components of implantable hearing devices, c) Determine candidacy for implantable hearing devices, d) Assess benefits from implantable hearing devices and guide the clinical population, e) Work in a multidisciplinary team and sensitize the other members of the team f) Advise and counsel the parents / caregivers of the clinical population, and	
Unit 1	**Development of Technology, Criteria/ Candidacy of IHD; Bone Conduction Implantable Devices and Middle Ear Implants** a) Need for IHD program, Pre-requisite to start an IHD program b) Comprehensive candidacy assessment for implantable hearing devices (Audiological and non-audiological). c) Types of BCID and components (percutaneous, transcutaneous, and intra-aural); Types of MEI and components d) Candidacy for bone conduction implantable devices (BCID), middle ear implants (MEI): evidence from research e) Overview of surgery for BCID and MEI f) Programming BCID and MEI g) Post-operative measurements/assessment for device function and performance outcomes; counseling on use, care, and maintenance.	15 Hours

	h) Contraindications, complications/risks and management of device failures and poor performance; troubleshooting Limitations and future development/requirements.	
Unit 2	**Cochlear Implants** a) Concepts and types of CI: external components (sound processor- body worn, BTE, off the ear); internal components (receiver-stimulator, electrode type/design, MRI compatibility & reliability); totally implantable cochlear implants. b) Candidacy criteria and expanding criteria for CI; audiological and non-audiological assessment: single-sided deafness, ski-sloping SN hearing loss, bilateral asymmetric HL; cochlea/nerve anomaly (classification), auditory neuropathy spectrum disorder (ANSD) and multiple disabilities; evidence from research c) Speech/Sound Coding Strategies; Pre-processing strategies; Evidence from research and critical analysis of each strategy; Features for Enhancing Speech and Music perception. d) Surgical procedures: posterior tympanotomy, Veria technique, hearing preservation technique; surgical complications and management Intra-operative measurement: device function (impedance/ voltage/ compliance telemetry); neural path function (eCAP, eSRT, eABR, and facial nerve monitoring); Special consideration in anomalous cochlear/nerve, ANSD and multiple disabilities.	15 Hours
Unit 3	**Programming Cochlear Implants** a) Psychophysics of programming parameters (pulse width, rate of stimulation, frequency allocation/ re-allocation, map law); pre-requisites for switch-on: non-physiological objective measures (electrode impedance, compliance, electrode voltage); special considerations in cochlea/nerve anomaly, ANSD, multiple disabilities, and SSD; Effect of map parameters on the perception of loudness, pitch perception, gap detection, b) Programming techniques - evidence from research: behavioral maps; objective maps (eCAP, eSRT-based programming); evidence and target-based programming (artificial intelligence); CT guided mapping, self-programming, for different age groups. c) Measuring performance and MAP optimization: assessment of benefit: speech and non-speech; electrophysiological measures (eABR and other evoked potentials); optimization of: hearing aid in the contralateral ear for bimodal implants; bilateral cochlear implants; electroacoustic stimulation and SSD. d) Complications: identifying and managing device failures; identifying and managing infection,	15 hours

	magnet migration, electrode extrusion; identifying and managing poor performance including device troubleshooting; decision making in subjects with poor performance; special consideration in revision implantation; outcome audit. e) Counselling on the use, care, and maintenance of CI. f) Limitations and future developments/requirements (device, techniques, and procedures)	
Unit 4	**Auditory Brainstem Implant (ABI) and Auditory Midbrain Implant (MBI)** a) Device type and components; Evidences from research for predicting outcome; counseling and expectations; b) Candidacy for auditory brainstem implant (ABI) and mid-brain implant (MBI): evidence from research c) Post-op: programming ABI (subjective and objective methods) and technique for pitch ranking, identifying auditory and non-auditory electrodes); MAP optimization (pitch, loudness, auditory and non-auditory sensation); techniques to identify auditory and non-auditory sensation; assessment of benefit: speech and non-speech; the role of eABR, cortical potentials, PET and fNIRS in programming and monitoring outcomes. d) Managing and monitoring persons with ABI: identifying and managing complications (device failure, infection, trauma, device migration, radio imaging); identifying poor performance- auditing outcome; decision making in complications and poor performance. e) Safety standards and regulations for IHD. f) State and central Government schemes for cochlear implants and other implantable devices. Comprehensive policy issues relating to IHD	15 Hours
References	**Unit 1** • Boheim, K. (2010). Active middle ear implants. Karger. • Dillon, H. (2012). Hearing aids (2nd ed.). In Chap. 17: CROS, bone-conducted, and implanted hearing aids. Thieme Medical Publishers. • Kompis, M., & Caversaccio, M. D. (2011). Implantable bone conduction hearing aids. Karger Publishers. • Dutt, S. (2002). The Birmingham bone-anchored hearing aid programme: Some audiological and quality of life outcomes. Print Partners Ipskamp. • Manenkar, G. (2014). Implantable hearing devices other than cochlear implants. Springer-Verlag. • Ruckenstein, M. J. (2012). Cochlear implants and other implantable devices. Plural Publishing Inc.	

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Course: 3.2 (HC) **Vestibular System and its Disorders**		
Objectives	After passing this course, the student should be able to: a) Describe the anatomy and physiology of the human vestibular system b) Perform tests for vestibular assessment and interpret the results c) Identify vestibular pathologies and differentially diagnose between them d) Carryout vestibular rehabilitation and make appropriate referrals e) Counsel the affected and their family members	
Unit 1	**Anatomy and Physiology of the Systems of Balance** a) Anatomy and physiology of peripheral vestibular system (semicircular canals, Utricle, Saccule, Vestibular nerve)	15 Hours

	b) Anatomy of the central vestibular pathway and its connections c) Reflexes involving the vestibular system (Vestibuloocular, Vestibulospinal reflex and Sacculocollic reflex) d) Proprioceptive (somatosensory) system and visual system	
Unit 2	**Disorders of the Vestibular System** a) Diseases of the vestibular labyrinth (Meniere's disease, and Benign paroxysmal positional vertigo, among others) b) Diseases of the nerve (Vestibular neuritis, Auditory neuropathy spectrum disorders, Vestibular schwannomas, Vestibular Paroxysmia) c) Diseases of the central nervous system (Generalized neuropathy involving multiple systems, Multiple sclerosis, Tumors of CP angle, among others) d) Pathologies affecting entire balance pathway (Presbystasis, Diabetes Mellitus and others systemic diseases) e) Association between vestibular disordersand cognition f) Vestibular disorders in childrens	15 Hours
Unit 3	**Assessment of Vestibular System** a) Questionnaire based assessments • Questionnaires for screening and diagnosis (Standard case history, Vertigo symptom scale, Motion sensitivity quotient) • Questionnaires for quality of life assessment (Dizziness handicap inventory, Activities-specific balance confidence scale, Vestibular disorders activities of daily living, visual analog scales) b) Behavioral tests for bedside assessment and diagnosis- background, technique involved, interpretation and usefulness (Romberg test and others) c) Physiological/electrophysiological tests- background, technique involved, interpretation and usefulness (Rotatory chair test, Positional/positioning tests and others)	15 Hours
Unit 4	**Non-medical and Medical Management of Vestibular Disorders** a) Treatment of BPPV of Posterior Canal, lateral semicircular canal, Anterior semicircular canal- Habituation exercises for recurrent BPPV (Brandt-Daroff exercises) b) Treatment for heavy and light cupula	15 Hours

	c) Concept of central compensation and decompensation in vestibular disorders d) Vestibular rehabilitation therapy: Principle, Candidacy, procedure and efficacy e) Rehabilitation of children with disequilibrium **Medical Management** a) Role of radiological evaluations and other lab tests (in the diagnosis and management of vestibular disorders: purpose, findings and implication b) Lab investigations: purpose, findings, and implications (Blood investigations, urine and other things like ECG, Vitamin profiles etc.) c) Dietary modifications: candidacy, effectiveness and contraindication d) Vestibular suppressants: candidacy, use, effectiveness and contraindication e) Surgeries for vestibular disorders: types, candidacy, procedure, effectiveness and contraindications f) Other forms of medical management for specific disorders • Intratympanic Gentamycin: candidacy, effectiveness and contraindication • Steroid Therapy: candidacy, effectiveness and contraindication Vestibular implants	
References	**Unit 1** • Ackley, R. S., Decker, T. N., & Limb, C. J. (2007). An essential guide to hearing and balance disorders. Lawrence Erlbaum Associates Inc. • Biswas, A. (1998). An introduction to neurotology. Bhalani Publishing House. • Claussen, C. F., De Sa, J. V., Estelrrich, P., & Kirtane, M. V. (1978). Clinical study of human equilibrium by electronystagmography and allied tests. Popular Prakashan. • Desmond, A. L. (2004). Vestibular function: Evaluation and treatment. Thieme Medical Publishers Inc. • Deviterne, D., Gauchard, G. C., Jamet, M., Vancon, G., & Perrin, P. P. (2005). Added cognitive load through rotary auditory stimulation can improve the quality of postural control in the elderly. Brain Research Bulletin, 64, 487-492. • Furman, J. M., Cass, S. P., & Whitney, S. L. (2010). Vestibular disorders: A case-study approach. Oxford University Press Inc. • Guidetti, G. (2013). The role of cognitive processes in vestibular disorders. Hearing, Balance and Communication, 11, 3-35.	

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Course: 3.3 (HC) **Geriatric Audiology**		
Objectives	After completing this course, the student will be able to a) identify and explain age-related changes in the peripheral and central auditory system b) modify assessment protocols and interpretation of results depending on the age of the client c) recommend hearing devices depending on the age of the client and d) plan rehabilitative strategies considering the age of the client.	
Unit 1	**Aging Auditory System** a) Biology of aging: differentiating between hearing loss due to normal aging and hearing loss due to disease/disorder b) Factors that affect communication in older adults c) Effect of advancing age on the peripheral and central auditory system d) Factors that can contribute to hearing loss in older adults e) Effect of cognitive decline and other associated problems on speech understanding f) Association between cognition and hearing abilities in older adults g) Effect of hearing loss on quality of life of older adults	**07 Hours**
Unit 2	**Assessment of Hearing of Older Adults** a) Behavioral assessment hearing in older adults: factors to be considered during assessment and interpretation	**08 hours**

	b) Effect of advancing age on electrophysiological measures of hearing c) Assessing central auditory processing in older adults	
Unit 3	**Rehabilitation of Older Adults** a) Fitting hearing devices (hearing aids, assistive listening devices, cochlear implants) to older adults b) Evaluating the efficacy of hearing devices in older adults c) Counseling older adults and their significant others regarding t h e use, care, and maintenance of hearing devices d) listening training for older adults e) training for speech reading and communication strategies for older adults	**07 Hours**
Unit 4	**Assessment and Rehabilitation of Vestibular Disorders in older adults** a) Age-related anatomical changes in the vestibular system b) Signs and symptoms of vestibular disorders in older adults c) Assessment of Fall risk in older adults d) Precautions to be taken during the vestibular assessment in older adults Environmental and lifestyle modifications	**08 Hours**
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Course: 3.4 (SC) **Genetics of Hearing**		
Objectives	After completing this course, the student will be able to a) understand the genetic basis of hearing loss b) explain the importance of genetic testing in diagnosing and managing hearing disorders. c) refer clients for genetic testing d) counsel parents or caregivers of children with genetic hearing loss	
Unit 1	**Molecular Genetic for Audiologists**	**08 hours**

	a) Basic concepts of genetics: Introduction to genetics (Human Chromosome, Cytogenetics, Mitosis and Meiosis, Numerical aberrations, structural aberrations, sex chromosome analysis, Genes) - Mendelian, Non-Mendelian inheritance, penetrance and expressivity b) Multifactorial (role of environmental exposure, in-utero exposure, genetic interactions influencing fetus, cultural experience, stochastic variations in genetic expression. c) Genetic mutations, copy number variations (CNVs), Polymorphism, and Single Nucleotide polymorphisms (SNPs). Overview of genetic testing (Biochemical genetics, molecular genetics), gene mapping, and localization.	
Unit 2	**Genetics and hearing loss** a) An overview of various genetic conditions leading to communication disorders. b) Genetics of hearing impairment and heterogeneity of hearing disorders, genes involved in auditory development and hearing, and gene database for hearing loss. c) Congenital hearing loss due to genetic disorder- syndromic and non-syndromic (genes identified, phenotype, and genotype) Late-onset hearing loss due to genetic disorder (genes identified, phenotype, and genotype).	**10 Hourss**
Unit 3	**Evaluation of Genetic Hearing Loss** a) Screening and genetic evaluations of persons /families with hearing loss. b) Client selection for genetic testing, Ethical, Social, and Legal considerations during genetic testing, benefits and limitations. Laboratory techniques – DNA extraction, PCR, Sanger Sequence, NGS, Human Genome Mapping Project (HGMP)	**08 hours**
Unit 4	**Management of Genetic Hearing loss** a) Accurate diagnosis, knowledge of the biochemical basis of the disorder, and early intervention. b) Counselling clients/parents regarding genetics in Hearing loss, Special problems in genetic counseling (consanguinity, adaptation and genetic disorders, disputed paternity) c) Amniocentesis, ultrasonography, genetic heterogeneity, and etiologic heterogeneity. Gene therapy, stem cell therapy, and new techniques for genetic control.	**06 Hours**
Reference	• Cremers, CWRJ & Smith R (Eds.) (2002). Genetic hearing impairment: Its clinical presentations (vol.61). Karger Medical and Scientific Publishers. • Gangane, SD (2021), Human Genetics (6^{th} ed.) India: Elsevier.	

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	Course: 3.5 (SC) **Dissertation - I**	
Course: 3.6 (HC) **Clinicals in Audiology - III**		
	General Considerations a) The student should be able to carry out complete audiological evaluation for individuals candidates for hearing implants and hearing-related vestibular disorders b) After completion of clinical postings, the student will have the ability to apply, show (in a clinical diary/log book), and perform the following on patients/clients	
	Know • Generation of stimuli for recording AEPs • Protocol to record and analyse AEPs, including ABR, ASSR, MLR, LLR, endogenous potentials, and other auditory brainstem and cortical potentials • CHAMP recording with 500 Hz. 1000 Hz, 2000 Hz. 4000 Hz. 8000 Hz HPN • To interpret various types of AEPs	

	• Identify key features of ABR waveforms and their variations across different age groups (e.g., latencies, amplitudes). • The subjective and objective tests for evaluation of different vestibular disorders • Correlate the different vestibular test results with various vestibular disorders • Observation of mapping in cochlear implantees, and hands-on practice on mapping and recording ECAP, and writing an analytic report. **Know-how** • Set up audio-vestibular assessment and management clinics or centers in different set- ups • To record and analyse AEPs including ABR, ASSR, MLR,LLR, endogenous potentials and other auditory brainstem and cortical potentials • Counselling based on needs of individuals with hearing impairment based on their narratives and responses to questionnaires and validation measures. • Advise clinical clientele on the latest implantable devices available for persons with hearing impairment. • Conduct sound field testing while fitting bone-anchored and other implantable devices. • Simulate map parameters to decrease/increase 'C' / 'M' levels. • Administer canalith repositioning maneuvers to individuals diagnosed with benign paroxysmal positional vertigo (BPPV). **Show** • Calibrating the click output of any 2 equipment to NHL • Observe and document the changes in online EEG with changes in filtering, changes in gain, changes in repetition rate, etc. • Induce artifacts- eye blink, eye movements, biting teeth, tensing neck muscles, tensing hand and leg muscles, etc., and observe the changes in the online EEG. The observation shall be made in different filter settings. • The effects of filtering and muscle artifacts on MLR • Estimating ALLR threshold using clicks and 500Hz tone bursts. • Record aided ALLRs. • Effect of electrode site: Non-inverting Cz, Pz, Fz, FPz, TL, TR referenced to mastoid.	

	• Observation of EEG recording in High-density research equipment. • Identification of the transient and sustained components of the Response • Administration of subjective balance assessment tests • Administration of objective balance assessment tests, including VEMPs, vHIT, and VNG • Plan management for 5 persons with different types of vestibular disorders • Troubleshoot cochlear implants • Cochlear implant mapping changing the parameters based on the needs of clients • Compile map parameters of implantable devices available in India. • Compile pre-processing strategies and coding strategies of devices available • Vestibular rehabilitation therapy for patients with vestibular problems **Do** • Record electrocochleography and measure SP/AP amplitude and area ratio • Record ABR at different intensities, starting from 90 dBHL descending in 10 dB steps till the ABR threshold. Plot latency intensity function for the data obtained. • Induce conductive hearing loss by blocking the ear canal with ear mold material and plot the latency intensity function. • Record Tone burst ABR for different frequencies and track threshold at each frequency. The ABR threshold then shall be correlated with the hearing threshold. Record ABRs in vertical and horizontal montages and note down differences. • In a single channel recording, record ipsilateral and contralateral responses and note down the differences. • Interchange between non-inverting and inverting electrode sites and note down the differences. • Compare the Cz and FPz electrode sites for Non inverting placement and note down the differences. • Compare mastoid, ear lobe, nose tip and nape of the neck for inverting placement and note down the differences. • Induce artifacts- eye blink, eye movements, biting teeth, tensing neck muscles, tensing hand and leg muscles etc. and note down the changes in ABR. • ABR is to be recorded in awake, deep sleep and REM sleep. The peak amplitudes and latencies should be documented. Note down the differences in the morphology if any. • Find out the binaural interaction component of ARR for clicks and speech stimuli.	

	• Record fine structure OAEs and interpret the results (5 ears) • Record ipsilateral and contralateral suppression of TE and DPOAEs, note down the suppression magnitudes and interpret the findings • Offline analysis of the Waveform • *Offline filtering:* Record ABR. MLR and LLR and run offline filtering with the following settings and notedown the differences. o HPF: 30Hz, 100 Hz, 300 Hz. 500Hz. 1000 Hz, 1500Hz (with LPF at 00Hz) LPF: 3000Hz, 2000hz, 1500Hz. 800 Hz. 500 Hz. 300Hz (with HPF at 30Hz) o *Stimulus-to-response correlation* o *Autocorrelation* o *FFT* o *Addition and subtraction of the waveforms* o *Time aligning the waveforms* • Record Ecochg using tiptrodes, identify the potentials, note down their latency and amplitude. • Calculate the SP/AP ratio and compare it with the normative. • Record Ecochg for clicks and tone bursts (at least 500Hz & 4000Hz) and, note down the differences. • Record PAM, identify the peaks, and note their latency and amplitude. Compare it with the normative. • Record MLR, identify the peaks and note their latency and amplitude. Compare it with the normative. • Record ALLR, identify the peaks, and note their latency and amplitude. Compare it with the normative. • Recording and Identification of P1, N1, P2 and N2. Measurement of Peak latency, peak amplitude, peak-to-peak amplitude, and baseline corrected amplitudes. • Effect of sleep on ALLR. • Noninverting Cz, Pz, Fz, FPz, TL, TR (referenced to mastoid). • Non-inverting Cz referenced to Nasion, nose tip, mastoid, and nape of the neck. • Testing Hemispheric asymmetry in the ALLR recorded for speech and Nonspeech stimuli. • Recording and identifying ACC recorded for /sa/, /si/ and /su/. • Response analysis: Measurement of latency and amplitude of ACC components. • Recording ACC for non-speech stimuli • Recording and identification of MMN, recorded for different magnitudes of deviance.	

	• Response analysis: Measurement of onset latency, peak latency, offset latency, peak amplitude, and area of MMN. • Recording MMN using different methods: conventional, same stimulus as frequent and infrequent, same stimulus once used to record LLR and later used as infrequent in oddball paradigm. • Comparison of MMN recorded for frequency, intensity, and duration deviances. • Effect of active V passive attention on MMN. • Effect of sleep on MMN • Effect of repetition rate (below 1.1/s) or inter-stimulus interval on MMN. • Effect of stimulus probability (frequent: infrequent ratio) on MMN. • Recording speech elicited MMNs • Recording and identification of P300, recorded for different magnitudes of deviance. • Response analysis: Measurement of onset latency, peak latency, offset latency, peak amplitude and area of P300. • Comparison of P300 recorded for frequency, intensity and duration deviances. • Effect of active Vs passive attention on P300 • Effect of sleep on P300 • Effect of electrode site: Non-inverting Cz, Pz, Fz, FPz, TL. TR (referenced to mastoid) • Recording speech elicited P300 • Recording of speech ALLR for /da/-40ms, /ba/-40ms and /da/-l70ms • Exploring additional facilities available regarding stimulus presentation and response acquisition in High-density research equipment. • Administer VEMPs on 5 normal hearing subjects • Administer VNG on 5 normal subjects • Administer vHIT on 5 normal subjects • Administer ROMBERG. Tandem gait and Fukuda stepping test using CCG on 5 subjects • Administer fHIT on 5 normal subjects • Demonstrate different maneuvers for BPPV on 5 normal subjects. • From 5 case files, further testing is recommended to decide candidacy for implantable devices. • Compile information from 10 case files of individuals with hearing impairment (5 children & 5 adults) and make recommendations on whether implantable devices should be recommended. • Carry out mapping for 5 persons using cochlear implants	

	• Role play pre-implant and post-implant counseling • Counsel 5 persons regarding the use and maintenance of cochlear implants • Watch Videos on surgery, care and troubleshooting Plan and carry out therapy for 5 children with hearing loss (minimum of 10 sessions each)	
Course: 4.1 (HC) **Speech Perception**		
Objectives	After completing this course, the student will be able to: a) Explain coding of speech in the auditory pathway in normal hearing and hearing impaired individuals, b) Critically evaluate theories of speech perception and methods of synthesis of speech, c) Explain speech perception in relation to short-term memory and d) Describe aspects of dichotic speech perception and the basis of this.	
Unit 1	**Theories of Speech Perception** a) Basic concepts of speech perception: hearing, listening, perception, and comprehension; acoustic cues of different classes of speech sounds b) Definition and concept of categorical and continuous speech perception c) Normalization in speech perception: Definition and methods used for normalization of vowels and consonants d) Theories of speech perception (acoustic, neurological, auditory, motor, analysis-by-synthesis, dual stream, reverse hierarchy theory) Methods to study speech and music perception: EEG/electrophysiological and behavioral methods.	**15 Hours**
Unit 2	**Perceptual Cues for Vowels and Consonants** a) Perception of vowels, diphthongs, and consonants in persons with normal hearing- major and minor cues to identify place, manner, and voicing features of stops, fricatives, affricates, nasals b) Perception of vowels and consonants in persons with hearing impairment c) Perception of vowels and consonants through amplification. Perception of vowels and consonants through implantable devices	**15 Hours**
Unit 3	**Factors Related to Speech Perception** a) Effects of co-articulation on speech perception b) Perception of segmental and suprasegmental features in individuals with normal hearing and	**15 Hours**

	hearing impairment. c) Memory and speech perception • Stages of memory, coding, and capacity at the different stages • Models of short-term memory: Dual coding Model, Modal model, A model for auditory memory and contrast, Working memory model • Role of short-term memory in the perception of consonants and vowels Role of cognition in speech perception.	
Unit 4	**General Issues Related to Speech Perception** a) Dichotic listening: • Theories and physiological bases: • Testing of dichotic listening and the clinical significance of the results; • Factors influencing dichotic perception b) Infant perception: • Theories of infant speech perception (universal theory, attunement theory, perceptual learning theory, maturational theory, perceptual magnetic theory); • Methods of studying infant speech perception; • Perception of consonants and vowels in infants, and • Comparison with adults c) Speech perception in animals: • Methods of study of speech perception in animals; • Perception of consonants and vowels; • Categorical perception and normalization; • Animal vs. Human perception; Need for the study of speech perception in animals	**15 Hours**
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Course: 4.2 (SC) **Dissertation – II**		
Course: 4.3 (HC) **Clinicals in Audiology - IV**		
	General Considerations a) The student should be able to carry out complete knowledge and assess the aspects related to speech perception in persons with hearing impairment b) After completion of clinical postings, the student will have the ability to apply, show (in a clinical diary/log book), and perform the following on patients/clients	
	Know • Understand the acoustic characteristics of vowels and consonants by analyzing spectra, waveforms, and spectrograms. • Gain knowledge of the acoustic cues for place, manner, and voicing distinctions in speech sounds. • Understand the methods of vowel and consonant normalization and its importance in perception. • Learn about speech perception across hearing loss (normal hearing, hearing impairment, amplification, and implantable devices). • Understand the role of cognition and auditory processing in speech perception. • Gain knowledge of dichotic listening tests and their clinical significance. • Understand the methods used to study speech perception, including behavioral and electrophysiological approaches. **Know How** • Procedure for certification of persons with disability • Financial planning and insurance policies for individuals with hearing impairment. • Analyze the differences in the perception of consonants/vowels when truncated from CVC or VCV syllables. • Synthesize vowels using different synthesis techniques (analysis-by-synthesis, parametric synthesis, articulatory synthesis). • Use synthesized Voice Onset Time (VOT) continua to conduct categorical perception studies.	

	• Administer dichotic listening tests and interpret the results for clinical applications. **Show** • Perform categorical perception tests and document findings. • Demonstrate the ability to synthesize speech stimuli using software tools (e.g., Praat, MATLAB, Klatt synthesizer). • Conduct speech perception tasks for different SNR conditions and analyze outcomes. • Test recency and precedence effects using words in controlled listening environments. • Demonstrate the ability to administer and score speech perception tests in clinical settings. **Do** • Analyze and report vowel and consonant perception through visual (spectrogram) and auditory (listening) analysis. • Conduct speech perception experiments with synthesized stimuli and interpret the data. • Perform dichotic listening testing. Conduct behavioral and electrophysiological methods to assess speech perception in clinical and research settings.	