



SRI RAMACHANDRA
MEDICAL COLLEGE AND RESEARCH INSTITUTE
(Deemed to be University)
Porur, Chennai - 600 116

FACULTY OF ALLIED HEALTH SCIENCES

REGULATIONS AND SYLLABUS FOR
M.Sc. (AUDIOLOGY) PROGRAM
(Under Credit Based Semester System)

Approved by Academic Council in its 26th meeting held on 23.06.2018

Master of Science (Audiology)

Introduction

The **Master of Science (Audiology)** is a two-year postgraduate program in Audiology. This post graduate program covers relevant theory, clinical and research project courses in the area of Audiology. The aim of the theory courses is to provide thorough knowledge in different subject areas through formal lectures and / or seminars. The clinical courses aim to develop skills necessary for professional practice in the area of Audiology. The courses related to research project provide graded training to conduct research in a particular area culminating in the preparation of the dissertation. This program will impart advanced theoretical knowledge and skills related to professional practice in the area of Audiology than previously studied at the undergraduate level.

The objectives of the M.Sc. (Audiology) program are to equip the students with knowledge and skills to

- function as teachers and researchers in institutions of higher learning,
- diagnose and manage hearing, vestibular and auditory processing disorders across life span,
- counsel and guide persons with hearing and balance issues
- implement rehabilitation programs for persons with hearing impairment, auditory processing issues vestibular disorders
- function as the disability certification authority in the field,
- liaise with professionals in allied fields and other stake holders,
- implement prevention and public education programs,
- undertake advocacy measures on behalf of and for persons with hearing impairment
- advise government and other institutions on legal and policy issues related to persons with hearing impairment, and
- establish and administer institutions of higher learning.

SUMMARY SCHEME FOR SEMESTER BASED CREDIT SYSTEM**Category of Course - Master of Science (Audiology), 2018**

SEMESTER	Core Theory (CT) (14)	Allied Theory (AT) (2)	Clinical Rotations (CR) (4)	Research Projects (RP) (4)	Total Credits
I	CT-1	AT-1	CR-1	RP-1	27
	CT-2	AT2			
	CT-3				
	12	8	5	2	27
II	CT-4		CR-2	RP-2	27
	CT-5				
	CT-6				
	CT-7				
	CT-8				
	20		5	2	27
III	CT-9		CR-3	RP-3	25
	CT-10				
	CT-11				
	CT-12				
	16		5	4	25
IV	CT-13		CR-4	RP-4	21
	CT-14				
	8		5	8	21
Total	56	8	20	16	100

REGULATIONS FOR MASTER OF SCIENCE (AUDIOLOGY)

In exercise of the powers conferred by rule 12.1 (iv) of the Memorandum of Association & Rules and clause 21 of Bye-Laws of Sri Ramachandra Medical College & Research Institute (Deemed to be University), Porur, Chennai-600 116, the Academic Council of the Deemed University hereby makes the following Regulations:

SHORT TITLE AND COMMENCEMENT

These regulations may be called as "THE REGULATIONS FOR MASTER OF SCIENCE (AUDIOLOGY) DEGREE PROGRAM OF SRI RAMACHANDRA MEDICAL COLLEGE AND RESEARCH INSTITUTE (DEEMED TO BE UNIVERSITY), PORUR, CHENNAI- 600116".

These regulations shall be deemed to have come into force from the academic year 2018-19. These regulations are subject to such modifications as may be approved by the Academic Council from time to time.

1. NOMENCLATURE

As per Rehabilitation Council of India (RCI), the nomenclature of the program shall be **Master of Science (Audiology)** - Abbreviated as **M.Sc. (Aud)** Degree Program.

2. ELIGIBILITY FOR ADMISSION

Candidates with a B. ASLP or B. Sc (Speech & Hearing) degree of any University recognized by the RCI or any other degree considered as equivalent thereto with an average of not less than 55% of marks are eligible for admission to M.Sc. (Audiology). "Average" refers to average of the aggregate marks obtained in all the years/semesters of the qualifying examination.

3. AGE LIMIT FOR ADMISSION

Applicants shall not be older than 30 years on the 1st July of the year of admission.

4. MEDICAL FITNESS CERTIFICATE

A candidate shall, at the time of admission, submit to the Head of the Institution, a certificate of medical fitness from an authorized Medical Officer certifying that the candidate is physically fit to undergo the academic program.

5. ELIGIBILITY CERTIFICATE

Candidates who have passed B.ASLP or B. Sc (Speech & Hearing) from any university other than Sri Ramachandra Medical College & Research Institute (Deemed to be University), shall obtain eligibility certificate from this Deemed University at the time of admission and remit recognition fee as prescribed.

6. REGISTRATION

A candidate admitted to the program shall register his/her name with the Deemed University by submitting application form for registration duly filled in, along with the prescribed fee, through the Head of the Institution within the stipulated date.

7. DURATION OF THE PROGRAM

- a) The program shall be of 4 semesters (2 academic years) and should be completed within 4 years from the date of admission.
- b) An academic year consists of two semesters, and each semester shall extend over a minimum period of sixteen weeks excluding examination days. The semesters shall be spread out as follows:

Odd semesters – 1 & 3	July – December
Even semesters – 2 & 4	January – June

8. COMMENCEMENT OF THE PROGRAM

The program shall commence ordinarily from 1st July of the academic year.

9. COMMENCEMENT OF THE EXAMINATIONS

There shall be two sessions of University examinations in an academic year, viz., June (end of even semesters) and December (End of odd semesters).

10. MEDIUM OF INSTRUCTION

English shall be the medium of instruction and examinations.

11. CURRICULUM

The curriculum and the syllabus for the program shall be as prescribed by the Rehabilitation Council of India, New Delhi and approved by the Academic Council of this Deemed University, on the recommendations of Board of Studies. The program will be conducted on a credit based semester pattern as described below:

11.1 Program / Course Credit Structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, clinics, seminars, assignments, etc are measured in terms of credits. On satisfactory completion of the courses, a candidate earns the credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra- curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week/per activity.

Credits

The term credit is used to describe the quantum of syllabus for various courses in terms and hours of study. It indicates differential weightage given according to the contents and duration of the course in the curriculum design. The amount of credit associated with a course/program is dependent upon the number of hours of instruction per week in that course/program. Similarly, the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week. Courses are broadly classified as Theory, Dissertation/Research Project and Clinical. Theory programs consist of lecture (L) and /or tutorial (T) hours; Clinical Rotation (CR) program consist of hours spent in the clinics. Credits (C) for a course/program is dependent on the number of hours of instruction per week in that program, and is obtained by using a multiplier of one (1) for lecture, and a multiplier of half (1/2) for tutorial and dissertation hours, multiplying by 1/3rd for clinicals. Thus, for example, a course/program carrying one credit for lectures will have instruction of one period per week during the semester, if three hours of lecture is necessary in each week for that program, then 3 credits will be the weightage.

The credit weightage is computed as shown below:

Lecture: 1 credit = 1 hour/week; 15 hours/Semester

Clinical: 1 credit = 3 hours/week; 45 hours/Semester

Research Project: 1 credit = 2 hours/week; 30 hours/Semester

Table 1 Credit value per course and structure of the syllabus/course/plan

For PG Programs each course will be provided a structured syllabus in the following style:

Category	Credits	Syllabus units
Core Theory (CT) /Allied Theory (AT)	4	5
Clinical Rotation (CR)	5	240 hours
Core Projects: Research Projects (RP)	8	240 hours
Dissertation (RP)	8	240 hours

The minimum credit allocation for a course is as per the curriculum designed by the department.

The program will be conducted on a credit based semester pattern as described below:

Minimum credit requirements

The minimum credit points required for the award of **M.Sc. (Audiology) Degree is 100**. These credits are divided into theory courses, clinics, seminars, assignments, dissertation with the supervisor, and journal club over the duration of four semesters. The credits are distributed semester-wise as shown in Table 2. Courses generally progress in sequence, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

12. GRADING SYSTEM

The University would be following the absolute grading system, where the marks are compounded to grades based on pre-determined class intervals.

Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each program. The letter grades and their corresponding grade points are given below:

Table 2: Letter grades and grade points equivalent to percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D (PASS)	6	Average
Less than 50	F or Reappear	0	Reappear
Absent	AB	0	AB
Not Completed	NC	0	detained
RC-Repeat the course	RC	0	Long absent

A student who remains absent for any University semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

- i. A student obtaining Grade RA shall be considered failed and will be required to reappear in the examination.
- ii. Candidate with NC grading indicates absent for examinations or detained in a course (s); while RC indicates that student is not fulfilling the minimum criteria for academic progress and

attendance [i.e., lack of attendance- < 50% and internal assessments (CIA)]. Registrations of such students for those courses shall be treated as cancelled. If the course is a core course, the candidate should register for and repeat the course when it is offered the next time.

Table 3: Example: Grades and Grade Points

Category	Course Title	Credits (C)	Grade Letter	Grade Point	Credit Point (Credit x Grade)
CT	Auditory Physiology	3	A	9	3x 9=27
CT	Neurophysiology of hearing	3	O	10	3x 10=30
CT	Hearing sciences	3	B	8	3x 8=24
CT	Technology and instrumentation in Audiology	3	C	7	3x7=21
RP	Dissertation*	5	D	6	5x6=30
CR	Clinicals in Audiology (Internals)*	5	A	9	5x9=45
	Total	22			177

Thus, SGPA = $177/22 = 8.04$

The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester. For example, if a student takes five courses (Theory/Practical) in a semester with credits C1, C2, C3, C4 and C5 and the student's grade points in these programs are G1, G2, G3, G4 and G5, respectively.

Computation of SGPA and CGPA

- The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$\text{SGPA (Si)} = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

- The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a Programme, i.e.,

$$\text{CGPA} = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

- The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Table 4: Illustration of Computation of SGPA and CGPA and Format for Transcripts

- i. Computation of SGPA
- ii. Computation of CGPA

Semester 1	Semester 2	Semester 3	Semester 4
Credit: 26 SGPA: 7.42	Credit: 24 SGPA: 6.8	Credit: 25 SGPA: 6.6	Credit: 25 SGPA: 6.0
Illustration for CGPA			
$\text{CGPA} = \frac{26 \times 7.42 + 24 \times 6.8 + 25 \times 6.6 + 25 \times 6.0}{100} = 6.71$			

13. EXAMINATIONS AND ASSESSMENT:

- i. For all category of core theory courses offered, the assessment will comprise of Internal Assessments (IA) and the End Semester University examination (ES). For each core theory course the IA evaluation weighted at 20% and the ES weighted at 80%.
- ii. Continuous internal assessment weighted at 100% shall be conducted internally by the subject experts at the college level for those courses (Only theory & Dissertation) that have no end semester exam component.
- iii. A candidate failed in any course in the University examination will be provided an opportunity to improve his/her internal marks (theory only) which will be called "Improvement I.A. Examinations".
- iv. If a failed candidate does not appear for such "Improvement I.A. Examinations" for internal marks in the failed course(s), the internal marks (in theory) already secured by him/her shall be carried over for his/her subsequent appearance(s) in the University examinations.
- v. IA Marks shall be submitted to the University for each Course separately by the Head of the department/ program co-ordinator 15 days prior to the commencement of the University examinations, through the Principal.

13.1. Internal assessment

- a) Evaluation for a course shall be done on a continuous basis. The uniform procedures to be adopted under the Credit based semester system (CBSS) are to conduct at least two internal assessments followed by University examination for each course.
- b) A regular record of attendance in theory, clinical, seminar, assignment, journal club, discussion with the supervisor, research work presentation and dissertation, etc shall be maintained by the department / teaching staff of respective courses.

13.2. Eligibility in Internal Examination for end –semester (IA for all theory, clinical courses, and other courses)

- a) For theory, clinical and research courses, a candidate should obtain a minimum of 50% marks in IA to be eligible to appear for University examination of each course in a semester. IA marks shall be awarded on the basis of the candidates work throughout the particular semester.
- b) Improvement of Internal Assessment: A student shall have the opportunity to improve his/her performance only once in the sessional exam component of the internal assessment. The re-conduct of the sessional exam shall be completed before the commencement of next end semester theory examinations.

13.3. Attendance Requirements

- a) No candidate shall be permitted to appear for the University examinations, unless he/she attends the program for the prescribed period and produces the necessary certificate of attendance and progress and a satisfactory conduct from the Head of the Institution.
- b) Every candidate is required to put in a minimum of 80% of attendance in theory and 90% in clinical course (s) in the semester concerned to become eligible to appear for admission to the University examination.
- c) A candidate lacking the prescribed attendance in any course(s) shall not be allowed to appear for University examination **in that course only**.

13.4. Assessments in End Semester Examinations:

- a) The process of assessment in examinations for all the theory and clinical courses offered in Semesters I to IV, dissertation examinations at the end of Semester IV shall be undertaken by internal and external who will be appointed by the Controller of Examinations based on the panel of examiners provided by the respective department heads / BoS.
- b) Clinical examinations (for PSL18CR101 and PSLP18CR301 shall be conducted by two University appointed faculty of the department at the end of 1st and 3rd semesters.
- c) Clinical examinations for PSL18CR201 and PSL18CR401 will be conducted by One external examiner and One internal examiner appointed by the University at the end of the 2nd and 4th semester, respectively. Clinical examination shall be with patients, equipment, simulators and/or patient records. The examiners shall also evaluate records of clinical work of the students.

13.5. Pattern of Question Paper - End Semester Examination

Theory	Duration: 3 hours
Essays (Answer 4 out of 5) (4 x 15)	60 marks
Short notes (Answer 4 out of 5) (4 x 5)	20 marks
Total	80 marks

14. DISSERTATION**14.1. Continuous and Summative assessments for DISSERTATION**

- a) All candidates registered to undergo the M.Sc. (Audiology) degree program shall have to submit a dissertation at the end of 4th semester (15 days prior to commencement of end semester theory exams).
- b) Each candidate will be assigned a recognized guide in the first semester.
- c) Candidate can obtain approval for their dissertation proposal through ethical committee (students) of the university (by the end of second semester).
- d) The topic assigned to the candidate will be intimated to the controller of examination of this University by the end of second semester.
- e) The dissertation work will be individual research and will consist of data collection carried out during third and fourth semester.
- f) The dissertation work shall be in a bound volume not exceeding 75 pages (one and half line spacing and on one side of A4 size paper) excluding references.

- g) Three bound copies and one soft copy of the dissertation work shall be submitted fifteen days prior to the commencement of the University examination and forwarded to the Controller of Examination of the University.
- h) The concerned guide may evaluate the performance of the candidate for the **internal marks** as per the guidelines given below. This evaluation would reflect the quality of work put into the dissertation by the student.

Table 5: Guideline for awarding IA – Dissertation

Semester	Activity to be completed	Hours/ Semester	Credits	Max. Marks (Internal)
I	Research Seminar 1: Submit a summary of literature related to broad area of research	60	2	100
II	Research Seminar 2: Present research proposal in the department, and obtain clearance from IEC	60	2	100
III	Research Practicum: Demonstrate progress in dissertation as written report	120	4	100
IV	Dissertation: Submit dissertation and present at the department	240	8	20

- i) The internal marks awarded based on the above format has to be submitted to the COE through the Head of Department 15 days before the commencement of end semester exams.
- j) One external and one internal examiner appointed by the University shall evaluate the dissertation as per the guideline given below.

Table 6 Guidelines for Allotment of Marks for University Examination

Introduction, Review of literature	10 marks
Need for the study and Objectives	10 marks
Method	20 marks
Results and discussion	30 marks
Summary and Conclusion	10 marks
Total	80 marks

15. CRITERIA FOR PASSING**15. 1. Marks qualifying for a Pass for M.Sc (Aud) Program**

A candidate shall be declared to have passed the examination if he/she obtains the following minimum qualifying grade / marks:-

- a) Grade D (50% of marks) in the University End Semester Examination Theory, Clinical, and Dissertation (ESE)
- b) Grade D (50%) aggregate in each course which includes both Continuous Internal Assessment and End Semester Examinations.

15.2. Reappearance for arrear subjects:

- a) In case a student fails to secure the minimum 50% in any theory or clinical course (s), then he/she shall reappear for the next end semester examination of that course only.
- b) However, his/her marks of the Internal Assessment shall be carried over and he/she will be entitled for grade obtained by him/her on passing, subject to provisions 13 (iii & iv).

15.3. Carry-over of courses

A student will be eligible to carry forward all the failed courses (including Grade AB) of I and II semesters till the III semester examinations but he/she will not be eligible to appear for the University examinations of IV semester until all the courses of I, II and III semesters are successfully completed. However, the student may be permitted to attend and complete the course requirements **ONLY**, for courses in the IV semester.

On successful completion of all courses until third semester such candidates are eligible to appear for the end semester examinations of the IV semester.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to IV semesters as per the norms of this University.

16. END SEMESTER SUPPLEMENTARY EXAMINATIONS

End semester supplementary examinations shall be conducted as per the schedule given in table below. The exact dates of examinations shall be notified from time to time.

17. RETOTALING OF ANSWER PAPERS

The candidates can apply for retotaling by paying prescribed fee.

18. CLASSIFICATION OF SUCCESSFUL CANDIDATES

The class shall be awarded based on CGPA as follows:

Table 9: Classification of successful candidates

≥ 7.50	First Class with Distinction	First attempt only
6.00 to 7.49	First Class	Class will be awarded only when the course is completed within the stipulated period. All others would be declared as 'Pass'
5.00 to 5.99	Second Class	

All assessments of M.Sc. (Audiology) program on an absolute mark basis will be considered and passed by the respective results passing Boards in accordance with the rules of the University. Thereafter the Controller of Examinations shall convert the marks for each course to the corresponding letter grade as mentioned in Table 3, compute the grade point average and cumulative grade point average, and prepare the grade and mark sheets. On satisfactory completion of the courses, a candidate earns the prescribed credits.

19. AWARD OF RANKS

Ranks and medals shall be awarded based on final CGPA for candidates who pass in the first attempt and the candidates should have completed the M.Sc. (Audiology) program in minimum prescribed number of years, (two years) for the award of ranks. However, candidates who fail in one or more courses during the M.Sc. (Audiology) program shall not be eligible for award of ranks.

20. AWARD OF DEGREE

The University will award the degree after a candidate successfully completes the required University examinations (all semesters).

21. RE-ADMISSION AFTER BREAK OF STUDY

A candidate having a break of study shall be re-admitted after satisfactory fulfillment of the regulations of the University at the commencement of an academic year only and shall undergo the full duration of the Program. No exemption for the period of study already undergone or for the examination already passed shall be granted. The candidate will be required to appear for all the examinations as prescribed in the regulations and syllabus in vogue at the time of readmission.

A candidate having a break of study of four years and above from the date of admission and more than two spells of break will not be considered for re-admission. The four years' period of break of study shall be calculated from the date of first admission of the candidate to the course inclusive of all the subsequent spells of break of studies.

If a candidate has a break of study of more than 2 months during the semester, he/ she has to apply for continuation to the semester which has to be redone when it is being offered with specific recommendations by HoD.

22. DISCHARGE FROM THE PROGRAM

If a student admitted to a Program of study in this Deemed University is for any reason not able to complete the Program or qualify for the degree by passing the examinations prescribed within a period comprising twice the duration prescribed in the Regulations for the concerned Program, he/she will be discharged from the said Program, his/her name will be taken off the rolls of the Deemed University and he/she will not be permitted to attend classes or appear for any examination conducted by the Deemed University thereafter.

SCHEME OF CURRICULUM AND EVALUATION OF THE PROGRAM

M.Sc. (Audiology), 2018-19 [APOA]																
SEMESTER- 1																
Course Number	Course code	Category	Course Title	Hours / Week				Hours/ semester (Credits x 15 weeks)				Internal assessment (IA) – Theory/ Practical (a)	University Exam		Grand Total	
				Lecture (L)	Tutorial(T)/ Clinical Training(CT)	Research Project (RP)	Credits(C)	Lecture	Tutorial(T)/ Clinical Training(CT)	Research Project (RP)	Total hours		(%) Attendance	Theory (b)		Viva-voce(c)
													EST	ESP		
1	POA18CT101	CT1	Auditory Physiology	4			4	60			60	80	20	80	-	100
2	POA18CT102	CT2	Neurophysiology of hearing	4			4	60			60	80	20	80	-	100
3	POA18CT103	CT3	Hearing sciences	4			4	60			60	80	20	80	-	100
4	POA18AT104	AT1	Technology and instrumentation in Audiology	4			4	60			60	80	20	80	-	100
5	POA18AT105	AT2	Research Methods, Epidemiology and Statistics	4			4	60			60	80	20	80	-	100
6	POA18CR106	CR1	Clinicals in Audiology – 1		5		5	-	225	-	225	90	50		50	100
7	POA18RP107	RP1	Research Seminar - 1			2	2			60	60	80	100			100
Year 1 – Semester-I			Total	20	5	2	27	300	225	60	585		250	400	50	700

M.Sc. (Audiology), 2018-19 [APOA]																
SEMESTER- 2																
Course Number	Course code	Category	Course Title	Hours / Week				Hours/ semester (Credits x 15 weeks)			Internal assessment (A) – Theory/ Practical (a)	University Exam		Grand Total		
				Lecture (L)	Tutorial(T)/ Clinical Training(CT)	Research Project (RP)	Credits(C)	Lecture	Tutorial(T)/ Clinical Training(CT)	Research Project (RP)		Total hours	(%) Attendance		Theory (b)	Viva-voce(c)
												EST	ESP			
8	POA18CT201	CT4	Auditory perception	4			4	60			60	80	20	80	-	100
9	POA18CT202	CT5	Auditory disorders	4			4	60			60	80	20	80	-	100
10	POA18CT203	CT6	Electrophysiological assessment	4			4	60			60	80	20	80	-	100
11	POA18CT204	CT7	Advances in management of hearing loss	4			4	60			60	80	20	80	-	100
12	POA18CT205	CT8	Genetics of hearing and Paediatric Audiology	4			4	60			60	80	20	80	-	100
13	POA18CR206	CR2	Clinicals in Audiology- 2		5		5	-	225	-	225	90	50		50	100
14	POA18RP207	RP2	Research Seminar - 2			2	2			60	60	80	100			100
Year 1 – Semester-II			Total	20	5	2	27	300	225	60	585		250	400	50	700

M.Sc. (Audiology) , 2018-19 [APOA]																
SEMESTER- 3																
Course Number	Course code	Category	Course Title	Hours / Week				Hours/ semester (Credits x 15 weeks)				Internal assessment (IA) – Theory/ Practical (a)	University Exam		Grand Total	
				Lecture (L)	Tutorial(T)/ Clinical Training(CT)	Research Project (RP)	Credits(C)	Lecture	Tutorial(T)/ Clinical Training(CT)	Research Project (RP)	Total hours		(%) Attendance	Theory (b)		Viva-voce(c)
													EST	ESP		
15	POA18CT301	CT9	Implant Audiology	4			4	60			60	80	20	80	-	100
16	POA18CT302	CT10	Speech perception	4			4	60			60	80	20	80	-	100
17	POA18CT303	CT11	Auditory Processing Disorders	4			4	60			60	80	20	80	-	100
18	POA18CT304	CT12	Vestibular system and its disorders	4			4	60			60	80	20	80	-	100
19	POA18CR305	CR3	Clinicals in Audiology - 3		5		5	-	225	-	225	90	50		50	100
20	POA18RP306	RP3	Research Practicum			4	4			120	120	80	100			100
Year 2 – Semester-III			Total	16	5	4	25	240	225	120	585		230	320	50	600

M.Sc. (Audiology) , 2018-19 [APOA]																
SEMESTER- 4																
Course Number	Course code	Category	Course Title	Hours / Week				Hours/ semester (Credits x 15 weeks)				Internal assessment (IA) – Theory/ Practical (a)	University Exam		Grand Total	
				Lecture (L)	Tutorial(T)/ Clinical Training(CT)	Research Project (RP)	Credits(C)	Lecture	Tutorial(T)/ Clinical Training(CT)	Research Project (RP)	Total hours		(%) Attendance	Theory (b)		Viva-voce(c)
													EST	ESP		
21	POA18CT401	CT-13	Audiology in Practice	4			4	60			60	80	20	80	-	100
22	POA18CT402	CT-14	Seminars in Practices related to Medical Audiology*	4			4	60			60	80	100	-	-	100
23	POA18CR403	CR4*	Clinicals in Audiology - 4		5		5	-	225	-	225	90	50		50	100
24	POA18RP404	RP4	Dissertation			8	8			240	240	80	20		80	100
Year 2 – Semester-IV			Total	8	5	8	21	120	225	240	585		190	80	130	400

**M.Sc. (Audiology)
Course content**

Semester I

Course Title: Auditory Physiology

Marks – 100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
1	POA18CT101	Core Theory CT1	Auditory Physiology	4	-	-	4	60/100

Learning Objectives	Learning Outcomes
<p>The objective of the course is to provide knowledge on:</p> <ol style="list-style-type: none"> The development of the external, middle ear and cochlea Anatomy & Physiology of external ear, middle ear and cochlea and generation of OAE, Protocol for recording OAEs in clinics and for research, Protocol for recording ECoChG in clinics and for research, and Research needs in physiological measurements of hearing 	<p>After completing this course, the student will be able to:</p> <ol style="list-style-type: none"> Illustrate the development of the ear Describe the micro and macro anatomy & physiology of the cochlea. Explain the physiological basis for generation of OAE, Use appropriate protocol for recording OAEs for clinical purpose and for research, Use appropriate protocol for recording ECoChG for clinical purpose and for research, and

Unit	Syllabus
UNIT I:	<p>Auditory system</p> <ol style="list-style-type: none"> External and middle ear <ul style="list-style-type: none"> Role of external ear and temporal bone in hearing, Middle ear transformer action and Eustachian tube physiology Micro & macro anatomy of cochlea Homeostatic mechanisms in cochlea Blood supply and Innervations of cochlea Cochlear regeneration

UNIT II:	Auditory Physiology a) Role of external ear and temporal bone in hearing b) Middle ear transformer action and physiology of Eustachian tube c) Techniques to study hair cell and basilar membrane physiology d) Basilar membrane mechanics e) Outer hair cell physiology – different mechanisms involved in hair cell motility f) Inner hair cell physiology g) Cochlear non-linearity
UNIT III:	Development of cochlea and top down control of sensory process a) Efferent control of cochlear hair cells b) Nutrients related to sensory cell physiology c) Ontogenetic development of cochlea d) Phylogenetic development of cochlea e) Developmental changes in the cochlea; effect of advancing age on cochlea f) Comparative physiology of auditory system in non-mammalian species
UNIT IV:	Otoacoustic Emissions a) Classifications of OAEs; mechanism based taxonomy b) Characteristics of different types of OAEs c) Instrumentation and techniques for recording different types of OAEs d) Factors affecting different types of OAEs e) Fine structure DPOAEs f) Suppression of OAEs: ipsilateral, contralateral, and bilateral g) Clinical applications of OAEs
UNIT V:	Cochlear Potentials a) Endocochlear potentials. b) Electrocochleography: Instrumentation and technique c) Protocol for recording ECoChG d) Interpretation of ECoChG e) Clinical application of ECoChG

Recommended Reading

- Musiek, F.E. & Baran, J.A. (2016). Auditory System: Anatomy, Physiology and Clinical Correlates. San Diego: Plural Publishing Inc
- Robinette, M. S., & Glatke (2007). Otoacoustic emissions: clinical applications. New York: Thieme Medical Publications.
- Musiek, F.E., Baran, J.A., Shinn, J., & Raleigh, J. (2012). Disorders of the Auditory System. San Diego: Plural Publishers

Other suggested reading

- Altschuler, R. A., & Hoffman, D. W. (1986). Neurobiology of hearing: the cochlea. New York: Raven Press.
- Berlin, C. I. (1996). Hair cells and hearing aids. San Diego: Singular Publishing Group.
- Dallos, P. (1973). Auditory periphery: Biophysics & physiology. New York: Academic Press.
- Dallos, P., Popper, A. N., & Fry, R. R. (1996). The cochlea. New York: Springer.
- De Reuck, A. V. S., & Knight, J. (1968). Hearing mechanisms in vertebrates. London: Churchill.
- Dhar, S and Hall, J.W. (2011). Otoacoustic emissions: Principles, Procedures and Protocols. San Diego: Plural Publishing Inc
- Drescher, D. G. (1985). Auditory biochemistry. Springfield: Charles C. Thomas.
- Flock, A., Ottoson, D., & Ulfendahi, M. (1995). Active hearing. Baltimore: Williams & Wilkins.

- Gelfand, S. A. (2004). Hearing: Introduction to Psychological and Physiological Acoustics. (4th Edn.). New York: Marcel Decker.
- Hall, J.W. (2007). New Handbook of Auditory Evoked Responses. Boston: Pearson.
- Jahn, A. F., & Santos-Sacchi, J. (1989). Physiology of the Ear. New York: Academic Press.
- Kemp, D. T. (1986). Otoacoustic emissions, travelling waves, and cochlear mechanisms. *Hearing Research*. 22, 95-104.
- Moller, A. R. (2000). Hearing: Its physiology and pathology. San Diego: Academic Press.
- Moore, B. C. J. (1995). Hearing. San Diego: Academic Press.
- Zemlin, W. R. (2010). Speech & Hearing Science: Anatomy & Physiology. Boston: Allyn & Bacon.

Course title: Neurophysiology of hearing

Marks – 100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
2	POA18CT102	Core Theory CT2	Neurophysiology of hearing	4	-	-	4	60/100
Learning Objectives				Learning outcomes				
<p>The objective of the course is to provide knowledge on:</p> <p>a) anatomy and physiology of afferent and efferent system</p> <p>b) the role of auditory nerve and brainstem in stimulus coding</p> <p>c) the tonotopic organization in auditory cortex</p> <p>d) neurophysiological basis of the disorders affecting the auditory nervous system</p>				<p>After completing this course, the student will be able to</p> <p>a) strengthen the basics in anatomy and neurophysiology of the afferent and efferent system,</p> <p>b) discuss the neurophysiologic basis of the disorders affecting the auditory nervous system</p> <p>c) apply the neurological basis of electrophysiological assessment</p>				

Unit	Syllabus
UNIT I:	<p>Ascending Auditory Pathway: Anatomy</p> <p>a) Auditory nerve</p> <p>b) Cochlear nucleus</p> <p>c) Superior olivary complex</p> <p>d) Lateral lemniscus</p> <p>e) Inferior colliculus</p> <p>f) Medial geniculate body</p>

UNIT II:	Functioning of the Auditory Nerve a) Stimulus coding i. Frequency, intensity and temporal coding ii. Coding of complex signals b) Non linearity c) Action potentials d) Neurotransmitters and neuromodulators
UNIT III:	Physiology of Auditory Brainstem a) Tonotopic organization of auditory brainstem i. Cochlear nucleus ii. Superior olivary complex iii. Lateral lemniscus iv. Inferior colliculus v. Medial Geniculate body b) Coding of simple and complex acoustic signals at auditory brainstem i. Cochlear nucleus ii. Superior olivary complex iii. Lateral lemniscus iv. Inferior colliculus v. Medial Geniculate body c) Role of subcortical structures in sound localization
UNIT IV:	Anatomy and Physiology of Auditory Cortex a) Anatomy of primary and secondary auditory cortex b) Tonotopic organization in auditory cortex c) Coding of signals in the auditory cortex i. Simple and complex signals ii. Speech d) Association of auditory cortex with other structures e) Role of auditory cortex in sound localization f) Plasticity of auditory cortex
UNIT V:	Efferent Auditory System a) Efferent auditory pathway: medial and lateral olivo cochlear bundle b) Functioning of the auditory efferent system c) Role of auditory efferent system in hearing d) Protective function of auditory efferent system

Recommended Reading

- Musiek, F.E., & Baran, J.A. (2006). The auditory system: anatomy, physiology and clinical correlates. USA: Indiana University Press.
- Musiek, F.E., Baran, J.A., Shinn, J., & Raleigh, J. (2012). Disorders of the Auditory System. San Diego: Plural Publishers.
- Pickels, J.O. (2012). An introduction to the physiology of hearing. United Kingdom: Emerald Group Publishing Inc.
- Richard, A. (1991). Neurobiology of Hearing. USA: Raven Press.

Other suggested reading

- Aitkin, L. (1990). The auditory cortex: structural and functional bases of auditory perception. University of Michigan: Chapman and Hall.
- Berlin, C.E. (1999). The efferent auditory system: basic science and clinical applications. USA: Singular Publishing Group.
- Enrique A. & Lopez-Poveda, S. (2010). The neurophysiological bases of auditory perception. New York: Springer-Verlag.
- Gelfand, S.A. (2004). Hearing: An introduction to psychological and physiological acoustics. USA: Marcel Dekker Inc.
- Günter, E., & Romand, R. (1997). The central auditory system. United Kingdom: Oxford University Press.
- Jahn, A.F., & Santos-Sacchi J. (2001). Physiology of the ear. San Diego: Singular/Thomson Learning.
- Jeffery, A., & Schreiner, C. (2005). The inferior Colliculus. USA: Springer-Verlag.
- Lambert, M.S., Miriam T. T, & Susan F. M (2010). Superior Olivary Complex. USA: Betascript Publishers.
- Meddis, R. (2010). Computational Models of the Auditory System. USA: Springer-Verlag.
- Moore, D., Rees, A. & Palmer, A.R. (2010). Oxford handbook of auditory science the ear. United Kingdom: Oxford University Press.
- Ryugo, D.K. (2010). Auditory and Vestibular Efferents. USA: Springer-Verlag.
- Schnupp, J., Nelken, I., & Andrew, K (2011). Auditory Neuroscience: Making Sense of Sound. USA: Library of Congress.
- Steven, G., & William, A.A. (2006). Listening to Speech: auditory perspectives. New Jersey: Lawrence Erlbaum Associates Inc.
- Syka, J. (1997). Acoustical signal processing in the central auditory system. USA: Springer Science.
- Syka, J., & Merzenich, M.M. (2003). Plasticity and signal representation in the auditory system. USA: Springer Science.
- Tony, L. S., Richard, H. N., & Musiek, F.E. (1997). Efferent auditory system: structure and function. USA: Singular Publishing Group.
- Webster, D.B., Popper A.N., & Fay R.R. (1992). The Mammalian auditory pathway: neuroanatomy. New York: Springer-Verlag.

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
3	POA18CT103	Core Theory CT3	Hearing sciences	4	-	-	4	60/100
Learning Objectives				Learning outcomes				
The objectives of the course is to provide knowledge on a) psychophysical components of sound and their measurement, b) the different methods of estimation of thresholds, frequency analysis and application of masking c) various psychophysical procedures to estimate thresholds and measure pitch d) relationship between the psychophysical components of sounds and its relevance to clinical practice .				At the end of the course the student will be able to a) demonstrate knowledge of psychophysical components of sound, their measurement, and their relationship with each other b) critically evaluate the different methods of estimation of thresholds c) discuss the various psychophysical procedures to estimate thresholds and measure pitch d) design experiments using principles learnt in absolute sensitivity, differential sensitivity, masking				

Unit	Syllabus
UNIT I:	Introduction to Psychoacoustics a) Physical description and parameters for generation of sounds: Sine wave and complex signals; Analysis of sound: Spectrum and spectrogram, LTASS; Filters and their properties b) Theory of signal detection: Basic concepts and applications of signal detection c) Psychophysical methods - Classical and adaptive methods
UNIT II:	Thresholds and Loudness a) Overview of absolute and relative measures: Methods of measuring absolute and relative thresholds; thresholds of audibility (MAP & MAF); Models of loudness. b) Loudness perception in normal hearing persons c) Effect of hearing impairment on perception of loudness d) Dynamic range of hearing, equal loudness contours and loudness scaling. e) Recruitment and softness imperceptions f) Consequences of altered loudness perception g) Factors affecting loudness: Bandwidth, duration, adaptation and masking. h) DLI

UNIT III:	Pitch a) Theories/models of pitch perception - simple and complex signals b) Pitch scales c) Factors affecting pitch perception d) Perception of pure-tones by persons with normal hearing and those with hearing impairment e) Perception of complex signals by persons with normal hearing and those with hearing impairment
UNIT IV:	Peripheral Masking a) Critical band concept and power spectrum model b) Estimating the shape of auditory filter: Psycho-physical tuning curve; Notched noise; Non-simultaneous masking c) Auditory filter shapes in normal hearing and hearing impaired d) Masking patterns and excitation patterns in normal hearing and hearing impairment
UNIT V:	Non-Peripheral Masking a) Central masking b) Informational masking c) Overshoot phenomena d) Co-modulation masking release e) Effect of hearing loss on non-peripheral masking

Recommended Reading

- Brian C.J. Moore (2007). Cochlear Hearing Loss: Physiological, Psychological and Technical Issues. England: John Wiley and Sons Ltd.
- Howard, D and Angus, J (2013). Acoustics and Psychacoustics. Oxford: Taylor & Francis
- Gelfand, S, A. (2005). Introduction to psychological and physiological acoustics. New York: Marcel Dekker.
- Gullick, W.L. (1971). Hearing physiology and psychophysics. New York: Oxford University Press.).
- Yost, W. A. (1994). Fundamentals of hearing: An introduction. San Diego: Academic Press.

Other suggested reading

- Moore, B. C. J. (1995). Hearing. San Diego: Academic Press.
- Stanley, A. Gelfand (1998). Hearing. New York: Marcel Dekker Inc.
- Stuart Rosen & Deter Howell (1991). Signals and systems for speech and hearing. CA: Academic Press Inc.
- Stuart Rosen and Deter Howell (1991). Signals and systems for speech and hearing. CA: Academic Press Inc
- Zwicker, E., & Fastl, H. (1999). Psychoacoustics-Facts and models. Springer Verlag: Berlin Heidelberg.

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
4	POA18AT104	Core Theory AT1	Technology and instrumentation in Audiology	4	-	-	4	60/100

Learning Objectives	Learning outcomes
<p>The objective of the course is to provide knowledge on</p> <ul style="list-style-type: none"> a) advanced aspects of signal acquisition and processing, b) development and application of software based tools, c) development and application of tele-technology, and technology of amplification devices 	<p>After completing this course, the student will be able to</p> <ul style="list-style-type: none"> a) discuss advanced aspects of signal acquisition and processing b) Demonstrate application of software based tools for analysis of sounds c) Demonstrate application of tele-technology d) demonstrate the technology used in amplification devices

Unit	Syllabus
UNIT I:	<p>Fundamentals of Digital Signal Processing & Communication Systems</p> <ul style="list-style-type: none"> a) Digitization of data and digital systems; Principles and methods of digital signal processing b) Fundamentals of communication systems – (i) AM & FM transmission & reception (ii) Digital modulation techniques, (iii) Satellite communication c) Transducers and signal generation c) Biomedical signals & signal processing: Principles of generation of acoustic stimuli d) Signal acquisition and processing techniques e) Working principles of EEG / Magnetoencephalography, event related potentials/ evoked potential. f) High-fidelity sound reproducing systems: Auditorium acoustics
UNIT II:	<p>Techniques of Speech Processing and Analysis</p> <ul style="list-style-type: none"> a) Artificial neural networks b) Speech processing and synthesis models and techniques (linear predictive coding, linear prediction model, LPC-based synthesis) and applications, review of signal processing, Fourier transform and short-time speech analysis(energy, zero-crossing rate, autocorrelation function). c) Voice response system, speaker recognition system and speech recognition system: Speech synthesis methods, speech recognition, speaker recognition, speech coding, and speech enhancement. d) Basic principles of cepstral analysis, filtering low-time filtering for formant estimation, high-time filtering for pitch estimation, complex cepstrum

UNIT III:	Neuro Imaging a) Principles of neuro imaging techniques - MRI, fMRI, NIRS, CT, PET, SPECT, TMS and MEG and their technology (working principles, interpretation and implications). b) Synching various speech stimuli and events for fMRI acquisition and speech perception in fMRI c) Technology available for intra-operative monitoring of sensory and motor functions
UNIT IV:	Tele-technology a) Tele-technology: Definition, applications, technology, resources b) Transmission of information: transmission of patient images, reports, etc. c) Remote consultations and databases d) Distance learning- multimedia meeting room / videoconferencing
UNIT V:	Software for Analysis a) Software packages and applications in hearing diagnostics and research - MATLAB, Adobe audition, Audacity, PRAAT b) Basics features, vectors and matrices, built-in functions and plotting c) Editing audio files, applying effects in waveform editor, amplitude compression and modulation effects, filter and equalizer effects, noise reduction/ restoration effects, basic multitrack controls, saving and exporting d) Computer based assessment and intervention programs relating to hearing e) Calibration and maintenance of equipment

Recommended Reading

- Moser, P. (2015). Electronics and Instrumentation for Audiologists. Psychology Press.
- Boulston, F. R. & Dvorak, J.D (2015). Matlab Primer for Speech Language Pathology and Audiology. San Diego: Plural Publishing Inc
- Schaub, A. (2008). Digital hearing aids. New York: Thieme Medical publishers.
- Boulston.FR and Dvorak.J.D. (2015) . Matlab Primar for speech Language pathology and Audiology. Plural publishing Inc

Other suggested reading

- Villchur, E. (1999). Acoustics for Audiologists (1 edition.). San Diego, Calif: Delmar Cengage Learning.
- Baber, C. & Noyes, J.M. (1993). Interactive Speech Technology: Human Factors Issues in the Application of Speech Input Output to Computers. London: Taylor and Francis.
- Daniloff, R.G (1985). Speech Sciences: Recent advances. London: Taylor and Francis.
- Gottingen, M.R.S. (Ed.) (1985). Speech and Speaker Recognition. Basel: Kager.
- Haton, J.P. (Eds) (1981). Automatic speech analysis & Recognition. USA, D. Reidel Publishing Company.
- Keller, E. (ed.) (1994). Fundamentals of Speech Synthesis and Speech Recognition: Basic Concepts, State of the art and Future challenges. New York: John Wiley & sons.
- Morgan, D.P. & Scofield, C.L (1991). NeuralNetworks and Speech Processing. Boston, Kluwer Academic Publishers.
- Nakagawa, S. & etal. (1995). Speech, Hearing and Neural Network Models. Oxford: IOS, Press
- Oppenheim & Schafer (1989). Digital signal processing. New Delhi: Prentice Hall of India.
- Silman,S & Emmer, M.B. (2011). Instrumentation in Audiology and Hearing Science: Theroy and Practice. San Diego: Plural Publishing Inc

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
5	POA18AT105	Core Theory AT2	Research Methods, Statistics & Epidemiology	4	-	-	4	60/ 100
Learning Objectives				Learning outcomes				
The objectives of the course are to provide knowledge on: a) clinical research designs and statistical methods b) ethical considerations in conduct of research with human participants c) epidemiological issues and its relevance in speech-language research d) methods used in evidence-based practice in speech and language pathology				At the end of the course, the student will be able to: a) evaluate research material/publications in terms of types of research designs and statistical methods used. b) discuss epidemiological concepts in relation to speech-language, hearing disorders c) appraise evidence-based practice in different fields of speech-language and hearing disorders d) develop a research proposal for research project				

Unit	Syllabus
UNIT I:	Research designs, documentation and research ethics a) Types of research- post facto research, normative research, standard group comparison, b) Experimental research, clinical and applied research, sample surveys, evaluation research c) Methods of observation and measurement, strategies and designs in research d) Experimental designs - single subject designs and group designs e) Documentation and research writing f) Ethical considerations in research with human participants – ICMR guidelines
UNIT II:	Epidemiology a) Definition, basic concepts – scope and function of epidemiology b) Study designs in epidemiology: Cohort studies, case-control studies, cross-sectional studies, clinical trials c) Measures in epidemiology – Ratios, proportions, rates, relative risk, odds ratio d) Identify biases and their consequences in published literature. e) Describe criteria for characterizing the causality of associations. f) Application of epidemiology in evaluation and screening procedures employed in Speech-language Pathology g) Application and impact of epidemiology on national and local policy; influence of epidemiology on ethical and professional issues

UNIT III:	Statistical measures and their features a) Review of data description and exploratory data analysis (Numerical summaries and graphical summaries) b) Statistical Inference – Estimation of Confidence Intervals c) Statistical Inference – Basic concepts related to hypothesis testing –null hypothesis, alternative hypothesis, significance level, statistically significant, critical value, acceptance / rejection region, p-value, power, types of errors: Type I (α), Type II (β), one-sided (one-tailed) test, Two-sided (two-tailed) test d) Parametric tests of hypothesis testing: testing the significance between two means (Independent samples t-test, Paired sample t-test) e) Non-parametric tests of hypothesis testing: Need for transformations and non-parametric tests; independent samples (Median test, Mann-Whitney U test, Kruskal-Wallis test) and for related samples (Sign test, Wilcoxon’s signed-rank test, Friedman’s test) f) Analysis of qualitative data - Contingency tables; Chi-square test for independence of attributes; Measures of Association - contingency coefficient and Cramer’s; Measures of agreement - Kappa coefficient
UNIT IV:	Regression, univariate and multivariate analysis a) Correlation; simple and multiple linear regression; logistic regression; path analysis b) Analysis of Variance (ANOVA)- Basic models, assumptions, one way and two-way ANOVA; Consequence of failure of assumptions underlying ANOVA; Tests for additivity, homogeneity, transformation; Post – hoc tests; Analysis of Covariance (ANOCOVA); Repeated measure ANOVA c) Multivariate data analysis (concept only) - Need for multivariate data analysis; Introduction to various methods including Principal component analysis, Cluster analysis, Discriminant analysis, MANOVA d) Evaluation of application of statistics to different research designs used in different publications e) Critical analysis of research articles in the field: Analysis of research designs in different areas of Speech-language Pathology
UNIT V:	Evidence based practice a) Introduction to Evidence Based Practice (EBP) and Steps to EBP from formulating foreground question, finding best current evidence, critical appraisal of best current evidence, summarizing evidence, integrating evidence and tracking progress. b) Concepts related to practical significance (effect size) vs. statistical significance, precision of measurement (confidence intervals) c) 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 d) Measures of diagnostic accuracy – positive and negative likelihood ratios; positive predictive value, negative predictive value, diagnostic odds ratio e) Concepts related to randomized control trials: Comparative groups- allocation concealment / random allocation; importance of participation and follow up in understanding, evaluating and applying randomized controlled trial results f) Methods of carrying out therapy trials; execution, indexing and reporting of therapy trials – efficacy studies; Conventions to study outcomes - i) Absolute risk reduction, ii) Absolute benefit increase, iii) Absolute risk increase, and iv) Absolute benefit reduction g) Systematic review and meta-analysis: importance of research publications in terms of systematic review, meta-analysis, clinical practice guidelines, health technology assessments. h) Challenges in implementation of EBP in Speech-language Pathology in India and future directions

Recommended Reading

- Hegde, M. (2017). *A coursebook on scientific and professional writing for speech-language pathology* (5th Ed). San Diego: Plural Publishing
- Irwin, D. L., Pannbacker, M., & Lass, N. J. (2013). *Clinical research methods in speech-language pathology and audiology*. (2nd Ed). San Diego: Plural Publishing
- Silverman, F. H. (1998). *Research design and evaluation in speech-language pathology and audiology*. Allyn & Bacon.
- Goyal, R. C. (2010). *Research methodology for health professionals*. Jaypee brothers' publishers.
- Kothari, C. R., & Garg, G. (2004). *Research methodology: Methods and techniques*. (3rd Ed). New Age International.
- Gurumani, N. (2011). *Research methodology: for biological sciences*. Mjp Publishers.
- National Ethical Guidelines for Biomedical and Health Research Involving Human Participants (2017) by Indian Council of Medical Research, New Delhi
- National Ethical Guidelines for Bio-Medical Research Involving Children by Indian Council of Medical Research, New Delhi
- Orlikoff, R.F., Schiavetti, N., & Metz, D. E. (2014). *Evaluating research in communication disorders*. USA: Pearson Education.
- Meline, T., (2009). *A research primer for communication sciences and disorders*. USA: Pearson Education.
- Miles, J., & Gilbert, P. (Eds.). (2005). *A handbook of research methods for clinical and health psychology*. Oxford University Press on Demand.
- Maxwell, D. L., & Satake, E. (2006). *Research and statistical methods in communication sciences and disorders*. San Diego: Singular Publishing.
- Carter, R., & Lubinsky, J. (2016). *Rehabilitation research: Principles and applications*. Elsevier.
- Reinard, J. C. (2006). *Communication research statistics*. SAGE Publications
- Pring, T. (2005). *Research methods in communication disorders*. Wiley
- Doehring, D. G. (2002). *Research strategies in human communication disorders*. Pro-Ed.
- Johnson, C. E., & Danhauer, J. L. (2002). *Handbook of outcomes measurement in audiology*. San Diego: Singular Publishing.

Course Title: Clinicals in Audiology - 1

Marks: 100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
6	POA18CR106	Clinical Rotation CR1	Clinicals in Audiology - 1	-	5		5	225/ 100

Option - 1**Note: Clinical practicum for CR-1 is listed with that for CR-2 at the end of syllabus****Course title: Research Seminar - 1**

Marks:100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project	Total Credits	Total Hours/Marks
7	POA18RP107	Research Project RP1	Research Seminar -1	-	-	2	2	60/ 100
Learning objectives			Learning outcomes					
The objectives of the course in conjunction with the course on research methods, epidemiology and statistics are to: a) learn to perform a literature research in a broad area of research b) learn to critically evaluate a research article c) appraise on issues related to ethics in research on human participants d) learn about functioning of institutional ethics committee and review process of proposals.			At the end of the course the student will be able a) to identify a research question within a broad research theme b) submit a summary of literature related to broad area of research					

COURSE PLAN:

1. Identify a Research Theme
2. Identify an Advisor and get approval
3. Perform a review of literature in the area of the research theme and write an annotated bibliography
4. Formulate hypotheses or research question

5. Complete online learning related to ethics in research on human subjects covering topics included but not restricted to:

- History and ethics of human subject research
- Social and behavioral research
- Basic Institutional Review Board (IRB) Regulations and Review process
- Informed consent
- Populations in research requiring additional considerations and/or protection
- Vulnerable subjects – Research involving children
- Conflict of Interest in research involving human subjects
- Records–based research

The above course plan will be transacted by students individually with their research advisors. The internal assessment for the course will be based on brief review of literature/annotated bibliography submitted by the student.

Course content

Semester II

Course title: Auditory Perception

Marks – 100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
8	POA18CT201	Core Theory CT4	Auditory Perception	4	-	-	4	60/ 100
Learning Objectives				Learning outcomes				
The objective of the course is to provide knowledge on: <ol style="list-style-type: none"> a) Psychophysical aspects of parameters of sound b) perception of sound in space c) Neurophysiological aspects of localization d) factors affecting binaural hearing and music perception 				After completing this course, the student will be able to: <ol style="list-style-type: none"> a) Illustrate the interaction of physical and biological aspects of sound b) Apply the concepts of localization in managing persons with hearing impairment c) Apply the phenomenon of interaction of two ears in managing the persons with hearing impairment d) Discuss the factors involved in music perception 				

Unit	Syllabus
UNIT I:	<p>Temporal processing</p> <ul style="list-style-type: none"> a) Overview of temporal processing: temporal resolution; temporal integration; models of temporal processing b) Detection and discrimination of gaps in normals and individuals with hearing impairment c) Temporal modulation transfer function in normals and individuals with hearing impairment d) Temporal integration in persons with normals hearing and those with hearing impairment e) Models of temporal processing in persons with normal hearing and those with hearing impairment
UNIT II:	<p>Auditory object and pattern perception</p> <ul style="list-style-type: none"> a) Basic concepts in auditory object perception b) Spectral cues for object perception c) Temporal cues for object perception d) Auditory pattern perception in individuals with normal hearing and those with hearing impairment e) Timber perception f) Time invariant-pattern and time varying pattern perception
UNIT III:	<p>Adaptation</p> <ul style="list-style-type: none"> a) Adaptation vs. fatigue b) Methods of studying adaptation c) Adaptation in in persons with normal hearing and those with hearing impairment d) Neurophysiological basis of adaptation e) Factors affecting adaptation
UNIT IV:	<p>Perception in Space</p> <ul style="list-style-type: none"> a) Perception of distance: localization vs. lateralization; localization of pure tones; localization of complex signals b) Effect of hearing loss on localization c) Monaural localization c) Factors affecting localization d) Neurophysiology of localization
UNIT V:	<p>Binaural hearing and Perception of Music</p> <ul style="list-style-type: none"> a) Binaural hearing - overview b) Models of binaural hearing c) Masking level difference d) Musical scales/Musical notes e) Factors affecting perception of music

Recommended Reading

- Brain, C.J. Moore (1986). Frequency selectivity in Hearing. CA: Academic Press Inc.
- 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
- Yost, W. A. (1994). Fundamentals of hearing: An introduction. San Diego: Academic Press.

Other suggested reading

- Diana Deutsch (2013). The Psychology of Music, Third Edition (Cognition and Perception) 3rd Edition. Academic Press
- M. Riess Jones, R.R. Fay, A.N. Popper (2010). Music Perception. Springer
- Oxenham, A., & Bacon, S. (2003). Cochlear Compression: Perceptual Measures and Implications for Normal and Impaired Hearing. Ear and Hearing, 24, 350-366.
- Plack, C.J., Oxenham, A.J., & Fay, R.R. (2005). Pitch: Neural Coding and Perception. New York: Springer.
- Stanley, A. Gelfand (1998). Hearing. New York: Marcel Dekker Inc.
- Warren, R. M. (2008). Auditory Perception: An Analysis and Synthesis. Cambridge: Cambridge University Press.
- Zwicker, E., &Fastl, H. (1999). Psychoacoustics-Facts and models. Springer: Verlag Berlin Heidelberg.

Course title: Auditory Disorders

Marks – 100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
9	POA18CT202	Core Theory CT5	Auditory Disorders	4	-	-	4	60/ 100
Learning Objectives				Learning outcomes				
<p>The objective of the course is to provide knowledge on</p> <p>a) pathophysiology and audiological profile of auditory disorders</p> <p>b) challenges in diagnosis of auditory disorders</p> <p>c) Non audiological management of auditory disorders.</p>				<p>After completing this course, the student will be able to</p> <p>a) develop insight in to histopathological changes in auditory disorders</p> <p>b) perform differential diagnosis of auditory disorders</p> <p>c) Apply knowledge to coordinate with medical professionals in treating auditory disorders.</p>				

Unit	Syllabus
UNIT I:	<p>Disorders of the External and Middle Ear</p> <p>a) Congenital malformations of external and middle ear</p> <p>b) Diseases of the external ear: otitis – externa, neoplasms of external ear, cerumen, keratosis obturans, injuries, sebaceous cysts, acquired atresia, stenosis of external auditory canal & malignant otitis externa</p> <p>c) Diseases of the middle ear cleft: otosclerosis otitis media, non suppurative otitis media, complications of middle ear diseases, neoplasms.</p> <p>d) Assessment of middle ear functioning: multicomponent tympanometry, multifrequency tympanometry, wide band reflectance/absorbance, reflexometry</p> <p>d) Reconstruction of external and middle ear hearing mechanisms: reconstructive and</p>

	rehabilitation procedure
UNIT II:	Disorders of the Cochlea a) Pathophysiology inner ear disorders: ototoxicity, Meniere's, age related hearing loss, Sudden hearing loss, auto immune conditions, hearing loss due to systemic diseases b) Audiological profile in persons with above inner ear disorders c) Nonaudiological management options
UNIT III:	Disorders of the Cochlea – NIHL & Traumatic Injury a) Pathophysiology inner ear disorders due to NIHL, traumatic injuries b) Audiological profile in persons with NIHL and other inner ear disorders c) Hearing Conservation: National and International guidelines d) Non-audiological management options
UNIT IV:	Auditory Nerve and Brainstem a) Pathophysiology of space occupying lesions of auditory nerve and brainstem b) Audiological profile in persons with space occupying lesions d) Radiological findings and its correlations with audiological findings d) Challenges in diagnosis of space occupying lesion e) Management options for space occupying lesion
UNIT V:	Auditory Neuropathy Spectrum Disorders a) Pathophysiology of ANSD b) Etiology of ANSD c) Audiological profile of persons with ANSD and its correlations with pathophysiology d) Speech perception in persons with ANSD e) Management of persons with ANSD: Aids and strategies

Recommended Reading

- Brain, C.J. Moore (1986). Frequency selectivity in Hearing. CA: Academic Press Inc.
- Gelfand, S, A. (2005). Introduction to psychological and physiological acoustics. New York: Marcel Dekker.
- Howard, D and Angus, J (2013). Acoustics and Psychoacoustics. Oxford: Taylor & Francis
- Moller, A.R (2000). Hearing: Its physiology and pathology. Academic press Inc

Other suggested reading

- Diana Deutsch (2013). The Psychology of Music, Third Edition (Cognition and Perception) 3rd Edition. Academic Press
- M. Riess Jones, R.R. Fay, A.N. Popper (2010). Music Perception. Springer
- Oxenham, A., & Bacon, S. (2003). Cochlear Compression: Perceptual Measures and Implications for Normal and Impaired Hearing. Ear and Hearing, 24, 350-366.
- Plack, C.J., Oxenham, A.J., & Fay, R.R. (2005). Pitch: Neural Coding and Perception. New York: Springer.
- Stanley, A. Gelfand (1998). Hearing. New York: Marcel Dekker Inc.
- 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.

- Zwicker, E., & Fastl, H. (1999). Psychoacoustics-Facts and models. Springer: Verlag Berlin Heidelberg.

Dept. of SLHS, SRMC & RI (DU)

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
10	POA18CT203	Core Theory CT6	Electrophysiological Assessment	4	-	-	4	60/ 100

Learning Objectives	Learning outcomes
<p>The objective of the course is to provide knowledge on</p> <ul style="list-style-type: none"> a) classification and characteristics of AEPs b) technology for recording and analysis of different types of AEPs c) research needs in AEPs 	<p>After completing this course, the student will be able to</p> <ul style="list-style-type: none"> a) discuss and classify auditory evoked potentials, b) use appropriate protocols for recording exogenous and endogenous potentials for clinical and research purposes c) apply the technology for recording auditory evoked potentials, d) interpret exogenous and endogenous potentials

Unit	Syllabus
UNIT I:	<p>Foundations of Auditory Evoked Potentials (AEPs)</p> <ul style="list-style-type: none"> a) Introduction and Classification of AEPs b) Neuroanatomy and neurophysiological basis for generation of AEPs; dipole orientation and scalp distribution of AEPs c) Stimuli for recording AEPs- generation, characteristics and types d) Electrodes for recording AEPs e) General principles of recording AEPs f) Overview to advanced analyses techniques such as independent component and time frequency analyses g) Maintenance and Calibration of instrumentation
UNIT II:	<p>Auditory Brainstem Responses</p> <ul style="list-style-type: none"> a) Acquisition and analysis responses for different stimuli -clicks, tone bursts, chirps, complex stimuli such as speech b) New trends in ABR such as Cochlear Hydrops Analysis Masker Procedure (CHAMP) and stacked ABRs, and ABR for chained stimuli, c) Factors influencing ABR: Stimuli related, acquisition related, subject related d) Clinical applications

UNIT III:	Middle Latency Auditory Evoked Potentials and Auditory Steady State Responses a) Acquisition and analysis of middle latency responses, b) Factors influencing middle latency responses: Stimuli related, acquisition related, subject related c) Acquisition and analysis of auditory steady state responses (ASSR) d) Factors influencing ASSR: Stimuli related, acquisition related, subject related e) Post auricular muscle responses f) Clinical applications
UNIT IV:	Cortical Auditory Evoked Potentials a) Overview of exogenous and endogenous cortical evoked potentials b) Acquisition and analysis of obligatory cortical auditory evoked potentials, acoustic change complex, T-complex, mismatch negativity, P300, N400, P600, CNV and other endogenous potentials c) Factors affecting exogenous and endogenous evoked potentials Stimuli related, acquisition related, subject related d) Clinical applications
UNIT V:	Intraoperative monitoring a) Physiological tests useful in intraoperative monitoring of auditory function b) Effect of anesthetic agents on electrophysiological responses of the auditory system c) Recording auditory evoked potentials during surgery; requirements, patient preparation d) Guidelines for intraoperative monitoring e) Electroneurography

Recommended Reading

- Hall, J.W. (2007). New Handbook of Auditory Evoked Responses. Boston: Pearson.
- Burkard, R.F., Don, M., & Eggermont, J.J. (Eds.) (2007). Auditory Evoked Potentials: Basic Principles & Applications. Baltimore: Lippincott Williams & Wilkins.
- Hood, L.J. (1998). Clinical applications of auditory brainstem response. San Diego: Singular Publishing Group Inc.
- Picton, T. (2010). Human Auditory Evoked Potentials. San Diego: Plural Publishing Group.
- Kilney, P.R. (2017). Audiologists handbook of intraoperative neurophysiological monitoring. San Diego: Plural Publishing Group

Other suggested reading

- Ferraro, J.A. (1997). Laboratory exercises in auditory evoked potentials. San Diego: Singular Publishing Group Inc.
- Hall, J.W., & Mueller, H.G. (1997) Audiologists' Desk Reference. Volume 1: Diagnostic Audiology Principles, Procedures and Protocols. San Diego: Singular Publishing Group.
- McPherson, L.D. (1995). Late potentials of the auditory system. London: Singular Publishing Group.
- Rance, G (2008). Auditory Steady State Responses. San Diego: Plural Publishing Group
- Katz, J. (Ed.). (1994). Handbook of Clinical Audiology. Baltimore: Williams and Wilkins.

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
11	POA18CT204	Core Theory CT7	Advances in Management of Hearing Loss	4	-	-	4	60/ 100

Learning Objectives	Learning outcomes
<p>The objective of the course is to provide knowledge on</p> <ul style="list-style-type: none"> a) different amplification/assistive devices and their changing technology b) developing need-based programs and intervention strategies for persons with different types of hearing impairment across age groups, and c) specific needs and know psychosocial and communicative demands 	<p>At the end of course the student will be able to</p> <ul style="list-style-type: none"> a) discuss the need and candidacy for amplification/assistive devices b) explain the strategies of device selection and optimization c) select appropriate amplification and habilitation procedures for persons with different types of hearing impairment d) counsel and guide on strategies to enhance communication

Unit	Syllabus
UNIT I:	<p>Advances in Hearing Aid and Hearing Assistive Technology</p> <ul style="list-style-type: none"> a) Application of recent advances in hearing aids and hearing assistive technology : Compression and expansion, directionality, advanced signal processing techniques including noise reduction algorithms, wireless technology, data logging, trainable hearing aids, occlusion reduction, application of nanotechnology in hearing aids, Personal amplification systems 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 ear mold production, ear mold modifications for enhancing listening comfort – physical and acoustic modifications d) Electroacoustic measurement of hearing aids : Variables affecting electroacoustic measurements and its implications e) International and Indian standards/legislations for hearing aids and ALDs.

UNIT II:	Selection and Fitting of Hearing Aid and Hearing Assistive Devices a) Selection, verification and validation of hearing aids and hearing assistive devices: Pre-selection, selection and assessment of listening needs b) Objective procedures for hearing aid fitting (ABR, ALLR, ASSR and others): c) Hearing aid programming, optimization, verification and validation d) Hearing aid fitting for children : pre-selection, selection, verification and validation: Different protocols used e) Hearing aid fitting for persons with different types of hearing loss (Sudden hearing loss, unilateral hearing loss, High frequency hearing loss, Cochlear dead region) f) Future trends in hearing aids and HATs: Technology and fitting strategies
UNIT III:	Speech Perception through Hearing Aids 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) Noise reduction algorithms and nanotechnology in hearing aids
UNIT IV:	Rehabilitation of Individuals with Hearing Impairment a) Counseling of users of hearing aid and hearing assistive devices: techniques: Realistic expectations, adjusting to hearing device, other management options b) Care and maintenance of hearing aid and hearing assistive devices c) Trouble shooting and fine tuning/optimization of hearing aids and assistive devices d) Management of children with hearing impairment: Criteria for selecting different auditory listening programs; criteria for transition from one method to the other as a child grows: Adapting AVT techniques for Indian languages and late identified children and team approach . e) Providing group listening training activities for children having different listening skills f) Rehabilitation of adults and older adults: auditory listening / speech reading training for older adults: variables that affect the communication and the role of the communication partner: auditory plasticity: Planning training activities; assertiveness training g) Quality of life of hearing impaired and its enhancement: Outcomes of different management strategies across age groups: Methods and measures
UNIT V:	Management of the children/adult with Multiple Disabilities and other Hearing Related Disorders a) Management of children and adults with multiply disability: hearing aid fitting considerations, strategies used and the outcome with different strategies for individuals with hearing impairment with visual problems; cognitive problems; neuro-motor problems: educational and vocational placement, role of caregivers and outcome measures b) Audiological management of tinnitus: characteristics, assessment of tinnitus, basis and theories of tinnitus, models related to tinnitus management: patho-physiological and neurophysiological model: overview to non-audiological management techniques for tinnitus c) Audiological management techniques for those with normal hearing and different degrees of hearing loss (TRT, counselling, others) and their outcomes d) Audiological management of persons with hyperacusis: Models related to hyperacusis management; overview to non-audiological management techniques for hyperacusis Audiological management techniques for normal hearing and different degrees of hearing loss and their outcomes

Recommended Reading

- Estabrooks, W. (2006). Auditory Verbal Therapy & Practice. United States: Alexander Graham Bell Association for the Deaf and Hard of Hearing Inc.
- Hull, R. H. (2014). Introduction to aural rehabilitation. 2nd edn. San Diego: Plural publishing Inc.
- Tye-Murray, N. (2015). Foundations of aural rehabilitation-Children, Adults & Their family members. 4th Edn. United States of America: Stamford, Cengage Learning.
- Dillon, H. (2012). Hearing Aids. 2nd Edn. Australia: Boomerang Press.
- Tharpe, A.M and Seewald. R (2016). Comprehensive handbook of pediatric audiology. Plural publishing.
- Schaub, A. (2008). Digital hearing aids. New York: Thieme Medical publishers.

Other suggested reading

- Atcherson, S. R., Franklin, C. A., & Smith-Olinde, L. (2015). Hearing assistive and access technology. San Diego: Plural Publishing Inc.
- Martini, A., Mazzoli, M., Read, A., & Stephens, D. (2001). Definitions, Protocols and Guidelines in Genetic Hearing Impairment. England: Whurr Publishers Ltd.
- Metz, M. J. (2014). Sandlin's textbook of hearing aid amplification. 3rd Edn. San Diego: Plural publishing Inc.
- Mueller, H. G., Rickettes, T. A., & Bentler, R. (2014). Modern hearing aids: Pre-fitting Testing and selection considerations. San Diego: Plural Publishing Inc.
- Sandlin, R.E. (1995). Handbook of Hearing aid amplification – clinical consideration and fitting practices. London: Singular Publishing Group.
- Tyler, R.S., & Schum, J. (1995). Assistive devices for persons with hearing impairment. United States of America: Allyn & Baccon.
- Cole, E.B., & Carol, F. (2007). Children with hearing loss- Developing Listening & Talking. United States of America: Plural Publishing Inc.
- Baguley, D. M., & Andersson, G. (2007). Hyperacusis: Mechanisms, Diagnosis and Therapies. San Diego: Plural Publishing Inc.
- Hersh, M. A., & Johnson, M. A. (2003). Assistive Technology for the hearing-impaired, Deaf and Deaf-blind. Nottingham: Springer-Verlag London Ltd.
- Jastreboff, P.J., & Hazell, J.W.P. (2004). Tinnitus retraining therapy-implementing the Neurophysiological model. United Kingdom: Cambridge University Press.
- Johnson, C. E. (2012). Introduction to auditory rehabilitation: A contemporary issues approach. New Jersey: Pearson Education, Inc.
- Wong, L., & Hickson, L. (2012). Evidence-based practice in audiology: Evaluating interventions for children and adults with hearing impairment. San Diego: Plural Publishing Inc.

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
12	POA18CT205	Core Theory CT8	Genetics of Hearing & Paediatric Audiology	4	-	-	4	60/ 100
Learning Objectives				Learning outcomes				
The objective of the course is to provide knowledge on a) genetic basis for hearing loss b) various tests/procedures for identifying genes for hearing loss c) counseling strategies for genetic and non-genetic hearing loss d) planning and execution of screening programs to identify hearing loss using appropriate protocols, and e) Evaluation and management of hearing loss in children using appropriate tests/protocols				After completing this course, the student will be able to a) discuss the implication of identifying gene mutation for hearing loss c) counsel parents or caregivers of children on probability of occurrence of congenital hearing loss d) carry out screening programs to do primary and secondary prevention of hearing loss e) Introduce pediatric modification of protocols for diagnosis and management				

Unit	Syllabus
UNIT I:	Molecular Genetics for Audiologists a) Basic concepts of genetics b) Genes involved in hearing c) Gene localization methods, gene mapping
UNIT II:	Genetic hearing loss a) Genetics of hearing impairment, gene database for hearing loss b) Genetic evaluation of persons/families with hearing loss, genetic screening c) Genotypes and phenotypes of non syndromic hearing loss d) Genotypes and phenotypes of syndromic hearing loss e) Genetic Counselling

UNIT III:	Hearing Screening a) Neonatal and infant hearing screening, international and national Protocols to identify middle ear disorders; sensory and neural hearing loss b) Screening for hearing loss in school children c) Screening for central auditory processing disorders in school children d) Issues related to hearing screening
UNIT IV:	Pediatric Hearing Evaluation a) Etiology of hearing loss in children b) Behavioral tests of hearing evaluation for children c) Physiological tests of hearing evaluation for children d) Assessing hearing in children with associated problems e) Speech audiometry in children f) Development of tests for speech audiometry in children g) Issues related to assessment and diagnosis of hearing loss in children
UNIT V:	Team Approach in diagnosis of hearing loss in children a) Integration of results of behavioral and electrophysiological assessment of hearing b) Correlating results of audiological evaluation with those of otolaryngological, pediatric, psychological and speech-language evaluation c) Problems faced by children with different types and degrees of hearing loss including APD in preschool and school setup d) e) Counseling parents/caregivers regarding hearing impairment, sequel and management f) Counseling and management of children with unilateral hearing loss, ANSD and mild hearing loss

Recommended Reading

- Bess, F.H. & Gravel, J.S. (2006). Foundations of Pediatric Audiology. San Diego: Plural Publishing Inc
- Tharpe, A.M. & Seewald, R. (2016). Comprehensive Handbook of Pediatric Audiology. San Diego: Plural Publishing Inc
- Madell, Jane.R, Flexer, C. (2014). Pediatric audiology: Diagnosis, Technology and Management
- Fitzpatrick, E.M, Doucet, S.P. (2013). Pediatric Audiologic rehabilitation from infancy to adolescence

Other suggested reading

- Driscoll, C. & McPherson, B (2010). Newborn Screening Systems: The complete perspective. San Diego: Plural Publishing Inc
- Martini, A, et al. (1996) Genetics and Hearing impairment, London: Whurr Publishers.
- McCreery, R.W. & Walker, E.A. (2017). Pediatric Amplification: Enhancing Auditory Access. San Diego: Plural Publishing Inc
- 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.
- Willems P J. (2004). Genetic Hearing loss. USA: Marcel Deckeer Inc.
- Toriello H V., & Smith S D. (2013). Hereditary Hearing Loss and Its Syndromes. United Kingdom: Oxford University Press.
- Flexer C A (2008). Pediatric Audiology: Diagnosis, Technology, and Management. New York: Thieme Medical Publishers.

Course Title: Clinicals in Audiology -2

Marks: 100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
13	POA18CR206	Clinical Rotation CR2	Clinicals in Audiology -2	-	5		5	225/ 100

Course Title: Research Seminar - 2

Marks:100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
14	POA18RP207	Research Project RP2	Research Seminar- 2	-	-	2	2	60/ 100
Learning objectives				Learning outcomes				
The objectives of the course in conjunction with the course on research methods, epidemiology and statistics are to: a) become familiar with components of a research proposal b) understand details of scientific writing				At the end of the course the student will be able a) write a research proposal in the prescribed format b) submit research proposal to the IEC for approval				

Course Plan

1. Develop a hypothesis or a research question in an identified area of research
2. Write a research proposal and submit to your advisor
3. Make a presentation of the research proposal in the department
4. Submit the research proposal with necessary documentation to the Institutional Ethics Committee for approval; obtain approval from the IEC.

The above course plan will be transacted by students individually with their research advisors. The internal assessment for the course will be conducted by the advisor based on the written research proposal, presentation of the research proposal and submission to the IEC.

Semester III

Content

Course title: **Implant Audiology**

Marks – 100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
15	POA18CT301	Core Theory CT9	Implant Audiology	4	-	-	4	60/ 100

Learning Objectives	Learning outcomes
<p>The objective of the course is to provide knowledge on</p> <ul style="list-style-type: none"> a) Various types and components of implantable hearing devices b) Candidacy for implantable hearing devices c) Audiological Procedures for measuring benefits d) Relevant Government policies and schemes 	<p>At the end of the course, the student should be able to</p> <ul style="list-style-type: none"> a) identify and discuss the types of implantable hearing devices, b) discuss 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, and e) contribute to formulation of Government policies and schemes relating to implantable hearing devices

Unit	Syllabus
UNIT I:	<p>Development of Technology, Criteria/ Candidacy and Program</p> <ul style="list-style-type: none"> a) Candidacy for bone conduction implantable devices (BCID), middle ear implants (MEI), cochlear implant (CI), auditory brainstem implant (ABI) and mid brain implant (MBI): evidence from research b) Comprehensive Candidacy Assessment for implantable hearing devices (IHD - Audiological and non-audiological). c) Safety standards and regulation for IHD. d) State and central Government schemes for cochlear implants and other implantable devices. e) Pre-requisite to start a IHD program f) Comprehensive policy issues relating to IHD

UNIT II:	Bone Conduction Implantable Devices and Middle Ear Implants a) Types of BCID and components (per-cutaneous, trans-cutaneous and intra-oral) b) Types of MEI and components c) Intra-operative and post-operative measurements/assessment for device function (troubleshooting) and performance outcomes d) Programming BCID and MEI e) Contra indications and management of device failures and poor performance. f) Limitations and future development/requirement
UNIT III:	Cochlear Implants a) Concepts and types of CI: external components (sound processor- body worn, BTE, off the ear); internal component (electrode type/design, MRI compatibility & reliability); totally implantable cochlear implants. b) Expanding criteria- 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. c) Speech/Sound Coding Strategies: Within and across devices; Evidences from research and critical analysis of each strategy; Features for Enhancing Speech and Music perception. d) Surgical procedures: posterior tympanotomy, varia technique, hearing preservation technique; surgical complications and management e) Intra-operative measurement: device function (impedance/ voltage/ complainece telemetry); patient function (eCAP, eSRT, eABR and facial nerve monitoring); Special consideration in anomalous cochlear/nerve, ANSD and multiple disabilities.
UNIT IV:	Programming Cochlear Implants a) Psychophysics of programming a: parameters (pulse width, rate of stimulation, frequency allocation/ re-allocation, map law);pre-requisites for mapping: pre-implant radiological report, post-implant radiological report; discharge report of surgeon; 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 perception of loudness, pitch perception, gap, b) Programming technique: evidences from research: behavioral maps; objective maps (eCAP, eSRT & eABR based programming); evidence and target based programming (artificial intelligence); self-programming. 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, magnet migration, electrode extrusion; identifying and managing poor performance; decision making in subjects with poor performance; special consideration in revision implantation; outcome audit. e) Limitations and future developments/requirements (device, techniques and procedures)
UNIT V:	ABI and MBI a) Pre-op (ABI and MBI): candidacy for children and adult; audiological and non-audiological assessment; evidences from research for predicting outcome; counseling and expectations; device type and components b) Intra-op (ABI and MBI): Surgical procedures – overview; eABR, eCAP; cranial nerve monitoring; decision making. 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; role of

	<p>eABR, aided cortical potentials, PET and fNIRS in programming and monitoring outcomes.</p> <p>d) Managing and monitoring subject with ABI: rehabilitation strategy; identifying and managing complications (device failure, infection, trauma, device migration, radio imaging); identify poor performance- auditing outcome; decision making in complications and poor performance</p>
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Recommended Reading

- Kompis, M., & Caversaccio, M.D. (Eds.). (2011). Implantable Bone Conduction Hearing Aids. (New Delhi) Switzerland: Karger.
- Lim, H. H., Lenarz, M., & Lenarz, T., (2009). Auditory midbrain implant: A review. Trends in Amplification, Sept. 13(3), 149–180.
- Niparko, J. K. (2009). Cochlear Implants: Principles and practices. 2nd Edn. Philadelphia: Lippincott: Williams & Wilkins

Other suggested reading

- Boheim, K. (2010). Active middle ear implants. Basel: Karger.
- Clark, G., (2003). Cochlear implants - fundamentals & Applications. New York: Springer – AIP Press.
- Cooper, H. (1995). Cochlear Implants –A practical guide. Delhi: AITBS Publishers.
- Hughes, M. L. (2013). Objective measures in cochlear implants. San Diego: Plural Publishing Inc.
- Kirwin, S.H. (2014). Cochlear Implants: Technological advances, psychological/social impacts and long-term effectiveness. Ney York: Nova Biomedical.
- Manenkar, G. (2014). Implantable hearing devices other than cochlear implants. New D Suzuki, J.I, Tokyo (1988). Advances in audiology-Middle ear implant: Implantable hearing aids. Switzerland: Karger. Delhi: Springer-Verlag.
- Wolfe, J., & Schafer, E. C. (2010). Programming Cochlear Implants. San Diego: Plural Publishing Inc.

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
16	POA18CT302	Core Theory CT10	Speech Perception	4	-	-	4	60/100
Learning Objectives				Learning outcomes				
The objective of the course is to provide knowledge on <ul style="list-style-type: none"> a) Speech coding in different levels of auditory pathway b) theories of speech perception and methods for speech synthesis c) effect of short term memory on speech perception d) dichotic speech perception 				At the end of the course, the student should be able to <ul style="list-style-type: none"> a) discuss coding of speech in the auditory pathway in normal hearing and hearing impaired individuals, b) critically evaluate theories of speech perception and methods to synthesis speech, c) apply the differences in the vowel and consonant perception in individual with normal hearing and hearing impairment, d) discuss various factors affecting speech perception. 				

Unit	Syllabus
UNIT I:	Theories of Speech Perception <ul style="list-style-type: none"> 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 b) Normalization in speech perception: Definition and methods used for normalization of vowels and consonants c) Coding of speech in the auditory pathway - cochlea, auditory nerve and the central auditory pathway d) Theories of speech perception (acoustic, neurological, auditory, motor, analysis-by-synthesis, dual stream, reverse hierarchy theory)

UNIT II:	Perceptual Cues for Vowels and Consonants a) Perception of vowels and diphthongs in normal hearing listeners - major and minor cues b) Perception of consonants in normal hearing listeners : Major and minor cues to identify place, manner and voicing features of stops, fricatives, affricates, nasals c) Perception of vowels and consonants in the persons with hearing impairment d) Perception of vowels and consonants through amplification and implantable devices.
UNIT III:	Speech Perception of Segmental and Suprasegmental Features a) Effects of co-articulation on speech perception b) Perception of segmental features in normal hearing individuals c) Perception of suprasegmental cues in normal hearing individuals d) Perception of segmental and suprasegmental cues in persons with hearing impairment
UNIT IV:	Factors related to Speech Perception a) 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 b) Dichotic listening: Theories and physiological bases: Testing of dichotic listening and the clinical significance of the results; Factors influencing dichotic perception c) Music perception: Methods of study of perception of music; Perception of music through amplification and implantable devices.
UNIT V:	General issues related to speech perception a) 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 b) 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 study of speech perception in animals c) Methods to study speech perception: EEG/electrophysiological and behavioral methods to study speech perception; study designs; role of cognition in speech perception.

Recommended Reading

- Raphael, L. J., Borden, G. J., & Harris K. S. (2011). Speech Science Primer: Physiology, Acoustics, and Perception of Speech (Sixth edition). Baltimore, MD: LWW.
- Pisoni, D. B., & Remez, R. E. (Eds.). (2005). The Handbook of Speech Perception. Blackwell Publishing Ltd
- Pickett, J. M. (1998). The Acoustics of Speech Communication: Fundamentals, Speech Perception Theory, and Technology (1 edition). Boston: Pearson
- Niparko, J. K. (2009). Cochlear Implants: Principles and practices. 2nd Edn. Philadelphia: Lippincott: Williams & Wilkins

Other suggested reading

- Greenberg, S., Ainsworth, W. A., & Fay, R. R. (Eds.).(2004). Speech Processing in the Auditory System. New York: Springer.
- Mildner, V. (2007).The Cognitive Neuroscience of Human Communication (1 edition). New York: Psychology Press.
- Studdert-Kennedy, M., & Mattingly, I. G. (Eds.). (1990). Modularity and the Motor theory of Speech Perception: Proceedings of A Conference To Honor Alvin M. Liberman (1 edition). Hillsdale, N.J: Psychology Press.
- Tatham, M., & Morton, K. (2011).A Guide to Speech Production and Perception (1 edition). Edinburgh: Edinburgh University Press

Course title: Auditory Processing Disorders

Marks – 100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
17	POA18CT303	Core Theory CT11	Auditory Processing Disorders	4	-	-	4	60/ 100
Learning Objectives			Learning outcomes					
The objective of the course is to provide knowledge on: a) Physiological bases of auditory processing disorders (APD's) and to differentiate it from other disorders b) Test procedures and interpretation of findings c) Factors affecting assessment of APD d) Aids and appliances in management of APD e) Team work in management of APD			At the end of the course the student will be able to a) diagnose and differentially diagnose auditory processing disorders (APDs) and explain their physiological bases, b) administer different tests for diagnosis and interpret the findings including correlation with findings from imaging and cognitive studies, c) advise clinical clientele on management of APDS including guidance on aids and appliances, and e) advise and liaise with members of the management team like neurologists, neurosurgeons on the diagnosis as well as management of APDs.					

Unit	Syllabus
UNIT I:	Introduction to Auditory Processing Disorders (APDs) <ol style="list-style-type: none"> Terminologies and definitions of APD Underlying neurobiological and neuro-chemical (genetic) correlates Relationship between neural maturation - degeneration and auditory processing Models to explain auditory and spoken language processing: Relationship between the two Methods of studying auditory processing - Animal studies Various disorders that lead to APDs (Syndromes, TBI etc): Signs, symptoms and classification Developmental communication disorders and APDs
UNIT II:	Assessment of APDs (Behavioral) <ol style="list-style-type: none"> Overview of behavioral assessment in APDs Screening for APDs: questionnaires, checklists and tests Dichotic test (linguistic and non-linguistic) Monaural tests (linguistic and non-linguistic) Psychoacoustic tests for assessment of APDs Development of APD test materials (linguistic and non-linguistic)
UNIT III:	Assessment of APDs (Electrophysiological) <ol style="list-style-type: none"> Electrophysiological measures and their clinical applications in diagnosing APDs <ol style="list-style-type: none"> Endogenous potentials Exogenous potentials Correlation between behavioral and electrophysiological measures: implications for diagnosis Factors influencing assessment of APDs: behavioral and electrophysiological
UNIT IV:	Management of APDs <ol style="list-style-type: none"> Management of APDs in children and adults Direct remediation techniques and meta-cognitive and meta-linguistic approaches Auditory perceptual training and its methods, applicability and outcome. Evidence based approach and treatment efficacy Multidisciplinary approach Signal enhancement and room acoustics Aids and appliances - indication and outcome Factors affecting management of APDs
UNIT V:	Interdisciplinary approach in the diagnosis and management of APDs <ol style="list-style-type: none"> Electrophysiological and radiological correlates for APDs: implications in management Imaging and cognitive studies in APDs Diagnosis and differential diagnosis Open source software for developing diagnostic tests and intervention modules Role of Team members in diagnosis and management

Recommended Reading

- Katz J., Chasin M., & English, K. (2014). Handbook of Clinical Audiology. 7th Edn. Philadelphia: Lippincott, Williams & Wilkins.
- Musiek, F. E., & Chermak, G. D. (2014). Handbook Of Central Auditory Processing Disorder: Auditory Neuroscience And Diagnosis. 2nd Edn, Vol: 1. San Diego: Plural Publishing Group Inc.
- Chermak, G. D., & Musiek, F. E. (2006). Handbook of (Central) Auditory Processing Disorders – Comprehensive Intervention. Vol. II. San Diego: Singular Publishing Group Inc.

- Chermak, G. D., & Musiek, F. E. (2002). Auditory Training: Principles and Approaches for Remediating and Managing Auditory Processing Disorders. *Seminars In Hearing*, 23(4), 297-308.
- Musiek, F. E., Baran, J. A., Shinn, J. B., & Jones, R. O. (2012). *Disorders of the Auditory System*. San Diego: Plural Publishing Inc.
- Jacobson, G.P & Shepherd, N.T.(2006). *Handbook of (central) auditory processing disorders- Comprehensive intervention*.

Other suggested reading

- American Speech-Language-Hearing Association. (2005). (Central) auditory processing disorder (technical report) Retrieved from <http://www.asha.org/members/desref-journals/deskref/default..>
- Geffner, D., & Ross-Swain, D. (2013). *Auditory Processing Disorders: Assessment, Management, and Treatment*. 2nd Edn. San Diego, Plural Publishing Inc.

Course title: Vestibular Systems and its Disorders

Marks – 100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
18	POA18CT304	Core Theory CT12	Vestibular system and its Disorders	4	-	-	4	60/100
Learning Objectives				Learning outcomes				
The objective of the course is to provide knowledge on a) Anatomy and physiology of vestibular system b) Characteristics of vestibular disorders c) Evaluation of vestibular system d) Management option and counseling for vestibular disorders				After completing this course, the student should be able to a) discuss the functioning of the balance and vestibular system b) explain the disorders of the vestibular system c) assess vestibular system using appropriate tests/protocols d) recommend appropriate management option for persons with vestibular dysfunction e) counsel and guide the clinical clientele with vestibular disorders				

Unit	Syllabus
UNIT I:	Anatomy and Physiology of the Vestibular System) a) Peripheral vestibular system including semicircular canals, utricle, saccule and vestibular nerve b) Central vestibular pathway (brainstem, cerebellum, cortex) c) Reflexes involving vestibular system like vestibulo-ocular reflex, vestibulo spinal reflex and vestibulo- colic reflex d) Other systems involved in maintenance of balance like proprioceptive system, visual system etc.
UNIT II:	Assessment of the Vestibular System a) Techniques and Principles of electronystagmography / videonystagmography, Rotatory chair test, Video Head Impulse test, Sclera Coil search test, Vestibular Evoked Myogenic Potentials: cVEMP, oVEMP, Dynamic Posturography, Craniocorpography, Subjective visual vertical horizontal tests, Vestibular autorotation tests b) Screening for vestibular disorders c) Questionnaires to assess quality of life in persons with vertigo
UNIT III:	Pathophysiology of Vestibular Disorders a) Peripheral Vestibular Disorders like Benign paroxysmal positional vertigo, Meniere's disease, Vestibular neuritis, Labyrinthitis, Ototoxicity, vestibular neuropathy b) Perilymph fistula, Superior semicircular canal dehiscence, Auditory neuropathy spectrum disorders, Vestibular schwannomas c) Central Vestibular disorders like Generalized neuropathy involving multiple systems, Multiple sclerosis, Cranial tumors, Cerebro-vascular accidents involving vestibular cortex and cerebellum, Vertebro-basilar insufficiency, Migraine, Meningitis and encephalitis d) Vestibular disorders in children e) Age related changes in vestibular system
UNIT IV:	Profiling Vestibular Disorders using Audio Vestibular Test Battery a) Benign paroxysmal positional vertigo, Meniere's disease, Vestibular neuritis, Labyrinthitis, Ototoxicity, Perilymph fistula, Superior semicircular canal dehiscence, Auditory neuropathy spectrum disorders, Vestibular schwannomas, Multiple sclerosis, Cranial tumors, , vestibular neuropathy b) Quality of life in persons with vestibular disorders
UNIT V:	Management of Persons with Vestibular Disorders a) Medical management b) Surgical management c) Vestibular rehabilitation: i. Repositioning Maneuvers ii. Adaptation Exercises iii. Habituation Exercises iv. Imbalance Exercises d) Special considerations for rehabilitation of children with vestibular problems e) Vestibular implants

Recommended Reading

- Biswas, A. (2009). Clinical audio-vestibulometry for otologists and neurologists. 4th Ed. Mumbai, India: Bhalani Publishing House.
- Jacobson, G. P., & Shepard, N. T. (2014). Balance function assessment and management. San Diego: CA: Plural Publishing Inc.

Other suggested reading

- Ackley, R. S., Decker, T. N., & Limb, C. J. (2007). An essential guide to hearing and balance disorders. New Jersey: Lawrence Erlbaum Associates Inc.
- Desmond, A. L. (2004). Vestibular function: evaluation and treatment. New York: Thieme Medical Publishers Inc.
- Hughes, G. B., & Pensak, M. L. (2007). Clinical Otology. New York: Thieme Publishers, Inc.
- Jackler, R. K., & Brackmann, D. E. (2005). Neurotology. 2nd Ed. Philadelphia: Elsevier Mosby.
- Kaga, K. (2014). Vertigo and balance disorders in children. Tokyo, Japan: Springer.
- McCaslin, D. L. (2013). Electronystagmography and videonystagmography ENG / VNG. San Diego: Plural Publishing Inc.
- Murofushi, T., & Kaga, K. (2009). Vestibular evoked myogenic potential- its basics and clinical applications. Tokyo, Japan: Springer.
- Myers, B.L. (2011). Vestibular Learning Manual. San Diego: Plural Publishing Inc.
- O'Reille, R.C., Morlet, T & Kushing, S.L (2013). Manual of pediatric balance disorders. San Diego: Plural Publishing Inc.
- Ruckienstien, M & Davis, S. (2014). Rapid interpretation of balance function tests. San Diego: Plural Publishing Inc.
- Shepard, N. T., & Telian, S. A. (1997). Practical management of the balance disorders patient. New York: Thomson Delmar Learning.

Course Title: Clinicals in Audiology -3

Marks: 100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
19	POA18CR305	Clinical Rotation CR3	Clinicals in Audiology - 3	-	5		5	225/ 100

Note: Clinical practicum for CR-3 will be based on the sub-specialty clinics attended the students. The practicum is listed at the end of the syllabus.

Course Title: Research Practicum

Marks:100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
20	POA18RP306	Research Project RP3	Research Practicum	-	-	4	4	120/ 100
Learning Objectives				Learning outcomes				
<p>The objectives of the course in conjunction with the course on research methods, epidemiology and statistics are to:</p> <ul style="list-style-type: none"> a) become familiar with procedures in data collection and organization of data b) learn about components of writing a dissertation 				<p>At the end of the course the student will be able:</p> <ul style="list-style-type: none"> a) demonstrate progress in relevant sections of the research study depending on the individual requirements of the study. 				

Course Plan

1. Complete the literature search related to the research question
2. Undertake pilot study and interim analysis if required
3. Begin data collection as required by the research study
4. Demonstrate progress in dissertation as written report and submit for evaluation

Semester IV Content

Course title: Audiology in Practice

Marks – 100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
21	POA18CT401	Core Theory CT13	Audiology in practice	4	-	-	4	60/ 100

Learning Objectives	Learning outcomes
<p>The objective of the course is to provide knowledge on</p> <ul style="list-style-type: none"> a) Different setup for audiology practice and team work b) Scope of practice, legal and ethical issues for audiologists c) Government acts, legislation and policies related to hearing disability 	<p>At the end of the course, the students should be able to</p> <ul style="list-style-type: none"> a) define the role of an audiologist in different set-ups. b) Liaise with other professionals in setting-up an audiology clinic. c) audit audiology practices in existing set-ups. d) discuss Governments and other agencies on the formulation of policies and legislative acts relating to hearing disability e) discuss the legal implications of practice in audiology.

Unit	Syllabus
UNIT I:	<p>Scope of Practice, Laws, Regulations and Professional Ethics</p> <ul style="list-style-type: none"> a) Scope of practice in global and Indian scenario b) Professional ethics c) Existing acts, legislations, policies related to persons with communication impairment d) Role of audiologist in the formulation of acts, regulations and policies e) Implementation of acts, legislations, policies and welfare measures relating to persons with hearing impairment f) Advocacy groups, NGO's and rights of citizens g) National and international standards related to audiology

UNIT II:	Specialized Programs in Audiology a) Need for specialized programs in audiology: Geriatric and persons with multiple disability b) Forensic audiology d) Health, wellness, and health care - Health promotion and disease prevention, quality of life and healthcare finances e) Disability-friendly environment including public education f) Prevention and early identification programs including societal participation
UNIT III:	Service Delivery Models in Audiology a) Services in different medical / rehabilitation/ research /educational set ups b) School based services pertaining to regular and special schools c) Community based practice in rural and urban areas d) Family empowerment programs e) Home based delivery of services f) Autonomous practice in audiology g) Apps for screening/assessment and management
UNIT IV:	Tele-practice in Audiology a) Information and communication technology in Audiology practice b) Infrastructure for video-conferencing and tele-practice in audiology c) Techniques/principles of remote testing for screening and diagnostic assessment for hearing, intervention and counseling d) Challenges and limitations of tele-practice in audiology in screening, assessment and evaluation, selection of aids and appliances, therapeutics and counseling.
UNIT V:	Issues in Audiology Practice a) Entrepreneurship and planning to set up private practice/clinic for audiology practice: Clinical ethics b) Documentation in audiology practice: clinical / demographic data, database management and storage c) ICF framework for documentation / reports d) Quality control and auditing in audiology practice e) Documenting and implementing evidence based practice in audiology f) Understanding team approach: Work in cohesion with other professionals g) Information resources in audiology including books and journals, both electronic and print - Databases

Recommended Reading

- Taylor, B. (2015). Marketing in an Audiology practice. San Diego: CA: Plural Publishing Inc.
 - Ramachandran,V & Stach, B.A. (2013). Professional Communication Audiology. San Diego: Plural Publishing Inc
 - www.rehabcouncil.nic.in (website of Rehabilitation Council of India)
 - www.disabilityaffairs.gov.in (website of Department of Empowerment with Disabilities)
 - Acts relating to disability, particularly hearing, enacted by the Indian Parliament
 - Rushbrooks, E & Houston, K.T. (2015). Telepractice in Audiology. San Diego: Plural Publishing
- Other suggested reading**
- College of Audiologists and Speech-Language Pathologists of Ontario. (2004). Use of Telepractice Approaches in Providing Services to Patients/Clients.
 - Dobie, R.A (2015). Medico legal evaluation of hearing loss. San Diego: Plural Publishing Inc
 - Dunn, H.H., Roeser, R.J., & Valente, M. (2000). Audiology- practice management. New York: Thieme Medical Publishers Inc.

- King, P.F. et al., (1993). Assessment of hearing disability- guidelines for medico-legal practice, London: Whurr Publishers.
- Resource Guide for Educational/Pediatric Audiologists. Retrieved from <http://www.asha.org/aud/pediatric-ed>
- Rizzo, S.R., & Trudeau, M.D. (1994). Clinical administration in audiology and speech language pathology. San Diego: Singular Publishing Group Inc.
- Stephen, R.R., Jr., Trudeau, D.M. (Eds.) (1994). Clinical administration in audiology & speech language pathology. San Diego: Singular Publishing Group Inc.

Course title: Seminars in practices related to medical audiology

Marks :100

Course Number	Course Code	Course category	Course Title	Lecture (L)	Clinical Training (CT)	Research Project (RP)/ Dissertation	Total Credits	Total Hours/Marks
22	POA18CT402	Core Theory CT14	Seminars in practices related to Medical Audiology	4	-	-	4	60/100

Learning Objectives	Learning outcomes
<p>The objective of the course is to provide knowledge on:</p> <p>a) basic competencies in hospital inpatient procedures such as referrals and ward visits</p> <p>b) documentation of assessment and management</p> <p>c) Infection control protocols</p> <p>d) medical priorities needed in emergency situations</p>	<p>After completing this course, the student will be able to:</p> <p>a) Familiarize with procedures related to inpatient protocols</p> <p>b) Document the findings, opinion and record the outcome measures.</p> <p>c) Follow precautions and prevent infection to patient and self</p>

Course plan

- 1) Infection control/management – caution on type of dress, washing hands and use of disinfectants
- 2) Basic life support including seizures- Prevention of seizure triggers and providing first aid
- 3) Issues related to sedation of infants- Contraindication and need; intra-venous sedation
- 4) Medical assessment of middle ear disorders and its implication
- 5) Medico-legal issues.

Course Number	Course Code	Course category	Course Title	Lecture (L)	Tutorial (T)/Clinical Training (CT)	Research Project/ Dissertation	Total Credits	Total Hours/Marks
23	POA18CR403	Clinical Rotation CR4	Clinicals in Audiology - 4	-	5		5	225/50

Criteria for clinicals CR 1 and CR 2

- 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-how

- Make appropriate changes in OAE protocols depending on the clinical / research needs
- Develop protocol for recording exogenous and endogenous auditory evoked potentials
- Integrate the results of audiological evaluation and correlate it to the possible pathophysiological/radiological findings
- Apply the latest technological advances available for persons with hearing impairment.
- Make appropriate modifications in hearing devices depending on the listening needs.
- Recommend appropriate aural rehabilitation program for persons with hearing impairment

Demonstrate

- Recording of exogenous and endogenous potentials
- Generation of stimuli for recording AEPs
- Analyze auditory evoked potential waveforms
- Electroacoustic measurement of different types of hearing aids
- Carry out ear mold modifications

Do

- Record OAEs, ABR for different stimuli and cortical auditory potentials on 5 persons with hearing loss
- Complete audiological evaluation on 5 persons with hearing loss and prepare a detailed report with appropriate recommendations
- Select and fit appropriate hearing devices to 10 individuals with different degree, configuration and type of hearing loss.
- Plan and carry out appropriate aural rehabilitation program for five children
- Evaluate and counsel/carry out appropriate audiological management for 5 persons with tinnitus.
- Carry out aided AEPs

Clinicals for CR3 and CR 4

Know-how

- Identify, manage and counsel persons with genetic hearing loss
- Choose/modify appropriate tests/protocols for evaluating children and multiply disabled
- Choose appropriate tests/protocols for evaluation and management of persons with giddiness
- Develop language / culture sensitive APD tests
- Advise clinical clientele on the latest implantable devices available for persons with hearing impairment.
- Set up audiology clinics / centers in different set ups
- Procedure for certification of persons with disability
- Financial planning and insurance policies

Demonstrate

- Administration of different tests for APD
- Plan management for 5 persons with APD/at risk for APD
- Administration of different tests for vestibular assessment
- Troubleshoot cochlear implants

Do

- Administer complete audiological test battery, behavioural and electrophysiological tests on 10 children with hearing loss and prepare a report explaining the results of the test and make appropriate recommendations
- Administer APD test battery on 5 persons with APD symptoms and prepare a report
- Administer complete vestibular test battery on 5 persons with giddiness
- Carry out preimplant counselling for 5 persons with hearing loss
- Carry out mapping for 5 persons using cochlear implants
- Counsel 5 persons regarding use and maintenance of cochlear implants

Course title: Dissertation

Course Number	Course Code	Course Title	L	T	P	C	Total Hours
24	POA18RP404	Dissertation	-	-	8	8	240
Learning Objectives			Learning outcomes				
The objectives of the course in conjunction with the course on research methods, epidemiology and statistics are to: <ol style="list-style-type: none"> Learn about statistical analysis of data Learn about components of a dissertation including results and discussion and summary/conclusion 			At the end of the course the student will be able <ol style="list-style-type: none"> Select and apply statistical analyses as required for the research study Write a dissertation in the prescribed format 				

Course Plan

- Complete the data collection,
- Data analysis and interpretation
- Complete writing the dissertation in the prescribed format.
- Make a presentation in the department
- Prepare manuscript for publication and submit for approval of the publication oversight committee