MANIPAL
ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

Manipal College of Health Professions

(Mangaluru Campus)

Manipal Academy of Higher Education, Manipal

Outcome-Based Education (OBE) Framework

Two Years Full Time

Postgraduate Program

(Semester and Credit System)

Master of Science in Audiology

M.Sc. (Aud)

With effect from July 2021

C O N T E N T P A G E

Head of the Department **Dean**

Deputy Registrar - Academics **Registrar**

1. NATURE AND EXTENT OF THE PROGRAM

Audiology is a branch of science that deals with the normal and abnormal aspects of hearing, balance, and related disorders. Students of Masters in Audiology are trained to function as teachers and researchers in institutions of higher education, clinicians to diagnose and manage disorders of hearing and balance across life span, counsel and guide persons with disorders of hearing and balance as well as their family members, implement rehabilitation programs for persons with hearing and balance disorders, to 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 and balance disorders, advise government and other institutions on legal and policy issues related to persons with auditory disorders, and to establish and administer institutions of higher learning.

Program duration and aim of the program: The course-Masters in Audiology (MSc. AUD), is a full-time two year course and should be completed within four years from the date of admission. The Department, in its academic planning has kept excellent balance between theoretical, clinical and research orientated training in order to develop professional judgement and scientific competence for the trained Audiologists. The Postgraduate program in Audiology aims to impart advanced knowledge and skills as applicable to the profession of Audiology. The program is designed to develop manpower to contribute to theoretical, clinical, research, field-based and technology based knowledge to the discipline of Audiology. The program focuses on differential diagnosis and management of hearing, balance, and related disorders and conduct research to further the profession in the country and abroad.

Entry level qualification and scope of the program (career opportunities): Candidates applying for admission to MSc. AUD course should have B.ASLP or B.Sc (Speech & Hearing) degree with a minimum of 55% aggregate marks from any recognised university accredited by the Rehabilitation Council of India. Relaxation in the qualifying marks for designated categories of students shall be as per rules and regulations of respective University / State / Union Territories or the Central Government. An online entrance examination based on the B.Sc. (Sp. & Hg.) / B.ASLP syllabus will be conducted by the Manipal Academy of Higher Education for

the selection of candidates. Admission will be made only on the basis of merit of the entrance examination conducted by the university for this purpose. MAHE admits candidates under General or Foreign / NRI category, on fulfilling the eligibility requirements. All admissions are on the basis of merit only. Foreign / NRI category seats are only available for foreign nationals / candidates with NRI status or those sponsored by relatives with NRI status. Foreign / NRI category seats are **NOT** equivalent to payment / management / reserved seats.

Medium of Instruction: Medium of Instruction shall be in English

2. PROGRAM EDUCATION OBJECTIVES (PEOs)

The overall objective of the learning outcome-based curriculum framework (LOCF) for M.Sc Audiology are as follows:

PEO No.	Description
PEO 1	Students will be able to use their fundamental knowledge and clinical competence in various scientific aspects of hearing, balance, and related disorders on the basis of anatomical and physiological, cognitive, psychological, and sociological dimensions. Further, they would be capable of functioning as members of the disability certification team.
PEO 2	Students will demonstrate strong and well defined clinical / practical skills in to plan, implement, and modify clinical services across a wide range of population including individuals from culturally and linguistically diverse groups.
PEO 3	Students will be able to practice the profession with highly professional and ethical attitude, strong communication skills, and to work in an inter-disciplinary team so as to adopt an interprofessional perspective in evaluation and treatment of hearing, balance, and related disorders across the lifespan. In addition, they would be capable of participating and contributing to government and other institutions on legal and policy issues related to persons with auditory and vestibular disorders.
PEO 4	Students will be able to use interpersonal and collaborative skills to identify, assess and formulate problems and execute appropriate solutions over the span of hearing, balance, and related disorders. They would also be empowered to implement prevention and address public education programs.
PEO 5	Students will be able to imbibe the culture of research, innovation, entrepreneurship and incubation through evidence-based practice in hearing, balance, and related disorders. They would be prepared to participate & contribute to establishing and administering institutions of higher learning.
PEO 6	Students will be able to participate in lifelong learning process for a highly productive career and will be able to relate the concepts of trends and issues in the discipline of audiology. They would, in addition undertake advocacy measures on behalf of and for persons with hearing and balance disorders.

3. GRADUATE ATTRIBUTES

S No.	Attribute	Description
1	**Domain Knowledge**	Demonstrate comprehensive knowledge, competency and understanding of one or more disciplines that form a part of a professional domain
2	**Clinical / Hands-on skills**	Demonstrate clinical / hands-on skills in order to deliver and manage quality health care services
3	**Communication Skills**	Demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups using appropriate media.
4	**Team work**	Demonstrate the ability to effectively and efficiently work and collaborate with diverse teams in the best interest of health care needs of the community
5.	**Professional ethics**	Demonstrate the ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in professional life.
6.	**Research / Innovation-related Skills**	A sense of inquiry and investigation for raising relevant and contemporary questions, synthesizing and articulating.
7.	**Critical thinking and problem solving**	Demonstrate capacity to think critically and extrapolate from what one has learned by applying their competencies and knowledge to solve different kinds of non-familiar problems in real life situations.
8	**Information/Digital Literacy**	Demonstrate capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant

S No.	Attribute	Description
		information sources and to use appropriate software for analysis of data.
9	**Multicultural Competence**	Demonstrate knowledge of the values and beliefs of multiple cultures and a global perspective, effectively engage in a multicultural society, and interact respectfully with diverse groups.
11.	**Leadership qualities**	Demonstrate leadership capability to formulate an inspiring vision, build a team, motivate and inspire team members to attain organizational vision
12.	**Lifelong Learning**	Demonstrate the ability to acquire knowledge and skills that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to demands of work place through knowledge/skill development/reskilling.

4. QUALIFICATION DESCRIPTORS:

a) Demonstrate (i) a systematic, extensive and coherent knowledge and understanding of an academic field of study as a whole and its applications, and links to related disciplinary areas/subjects of study, including a critical understanding of the established theories, principles and concepts, and of a number of advanced and emerging issues/theories in the field of M.Sc Audiology; (ii) procedural knowledge that creates different types of professionals related to the disciplinary/subject area of study, including research and development, teaching and government and public service; (iii) skills in areas related to one's specialization and current developments in the academic field of M.Sc Audiology, including a critical understanding of the latest developments in the area of specialization, and an ability to use established techniques of analysis and enquiry within the area of specialization (M.Sc Audiology).

b) Demonstrate comprehensive knowledge about materials and methods, including professional literature relating to essential and advanced learning areas pertaining to the chosen disciplinary area(s) and field of study, and techniques and skills required for identifying/solving problems and issues relating to the disciplinary area and field of study.

c) Demonstrate skills in identifying information needs, collection of relevant quantitative and/or qualitative data drawing on a wide range of sources, analysis and interpretation of data using methodologies as appropriate to the subject(s) for formulating evidence-based solutions and arguments.

d) Use knowledge, understanding and skills for critical assessment of a wide range of ideas and complex problems and issues relating to the field

e) Communicate appropriately with all stakeholders, and provide relevant information to the members of the healthcare team

f) Address one's own learning needs relating to current and emerging areas of study, making use of research, development and professional materials as appropriate, including those related to new frontiers of knowledge

g) Apply one's domain knowledge and transferable skills that are relevant to some of the job trades, employment opportunities and seek solutions to real-life problems.

5. PROGRAM OUTCOMES (POs):

After successful completion of M.Sc Audiology program, students will be able to:

PO No.	Attribute	Competency
PO 1	**Domain knowledge**	Possess and acquire **scientific knowledge** to work as a health care professional
PO 2	**Clinical/ Hands-on skills**	Demonstrate and possess **clinical and hands-on skills** to provide quality health care services
PO 3	**Team work**	Demonstrate **team work skills** to support shared goals with the interdisciplinary health care team to improve societal health
PO 4	**Ethical value & professionalism**	Possess and demonstrate **ethical values and professionalism** within the legal framework of the society
PO 5	**Communication**	**Communicate effectively** and appropriately with the interdisciplinary health care team and the society
PO 6	**Evidence based practice**	Demonstrate high quality **evidence based practice** that leads to excellence in professional practice
PO 7	**Life-long learning**	Enhance knowledge and skills with the use of advancing technology for the **continual improvement** of professional practice
PO 8	**Entrepreneurship, leadership and mentorship**	Display **entrepreneurship, leadership and mentorship** skills to practice independently as well as in collaboration with the interdisciplinary health care team

6. COURSE STRUCTURE, COURSE WISE LEARNING OBJECTIVE, AND COURSE OUTCOMES (COs)

SEMESTER - I

Course Code	Course Title	Credit Distribution (hours/week)				Marks Distribution		
		S	SL	CL	CR	IAC	ESE	Total
ABS6101	Advanced Biostatistics & Research Methodology	3	1	-	4	30	70	100
AUD6101	Technology in Audiology	3	1	-	4	20	80	100
AUD6102	Cochlear physiology	3	1	-	4	20	80	100
AUD6103	Neurophysiology of Hearing	3	1	-	4	20	80	100
AUD6104	Hearing Sciences	3	1	-	4	20	80	100
AUD6131	Clinicals-I	-	-	18	6	100	-	100
	Total	**15**	**5**	**18**	**26**	**210**	**390**	**600**

Note:
ESE for theory papers will be conducted for 100 marks and normalized to 80 for all the subjects except Statistics.
ABS6101,ESE will be conducted for 50 and normalized to 70.

SEMESTER - II

Course Code	Course Title	Credit Distribution (hours/week)				Marks Distribution		
		S	SL	CL	CR	IAC	ESE	Total
AUD6201	Auditory Perception	3	1	-	4	20	80	100
AUD6202	Auditory Disorders	3	1	-	4	20	80	100
AUD6203	Electrophysiological Assessment	3	1	-	4	20	80	100
AUD6204	Advances in the Management of Hearing Loss	3	1	-	4	20	80	100
AUD6231	Clinicals-II	-	-	18	6	-	100	100
	Total	**12**	**4**	**18**	**22**	**80**	**420**	**500**

Note: ESE for theory papers will be conducted for 100 marks and normalized to 80

SEMESTER - III

Course Code	Course Title	Credit Distribution (hours/week)				Marks Distribution		
		S	SL	CL	CR	IAC	ESE	Total
AUD7101	Genetics of Hearing and Pediatric Audiology	3	1	-	4	20	80	100
AUD7102	Implantable Auditory Devices	3	1	-	4	20	80	100
AUD7103	Speech Perception	3	1	-	4	20	80	100
AUD7104	Auditory Processing Disorders	3	1	-	4	20	80	100
AUD7131	Clinicals-III	-	-	18	6	100	-	100
	Total	**12**	**4**	**18**	**22**	**180**	**320**	**500**
Note: ESE for theory papers will be conducted for 100 marks and normalized to 80								

SEMESTER - IV

Course Code	Course Title	Credit Distribution (hours/week)					Marks Distribution		
		S	SL	PW	CL	CR	IAC	ESE	Total
AUD7201	Audiology in Practice	3	1	-	-	4	20	80	100
AUD7202	Vestibular System and its Disorders	3	1	-	-	4	20	80	100
AUD7251	Dissertation	-	-	13	-	9	20	80	100
AUD7231	Clinicals-IV	-	-	-	18	6	-	100	100
	Total	**6**	**2**	**13**	**18**	**23**	**60**	**340**	**400**
Note: ESE for theory papers will be conducted for 100 marks and normalized to 80									

OVERALL CREDIT DISTRIBUTION

Semester	Credit distribution					Marks Distribution		
	S	SL	PW	CL	CR	IAC	ESE	Total
I - SEMESTER	15	5	-	6	26	210	390	600
II - SEMESTER	12	4	-	6	22	80	420	500
III - SEMESTER	12	4	-	6	22	180	320	500
IV - SEMESTER	6	2	9	6	23	60	340	400
Grand Total	**45**	**15**	**9**	**24**	**93**	**530**	**1470**	**2000**

Distribution of Dissertation hours

Total of 405 hrs of dissertation work will be distributed across all the four semester as mentioned below to accommodate the regulatory body requirements.

Semester	Hours	Activities
I	**2hrs/week (30hrs)**	Selection of Topic, guide, literature search
II	**6hrs/week (90hrs)**	Research Protocol preparation, Departmental level presentation, IRC presentation, Submission for ethical approval
III	**6hrs/week (90 hrs)**	Develop protocol for data collection, Writing Introduction, Literature review and method
IV	**13hrs/week (195 hrs)**	Data collection, Guidelines to write Result and Discussion, writing dissertation, attending manuscript wring workshops, Preparation of manuscript
Total Credits	**405 hrs**	

SEMESTER - I

COURSE CODE	:	COURSE TITLE
ABS6101	:	Advanced Biostatistics & Research Methodology
AUD6101	:	Technology in Audiology
AUD6102	:	Cochlear Physiology
AUD6103	:	Neurophysiology of Hearing
AUD6104	:	Hearing Sciences
AUD6131	:	Clinicals - I

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Advanced Biostatistics & Research Methodology**
Course Code	**ABS6101**
Academic Year	First
Semester	I
Number of Credits	4
Course Prerequisite	Students should have basic knowledge of research and statistical tools.
Course Synopsis	This course enables the student to understand the basics of research methods and design a research protocol for their research question. Additionally the course also enables the student to estimate sample size for their study, use statistical tests to analyse the results of the study and make meaningful interpretations.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Define the terms related to statistics and research methods (C1)
CO2	List and explain the research designs and sampling techniques (C2)
CO3	Explain, calculate and interpret the measures of central tendency (C4)
CO4	Determine sample size for the studies using means and proportions formula (C5)
CO5	Analyse and interpret the outputs of parametric and non-parametric tests (C4)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	**x**							
CO2	**x**					**x**		
CO3	**x**							
CO4	**x**						**x**	
CO5	**x**							

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1		
	The student should be able to • Define statistics (C1) • List the uses of statistics in health science	**4**

Content	Competencies	Number of Hours
	research. (C1) • Explain the role of Statistics in clinical and preventive Medicine. (C2) • Differentiate qualitative and quantitative variables with examples. (C3) • Differentiate discrete and continuous variables with examples. (C4) • List the properties of various scales of measurement with example. (C1) • Define central tendency, measure of central tendency. (C1) • Define arithmetic mean, median and mode. List the properties, situation for use, and examples. (C1) • Determine the three measures from raw data. (C5)	
Unit 2		
	The student should be able to • Define and calculate quartiles and percentiles. (C4) • Define measures of dispersion (C1) • Define, calculate and interpret range, quartile deviation, interquartile range, standard deviation, variance and coefficient of variation.(C4) • Give the situation for the use of these measures (C2).	**4**
	• Describe the properties of Normal and Standard Normal Distribution with sketch (C2) • List the applications.(C1) • Calculate probabilities recollecting the coverage of the intervals mean±SD, , mean±2SD, mean±3SD (C4) • Define skewness and list the characteristics with sketch.(C1) • Define kurtosis and list the characteristics with sketch.(C1) • Define and differentiate parameter and statistic with examples (C4). • Define the basic terms-population, sample, sampling, parameter, statistic, estimate and estimator. (C1) • Define Point estimate (C1) • Define and Differentiate standard deviation	**5**

Content	Competencies	Number of Hours
	and standard error (C4) • Define sampling distribution (C1) • Describe the importance of sampling distributions of different statistics.(C2) • Determine the sampling distribution of sample mean, sample proportion, difference between two means, difference between two proportions (Large sample approximation (CLT).(C5) • Calculate the standard error of mean, proportion, difference between two means, and difference between two proportions. (Large sample approximation (CLT). (C4)	
	• Construct and interpret confidence interval for mean, difference between two means, proportion, difference between two proportions (large sample approximation) (C5)	**3**
Unit 3		
	The student should be able to • Define /explain with example the concept of null hypothesis, alternative hypothesis, type I and type II errors. (C2) • Define level of significance, power of the test and p-value (C1) • Explain the difference between one sided and two-sided test (C2) • Give the situation for non-parametric tests. (C2) • List the differences, merits and demerits of non-parametric over parametric tests. (C1)	**4**
	• Explain the situation, hypothesis tested, assumptions and example for paired and unpaired t-test. (C2) • Interpret the output of paired and unpaired t-test (C4) • Explain the situation, hypothesis tested, assumptions and example for one-way and repeated measures ANOVA (C2)	**3**
	• Explain the situation, hypothesis tested, assumptions and example for : Mann-Whitney U-test, Wilcoxon signed rank test, Kruskal-Wallis ANOVA and Friedman's ANOVA (C2) • Explain the situation, hypothesis tested, assumptions and example for Chi square test	**4**

Content	Competencies	Number of Hours
	association/independence and McNemar's test for association (C2) • Computation and interpretation of chi-square test (2 x2 table) and McNemar's test result (C2)	
	• Give example for positive and negative correlations. (C2) • Explain different types of correlation with the help of scatter diagrams. (C2) • Give the assumptions, properties, and interpretation of correlation coefficient.(C4) • Explain the situation for the computation of Pearson's and Spearman's correlation coefficient. (C2) • Interpret coefficient of determination.(C4) • Explain the situation, example, application and assumptions for linear and multiple regression.(C2) • Interpret regression coefficients in simple and multiple regression.(C4) • Explain the need for sample size computation.(C2) • Given the situation/ingredients, should be able to determine sample size for estimating mean and proportion, testing of difference in means and proportions of two groups.(C5)	**4**
	• Explain the difference between rate, ratio, and proportion with example. (C2) • Calculate rate, ratio, and proportion (C4) • Define and calculate Incidence and prevalence rates.(C4) • Explain the design, merits and demerits of Case report, case series analysis, prevalence studies and ecological studies with example (C2)	**3**
	• Explain the design, analysis (2x2 table and odds ratio), merits and demerits ((unmatched and 1:1 matched design) of case control study with example.(C2) • Explain the design, analysis (2x2 table and relative risk), merits and demerits of cohort study with example.(C2)	**3**
	• Explain confounding with example. (C2) • List the methods to deal with confounding at design and analysis stage.(C1) • Explain the design, analysis, merits and demerits of RCT with example. (C2)	**4**

Content	Competencies	Number of Hours
	• Explain the need of simple, block and stratified randomization with example.(C2) • Explain the need and type of blinding with example (C2)	
	• Explain the situation for the use of logistic regression and survival analysis with example.(C2)	**3**
	• Define Population, sample, sampling, and sampling frame. Give one example each.(C1) • List the characteristics of a good sample.(C1) • Differentiate and list the advantages and disadvantages of random and non- random sampling techniques.(C4) • Explain simple, stratified, systematic, cluster and multistage random sampling techniques with examples. List the merits and demerits of each of them.(C2) • Explain Convenience, quota, judgment and snowball sampling with examples. List the merits and demerits of each of them.(C2) • Explain the difference between sampling and non-sampling errors. Give example for sampling and non-sampling errors. List the methods to minimize these errors.(C2)	**4**
	• Define Sensitivity, specificity, PPV and NPV. (C1) • Explain with example method of computation and interpretation. (C4) • Explain with example, the situation for the application of Bland Altman plot, Kappa statistic. (C2) • Explain the interpretation of Kappa Statistics. (C2) • Explain the format of various research documents. (C2)	**4**

Learning Strategies, Contact Hours and Student Learning Time (SLT)		
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**
Lecture	42	84
Tutorial	4	8
Self-directed learning (SDL)	6	12
Total	**52**	**104**

Assessment Methods						
Formative		**Summative**				
Mid Semester Exam (theory)		End Semester Exam (theory)				
Seminar / Assignments / Class test						
Mapping of Assessment with COs						
Nature of Assessment		**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Mid Semester Examination		x	x	x		
Quiz / Assignments					x	x
End Semester Exam		x	x	x	x	x
Feedback Process	Mid-Semester Feedback					
	End-Semester Feedback					
Main Reference	• Research for Physiotherapists: Project Design and Analysis - Caroline Hicks. (1995) • Tests, Measurements and Research in Behavioural Sciences by A K Singh (1986) • Rehabilitation Research - E-Book: Principles and Applications by Russell Carter, Jay Lubinsky, et al. (2015) • Foundations of Clinical Research by Leslie Gross Portney (2020) • Essentials of Research Methodology for all Physiotherapy and Allied Health Sciences Students by Ramalingam Thangamani A (2018)					

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Technology in Audiology**
Course Code	**AUD6101**
Academic Year	First
Semester	I
Number of Credits	4
Course Prerequisite	Students should have basic knowledge of electronics.
Course Synopsis	The module will provide introduction to various digital signal processing techniques and communication systems that are applicable in the area of hearing sciences, neuro imaging techniques, use of e-health and telemedicine platforms and software that used in the hearing sciences.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Understand advanced aspects of signal acquisition and processing (C2)
CO2	Understand development and application of software based tools. (C2)
CO3	Understand uses of tele-technology in hearing sciences. (C2)
CO4	Understand digital signal processing techniques and communication systems. (C2)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	x							
CO2		x						
CO3	x							
CO4	x							

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1		
Fundamentals of Digital Signal Processing & Communication Systems	The student should be able to • Recall Digitization of data and digital systems; Principles and methods of digital signal processing (C1) • Explain fundamentals of communication systems – (i) AM & FM transmission & reception (ii) Digital modulation techniques, (iii) Satellite communication (C2) • Explain working of transducers and signal generation (C2)	**12**

Content	Competencies	Number of Hours
	• Explain biomedical signals & signal processing: Principles of generation of acoustic stimuli (C2) • Explain signal acquisition and processing techniques (C2) • Explain working principles of EEG / Magnetoencephalography, event related potentials/ evoked potential. (C2) • List High-fidelity sound reproducing systems: Auditorium acoustics (C1)	
Unit 2		
Techniques of Speech Processing and Analysis	• The student should be able to • Explain artificial neural networks (C2) • Explain 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). (C2) • Explain voice response system, speaker recognition system and speech recognition system: Speech synthesis methods, speech recognition, speaker recognition, speech coding, and speech enhancement. (C2) • Explain basic principles of cepstral analysis, filtering low-time filtering for formant estimation, high-time filtering for pitch estimation, complex cepstrum (C2)	**12**
Unit 3		
Neuro Imaging	The student should be able to • Explain the principles of neuro imaging techniques - MRI, fMRI, NIRS, CT, PET, SPECT, TMS and MEG and their technology (working principles, interpretation and implications).(C2) • Explain synching various speech stimuli and events for fMRI acquisition and speech perception in fMRI (C2) • Summarize technology available for intra-operative monitoring of sensory and motor functions (C2)	**12**
Unit 4		
Tele-technology	The student should be able to • Explain tele-technology: Definition, applications, technology, resources (C2)	**12**

Content	Competencies	Number of Hours
	• Explain transmission of information: transmission of patient images, reports, etc.(C2) • Explain remote consultations and databases (C2) • Explain distance learning- multimedia meeting room / videoconferencing (C2)	
Unit 5		
Software for Analysis	The student should be able to • Explain software packages and applications in hearing diagnostics and research - MATLAB, Adobe audition, Audacity, PRAAT (C2) • List basics features, vectors and matrices, built-in functions and plotting in MATLAB (C1) • Demonstrate 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 in Adobe audition, Audacity etc. (C2) • Explain computer based assessment and intervention programs relating to hearing (C2) • Explain calibration and maintenance of equipment (C2)	**12**

Learning Strategies, Contact Hours and Student Learning Time (SLT):		
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**
Seminar / Lecture or Tutorial	45	90
Self-directed learning (SDL)	15	30
Total	**60**	**120**

Assessment Methods	
Formative	**Summative**
Mid Semester Exam (theory)	End Semester Exam (theory)
Seminar / Assignments / Class test	

Mapping of Assessment with COs				
Nature of Assessment	**CO1**	**CO2**	**CO3**	**CO4**
Mid Semester Examination	x	x	x	
Seminar / Assignments / Class test	x	x	x	x
End Semester Exam	x	x	x	x

Feedback Process	Mid-Semester Feedback
	End-Semester Feedback

Main Reference	• Daniloff, R.G (1985). Speech Sciences: Recent advances. London: Taylor and Francis • Moser, P. (2015). Electronics and Instrumentation for Audiologists. Psychology Press. • Haton, J.P. (Eds) (1981). Automatic speech analysis & Recognition. USA, D. Reidel Publishing Company.
Additional References	• 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. • Gottingen, M.R.S. (Ed.) (1985). Speech and Speaker Recognition. Basel: Kager. • 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). Neural Networks and Speech Processing. Boston, Kluwer Academic Publishers. • Nakagawa, S. et al. (1995). Speech, Hearing and Neural Network Models. Oxford: IOS, Press • Oppenheim & Schafer (1989). Digital signal processing. New Delhi: Prentice Hall of India. • Boulston, F. R. & Dvorak, J.D (2015). Matlab Primer for Speech Language Pathology and Audiology. San Diego: Plural Publishing Inc • Silman,S& Emmer, M.B. (2011). Instrumentation in Audiology and Hearing Science: Theory and Practice. San Diego: Plural Publishing Inc

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Cochlear Physiology**
Course Code	**AUD6102**
Academic Year	First
Semester	I
Number of Credits	4
Course Prerequisite	The student should have basic knowledge of anatomy and physiology of Auditory system
Course Synopsis	The module will revise the concepts of anatomy and physiology of cochlea. The student will understand the various assessment tests /protocols for cochlea assessment.
Learning outcome	• Students will explain normal and abnormal anatomy and physiology of the cochlea. • Students will choose and interpret tests for cochlea.

Course Outcomes (COs):
At the end of the course student shall be able to:

CO1	Explain normal and abnormal anatomy and physiology of cochlea. (C2)
CO2	Explain the physiological basis for generation of different tests of cochlea (C2)
CO3	Choose the appropriate test protocol and interpret the test results. (C3)

Mapping of Course Outcomes (COs) to Program Outcomes (POs):

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	x							
CO2	x							
CO3					x			

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1		
Cochlear Anatomy	a) Describe the Macro & microanatomy of cochlea (C2) b) Explain the homeostatic mechanisms in cochlea (C2) c) Outline the blood supply to cochlea (C2) d) Illustrate the innervations of cochlea (C2) e) Explain the concepts & advances in cochlear regeneration (C1 C2) f) Summarize the evolution of human cochlea (C1)	**12**

Content	Competencies	Number of Hours
Unit 2		
Cochlear Physiology	a) Describe the techniques to study hair cell and basilar membrane physiology (C2) b) Describe Basilar membrane mechanics and non-linearity (C2) c) Explain Outer hair cell physiology – different mechanisms involved in hair cell motility (C2) d) Explain Inner hair cell physiology (C2) e) Discuss on Cochlear non-linearity (C2)	**12**
Unit 3		
Development of cochlea and top down control of sensory process	a) Describe the efferent control of cochlear hair cells (C2) b) Outline the nutrients related to sensory cell physiology (C2) c) Describe the ontogenetic development of cochlea (C1) d) Describe Phylogentic development of cochlea & compare with ontogenetic development.(C1) e) Describe the developmental changes in the cochlea and discuss the effect of advancing age on cochlea (C2) f) Comparative physiology of auditory system in non-mammalian species (C1 C4)	**12**
Unit 4		
Otoacoustic Emissions	a) Classify OAEs; mechanism based taxonomy (C2) b) Describe the characteristics of different types of OAEs (C4) c) Illustrate the instrumentation and techniques for recording different types of OAEs (C2) d) Identify the factors affecting different types of OAEs (C3) e) Explain the fine structure DPOAEs (C2) f) Describe & analyse the Suppression of OAEs: ipsilateral, contralateral, and bilateral (C4) g) List & relate the clinical applications of OAEs (C2)	**12**
Unit 5		
Cochlear Potentials	a) Explain endocochlear potentials. (C2) b) Illustrate the electrocochleograhy: Instrumentation and techniques (C2) c) Explain protocol for recording ECochG (C2) d) Infer finding of ECochG (C4) e) List & explain the clinical applications of ECochG (C4)	**12**

Learning Strategies, Contact Hours and Student Learning Time (SLT)		
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**
Seminar / Lecture or Tutorials	45	90
Self-directed learning (SDL)	15	30
Total	**60**	**120**

Assessment Methods	
Formative	**Summative**
Mid Semester Exam (theory)	End Semester Exam (theory)
Seminar / Assignments / Class test	

Mapping of Assessment with COs			
Nature of Assessment	**CO1**	**CO2**	**CO3**
Mid Semester Exam (theory)	x	x	
Seminar / Assignments / Class test	x	x	x
End Semester Exam	x	x	x

Feedback Process	**Mid-Semester Feedback** **End-Semester Feedback**
Main reference	• Berlin, C. I. (1996). Hair cells and hearing aids. San Diego: Singular Publishing Group. • Dallos, P., Popper, A. N., & Fry, R. R. (1996). The cochlea. New York: Springer. • Dhar, S and Hall, J.W. (2011). Otoacoustic emissions: Principles, Procedures and Protocols. San Diego: Plural Publishing Inc • Flock, A., Ottoson, D., &Ulfendahi, M. (1995). Active hearing. Baltimore: Williams & Wilkins. • Hall, J.W. (2007). New Handbook of Auditory Evoked Responses. Boston: Pearson. Edn.). New York: Marcel Decker. • 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. • Musiek, F.E. &Baran, J.A. (2016). Auditory System: Anatomy, Physiology and Clinical Correlates. San Diego: Plural Publishing Inc • Robinette, M. S., &Glattke, T. J. (1997). Otoacoustic emissions: clinical applications. New York: Thieme Medical Publications. • Zemlin, W. R. (2010). Speech & Hearing Science: Anatomy & Physiology. Boston: Allyn & Bacon.
Additional reference	• Drescher, D. G. (1985). Auditory biochemistry. Springfield: Charles C. Thomas. • Gelfand, S. A. (2004). Hearing: Introduction to Psychological and Physiological Acoustics. • Moore, B. C. J. (1995). Hearing. San Diego: Academic Press.

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Neurophysiology of Hearing**
Course Code	**AUD6103**
Academic Year	First
Semester	I
Number of Credits	4
Course Prerequisite	The student should have basic knowledge of anatomy and physiology of Auditory system
Course Synopsis	The module will provide advanced anatomy and physiology of auditory system. It is a prerequisite course for auditory diagnosis and research.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	To understand and illustrate the anatomy of auditory system (C2)
CO2	To explain the functioning of various centres of auditory pathway (C2)
CO3	To Explain the role of central auditory pathway neurons in normal hearing (C2)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	x							
CO2	x							
CO3	x							

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1: Ascending Auditory Pathway: Anatomy		
	Explain the anatomy of • Auditory nerve (C2) • b) Cochlear nucleus (C2) • c) Superior olivary complex (C2) • d) Lateral leminiscus (C2) • e) Inferior colliculus (C2) • f) Medial geniculate body (C2)	**12**
Unit 2: Functioning of the Auditory Nerve		

	Explain
	• Stimulus coding (C2)
	  • Frequency, intensity and temporal coding
	  • Coding of complex signals
		12

Content	Competencies	Number of Hours
	• Non linearity (C2) • Action potentials (C2) • Neurotransmitters and neuromodulators(C2)	
Unit 3: Physiology of Auditory Brainstem		
	Explain • Tonotopic organization of auditory brainstem (C2) i. Cochlear nucleus ii. Superior olivary complex iii. Lateral lemniscus iv. Inferior colliculus v. Medial Geniculate body • Coding of simple and complex acoustic signals at auditory brainstem (C2) i. Cochlear nucleus ii. Superior olivary complex iii. Lateral lemniscus iv. Inferior colliculus v. Medial Geniculate body • Role of subcortical structures in sound localization (C2)	**12**
Unit 4: Anatomy and Physiology of Auditory Cortex		
	Explain • Anatomy of primary and secondary auditory cortex (C2) • Tonotopic organization in auditory cortex (C2) • Coding of signals in the at auditory cortex (C2) i. Simple and complex signals ii. Speech • Association of auditory cortex with other structures (C2) • Role of auditory cortex in sound localization (C2) • Plasticity of auditory cortex (C2)	**12**
Unit 5: Efferent Auditory System		
	Explain • Efferent auditory pathway: medial and lateral Olivo cochlear bundle (C2) • Functioning of the auditory efferent system (C2) • Role of auditory efferent system in hearing (C2) • Protective function of auditory efferent system (C2)	**12**

Learning Strategies, Contact Hours and Student Learning Time (SLT)		
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**
Seminar / Lecture or Tutorials	45	90
Self-directed learning (SDL)	15	30
Total	**60**	**120**

Assessment Methods	
Formative	**Summative**
Mid Semester Exam (theory)	End Semester Exam (theory)
Seminar / Assignments / Class test	

Mapping of Assessment with COs			
Nature of Assessment	**CO1**	**CO2**	**CO3**
Mid Semester Examination	x	x	
Seminar / Assignments / Class test	x	x	x
End Semester Exam	x	x	x

Feedback Process	Mid-Semester Feedback
	End-Semester Feedback
Main Reference	• Aitkin, L. (1990). The auditory cortex: structural and functional bases of auditory perception. University of Michigen: Chapman and Hall. · • Berlin, C.E. (1999). The efferent auditory system: basic science and clinical applications. USA: Singular Publishing Group. · • Fay, R. R. (Ed.). (2013). The mammalian auditory pathway: neurophysiology (Vol. 2). Springer Science & Business Media. · • Webster, D. B., & Fay, R. R. (Eds.). (2013). The mammalian auditory pathway: neuroanatomy (Vol. 1). Springer Science & Business Media. · • Ainsworth, W. A., Popper, A. N., & Fay, R. R. (2004). Speech processing in the auditory system (Vol. 18, pp. 17-20). S. Greenberg (Ed.). New York: Springer. · • Schreiner, C., & Winer, J. A. (2005). The inferior colliculus. New York: Springer. · • Winer, J. A., & Schreiner, C. E. (Eds.). (2010). The auditory cortex. Springer Science & Business Media. · • Oertel, D., & Fay, R. R. (Eds.). (2013). Integrative functions in the mammalian auditory pathway (Vol. 15). Springer Science & Business Media. · • Ehret, R. (1997). The central auditory system. Oxford University Press, USA

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Hearing Sciences**
Course Code	**AUD6104**
Academic Year	First
Semester	I
Number of Credits	4
Course Prerequisite	The student should have basic knowledge of acoustics.
Course Synopsis	This course deals with measurement, analysis of different psychophysical components of the sound. Further conducting this in practical experiments.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	To understand psychophysical components of sound and their measurement(C3)
CO2	To analyse and critically evaluate the different methods of estimation of thresholds, frequency analysis and application of masking, and (C4, P4)
CO3	To conduct experiments to estimate thresholds, measure pitch (C4, P4)
CO4	To conduct masking experiments (C4, P4)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	x							
CO2		x				x		
CO3		x				x		
CO4		x				x		

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1: Introduction to Psychoacoustics		
	• Comprehend the physical description and parameters for generation of sounds: Sine wave and complex signals; Analysis of sound: Spectrum and spectrogram, LTASS; Filters and their properties (C2,P3) • Apply the concepts of theory signal detection in audiology (C3,P4). • Apply the concepts of classical and adaptive methods in psycho-physical threshold estimation (C3,P5)	**12**

Content	Competencies	Number of Hours
Unit 2: Thresholds and Loudness		
	• Compare the methods of measuring absolute and relative thresholds; thresholds of audibility (MAP & MAF) (C4, P5) • Explain the models of loudness (C2). • Explain Loudness perception in normal hearing persons (C2) • Explain the effect of hearing impairment on the perception of loudness (C2) • Explain the concepts of dynamic range of hearing, equal loudness contours and loudness scaling (C2) • Explain the concepts of recruitment and softness imperceptions (C2) • Comprehend the consequences of altered loudness perception (C2) • Explain the factors affecting loudness such as Bandwidth, duration, adaptation and masking (C2) • Demonstrate the measurement of difference limen of intensity (C3, P5)	**12**
Unit 3: Pitch		
	• Explain the theories of pitch perception of simple and complex signals as well as pitch scales (C2, P3) • Expalin the factors affecting pitch perception (C2) • Compare the perception of pure-tones by persons with normal hearing and those with hearing impairment (C2,P3) • Compare the perception of complex signals by persons with normal hearing and those with hearing impairment (C4) • Explain the measurement of difference limen frequency (C3)	**12**
Unit 4: Peripheral Masking		
	• Critically evaluate the critical band concept and power spectrum model (C5) • Measure the shape of auditory filter using psycho-physical tuning curve & Notched noise methods (C5,P5) • Construct a non-simultaneous masking experiment (C5,P5) • Explain the auditory filter shapes in normal hearing and hearing impaired (C2) • Compare the masking patterns and excitation patterns in normal hearing and hearing impaired (C4)	**12**
Unit 5: Non-Peripheral Masking		
	• Explain the concept of central masking (C2) • Explain the concept informational masking (C2)	**12**

Content	Competencies	Number of Hours
	• Explain the psycho-physical overshoot phenomena Co-modulation masking release (C2) • Explain the effect of hearing loss on non-peripheral masking (C3)	

Learning Strategies, Contact Hours and Student Learning Time (SLT)		
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**
Seminar / Lecture or Tutorial	45	90
Self-directed learning (SDL)	15	30
Total	**60**	**120**

Assessment Methods	
Formative	**Summative**
Mid Semester Exam (theory)	End Semester Exam (theory)
Seminar / Assignments / Class test	

Mapping of Assessment with COs				
Nature of Assessment	**CO1**	**CO2**	**CO3**	**CO4**
Mid Semester Examination	x	x		
Seminar / Assignments / Class test	x	x	x	x
End Semester Exam	x	x	x	x

Feedback Process	Mid-Semester Feedback
	End-Semester Feedback
Main Reference	• Brain C.J., Moore (2007). Cochlear Hearing Loss: Physiological, Psychological and Technical Issues. England: John Wiley and Sons Ltd. • Gullick, W.L. (1971). Hearing physiology and psychophysics. New York: Oxford University Press.). • Howard, D and Angus, J (2013). Acoustics and Psychacoustics. Oxford: Taylor & Francis. • 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. • Yost, W. A. (1994). Fundamentals of hearing: An introduction. San Diego: Academic Press.
Additional References	• Zwicker, E., &Fastl, H. (1999). Psychoacoustics-Facts and models. Springer Verlag: Berlin. • Heidelberg. Bernthal, J.E., Bankson, N.W., & Flipsen, P. (2013). Articulation and phonological disorders (7th Ed.). Boston, MA: Pearson. • Journal articles

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Clinicals - I**
Course Code	**AUD6131**
Academic Year	First
Semester	I
Number of Credits	6
Course Prerequisite	The student should have a knowledge on basic Audiological assessments
Course Synopsis	The module will provide the student the clinical knowledge in the assessment of hearing disorders.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Perform audiological assessment on adults to identify hearing loss. (C3,P4)
CO2	Record auditory brainstem response and interpret the findings. (C4,P4)
CO3	Record otoacoustic emissions and interpret the findings. (C4,P4)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1		x				x		
CO2		x				x		
CO3		x				x		

Course Content and Outcomes

Content	Competencies	Number of Hours
Know-how (Ability to apply)		
	• Choose appropriate OAE protocols depending on the clinical needs (C3, P5) • Choose appropriate ABR protocols depending on the clinical needs (C3, P5)	**1 SDL** **1 SDL**
	• Interpret the results of audiological evaluation and correlate it to the possible pathophysiological or radiological findings (C5)	**1 SGD** **1 SDL**
Show **(Demonstrate in a clinical diary/log book based on clinical reports/recordings, etc.)**		
	• Demonstrate recording of ABR for different stimuli.	**1 SGD**

Content	Competencies	Number of Hours
	(C2, P5) • Analyze ABR waveforms. (C4, P5)	**1 SDL** **1 SDL**
Do (Perform on patients/ client contacts)		
	• Perform recording of OAEs and interpret the findings. (C4, P5)	**1 SDL**
	• Perform recording of ABR depending on the clinical needs and interpret the findings. (C4, P5)	**1 SGD** **1 SDL**
	• Perform complete audiological evaluation on 5 persons with hearing loss and prepare a detailed report with appropriate recommendations. (C4, P5)	**1 SDL**

Learning Strategies, Contact Hours and Student Learning Time (SLT)				
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**		
Small Group Discussion (SGD)	3	-		
Self-directed learning (SDL)	8	-		
Clinic	259	-		
Total	**270**	-		
Assessment Methods				
Formative	**Summative**			
Clinical assessment (WBPA)	Clinical Viva (internal)			
Practical Log Book/ Record Book				
Mapping of Assessment with COs				
Nature of Assessment	**CO1**	**CO2**	**CO3**	
Clinical assessment (WBPA)	x	x	x	
Practical Log Book/ Record Book	x	x	x	
Clinical Viva (internal)	x	x	x	
Feedback Process	Mid-Semester Feedback			
	End-Semester Feedback			

SEMESTER - II

COURSE CODE		COURSE TITLE
AUD6201	:	**Auditory Perception**
AUD6202	:	**Auditory Disorders**
AUD6203	:	**Electrophysiological Assessment**
AUD6204	:	**Advances in the Management of Hearing Loss**
AUD6231	:	**Clinicals - II**

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Auditory Perception**
Course Code	**AUD6201**
Academic Year	First
Semester	II
Number of Credits	4
Course Prerequisite	The student should have a basic knowledge on acoustics
Course Synopsis	This course deals with the auditory perception and its components. Further it explains its role in speech, space, music and object perception in normal and hearing impaired population.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	To comprehend the process involved in speech perception in individuals with normal hearing. (C2)
CO2	To analyse and differentiate the speech perception problem in individual with hearing impairment (C4)
CO3	To apply the principles of speech perception in diagnostics (C3, P4)
CO4	To apply the principles in therapeutics (C3, P4)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	x							
CO2		x				x		
CO3		x				x		
CO4		x				x		

Course Content and Outcomes

Content	**Competencies**	**Number of Hours**
Unit 1: Temporal processing		
	• Demonstrate temporal processing: temporal resolution; temporal integration; • Illustrate models of temporal processing (C2) • Apply the Detection and discrimination of gaps in normal and individuals with hearing impairment (C4,P4) • Compare Temporal modulation transfer function in normal and individuals with hearing impairment (C2) • Compare temporal integration in persons with normal hearing and those with hearing impairment (C2)	**12**

Content	Competencies	Number of Hours
	• Illustrate Models of temporal processing in persons with normal hearing and those with hearing impairment (C2)	
Unit 2: Auditory object and pattern perception		
	• Explain the basic concepts in auditory object perception (C2, P2) • Explain the role of spectral cues in object perception (C2) • Explain the role of temporal cues for object perception (C2) • Compare auditory pattern perception in individuals with normal hearing and those with hearing impairment (C4) • Compare timber perception in normal and hearing impaired (C2) • Explain Time invariant -pattern and time varying pattern perception (C2)	**12**
Unit 3: Adaptation		
	• Distinguish between Adaptation vs. fatigue (C4) • Explain different methods to study adaptation (C2) • Compare adaptation in persons with normal hearing and those with hearing impairment (C3) • Explain Neurophysiological basis of adaptation (C2) • Explain various factors affecting adaptation (C2)	**12**
Unit 4: Perception in space		
	• Explain the perception of distance: localization vs. lateralization; localization of pure tones; localization of complex signals (C2) • Explain the effect of hearing loss on localization (C2) • Explain monaural localization and space perception (C2) • Explain various factors affecting localization (C2) • Explain Neurophysiology of localization (C2)	**12**
Unit 5: Binaural hearing and perception of music		
	• Explain binaural hearing - (C2, P2) • Explain Models of binaural hearing (C2) • Compare masking level difference in normal and hearing impaired (C4) • Explain Musical scales/Musical notes (C2)	**12**

Learning Strategies, Contact Hours and Student Learning Time (SLT)		
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**
Seminar / Lecture or Tutorial	45	90
Self-directed learning (SDL)	15	30
Total	**60**	**120**

Assessment Methods				
Formative	**Summative**			
Mid Semester Exam (theory)	End Semester Exam (theory)			
Seminar / Assignments / Class test				
Mapping of Assessment with COs				
Nature of Assessment	**CO1**	**CO2**	**CO3**	**CO4**
Mid Semester Examination	x	x	x	
Seminar / Assignments / Class test	x	x	x	x
End Semester Exam	x	x	x	x

Feedback Process	Mid-Semester Feedback
	End-Semester Feedback
Main Reference	• Brain, C.J. Moore (1986). Frequency selectivity in Hearing. CA: Academic Press Inc. • Diana Deutsch (2013). The Psychology of Music, Third Edition (Cognition and Perception) 3rd Edition. Academic Press. • 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. • 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. • Journal articles
Additional References	• 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

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Auditory Disorders**
Course Code	**AUD6202**
Academic Year	First
Semester	II
Number of Credits	4
Course Prerequisite	The student should have a basic knowledge on disorders of auditory system
Course Synopsis	The students will describe pathophysiology and audiological profile of various auditory disorders. The students will construct appropriate differential diagnosis using the patient's history, physical exam, and audiological findings. The students will demonstrate the ability to diagnose and construct a treatment plan for clients with hearing loss.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Explain the pathophysiology of auditory disorders.(C2)
CO2	Diagnose and differentially diagnose auditory disorders.(C4)
CO3	Recommend appropriate management options for the clients with hearing loss.(C3)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	x							
CO2			x			x		
CO3			x			x		

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1: Disorders of the External and Middle Ear		
	• Identify congenital malformations of external and middle ear (C4) • Identify 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 (C4)	**12**

Content	Competencies	Number of Hours
	• Differentiate diseases of the middle ear cleft: otosclerosis otitis media, non suppurative otitis media, complications of middle ear diseases, neoplasms. (C4) • Assess middle ear functioning: multicomponent tympanometry, multifrequency tympanometry, wide band reflectance/absorbance, reflexometry (C6) • Describe reconstruction of external and middle ear hearing mechanisms: reconstructive and rehabilitation procedures (C2)	
Unit 2: Disorders of the Cochlea		
	• Explain pathophysiology of inner ear disorders: ototoxicity, Meniere's, age related hearing loss, Sudden hearing loss, auto immune conditions, hearing loss due to systemic diseases (C2) • Describe audiological profile in persons with above inner ear disorders (C6) • Recommend non-audiolgical management options when appropriate (C3)	**12**
Unit 3: Disorders of the Cochlea– NIHL &Traumatic Injury		
	• Explain pathophysiology of inner ear disorders due to NIHL and other traumatic injuries (C2) • Describe audiological profile in persons with NIHL and other traumatic injuries (C6) • Compare national and International guidelines of hearing conservation program (C4) • Recommend non-audiological management options when appropriate (C3)	**12**
Unit 4: Auditory Nerve and Brainstem		
	• Explain pathophysiology of space occupying lesions of auditory nerve and brainstem (C2) • Describe audiological profile in persons with space occupying lesions (C6) • Compare radiological findings and its correlations with audiological findings (C4) • Explain challenges in diagnosis of space occupying lesion (C5) • Explain management options for space occupying lesion (C5)	**12**
Unit 5: Auditory Neuropathy Spectrum Disorders		
	• Explain pathophysiology of ANSD (C2) • Prepare list of etiology of ANSD (C3) • Describe audiological profile of persons with ANSD and its correlations with pathophysiology (C6) • Explain speech perception in persons with ANSD (C5)	**12**

Content	Competencies	Number of Hours
	• Describe management of persons with ANSD: Aids strategies (C6)	

Learning Strategies, Contact Hours and Student Learning Time (SLT)		
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**
Seminar	45	90
Self-directed learning (SDL)	15	30
Total	**60**	**120**

Assessment Methods	
Formative	**Summative**
Mid Semester Exam (theory)	End Semester Exam (theory)
Seminar / Assignments / Class test	

Mapping of Assessment with COs			
Nature of Assessment	**CO1**	**CO2**	**CO3**
Mid Semester Examination	x	x	
Seminar / Assignments / Class test	x	x	x
End Semester Exam	x	x	x

Feedback Process	Mid-Semester Feedback
	End-Semester Feedback
Main Reference	• Berlin, C. I., Hood, L. J., & Ricci, A. (2002). Hair Cell Micromechanics and Otoacoustic Emissions. New York: Thomson Learning Inc. • Chasin, M (2009) Hearing Loss in Musicians: Prevention and Management. San Diego: Plural Publishers • Hall, J. W. (2000). Handbook of Otoacoustic Emissions. San Diego: Singular Publishing Company. • Hall, J.W. (2007). New Handbook of Auditory Evoked Responses. Boston: Pearson. • Hood, L.J. (1998). Clinical applications of auditory brainstem response. San Diego: Singular Publishing Group Inc. • Moller, A. R. (2000). Hearing: Its physiology and pathology. San Diego: Academic Press. • Rintleman, W.F. (1991). Hearing Assessment. Boston: Allyn and Bacon. • Roeser, R. J., Valente, M., & Hosford-Dunn, H. (2007). Audiology: Diagnosis. New York: Thieme Medical Publishers. • Sanbridge, S.A. (2009). Ear Disorders. San Diego: Plural Publishers
Additional References	• Sininger, Y& Starr, A (2001). Auditory Neuropathy: A new perspective in hearing disorders • Standring, S. (2008). Gray's Anatomy: The Anatomical Basis of Clinical Practice, Expert Consult. Livigstone: Churchill publishers. • Wiley, T.L., & Fowler, C.G. (1997). Acoustic immittance measures in clinical audiology: A primer. San Diego: Singular Publishing Group Inc.

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Electrophysiological Assessment**
Course Code	**AUD6203**
Academic Year	First
Semester	I
Number of Credits	4
Course Prerequisite	The student should have a basic knowledge on auditory evoked potentials
Course Synopsis	• This course will introduce concepts related to various auditory evoked potentials. • It will highlight the differences among recording principal of auditory evoked potentials • It will also highlight the differences among analysis technique used for auditory evoked potentials • It develops an understanding of various auditory evoked potentials with comprehensive methods of evaluation. • Various evidence based evoked potentials issues related to application will be discussed

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Describe and classify auditory evoked potentials (C2)
CO2	Understand the technology for recording auditory evoked potentials (C2)
CO3	Record and interpret exogenous and endogenous potentials (C4)
CO4	Use appropriate protocols for recording exogenous and endogenous potentials for clinical and research purposes (C5)
CO5	Understand research needs in auditory evoked potentials (C4)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	x							
CO2		x						
CO3		x				x		
CO4		x				x		
CO5						x		

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1		
Foundations of Auditory Evoked Potentials (AEPs)	• Classify concepts related to classification of AEP.(C2) • Explain the concepts related to neuroanatomy and neurophysiology related to AEPs; dipole orientation and scalp distribution of AEPs (C2) • Describe the stimuli for recording AEPs-generation, characteristics and types (C2) • Explain electrodes for recording AEPs (C4) • Describe general principles of recording AEPs (C2) • Explain overview to advanced analyses techniques such as independent component and time frequency analyses (C4) • Explain maintenance and Calibration of instrumentation (C5)	**12**
Unit 2		
Auditory Brainstem Responses	• Explain acquisition and analysis responses for different stimuli -clicks, tone bursts, chirps, complex stimuli such as speech (C2) • Explain new trends in ABR such as Cochlear Hydrops Analysis Masker Procedure (CHAMP) and stacked ABRs, and ABR for chained stimuli. (C2) (CO5) • Explain factors influencing ABR: Stimuli related, acquisition related, subject related (C3) (SGD) • Explain clinical applications (C3) (CBL)	**12**
Unit 3		
Middle Latency Auditory Evoked Potentials and Auditory Steady State Responses	• Perform acquisition and analysis of middle latency responses. (C4) • Discuss factors influencing middle latency responses: Stimuli related, acquisition related, subject related (C4) • Perform acquisition and analysis of auditory steady state responses (ASSR) (C4) • Explain factors influencing ASSR: Stimuli related, acquisition related, subject related (C5) (SGD) • Explain Post auricular muscle responses (C4) • Explain Clinical applications (C4) (CBL)	**12**
Unit 4		
Cortical Auditory Evoked	• Differentiate exogenous and endogenous cortical evoked potentials (C2)	**12**

Content	Competencies	Number of Hours
Potentials	• Perform acquisition and analysis of obligatory cortical auditory evoked potentials, (C4) • Explain acoustic change complex, T-complex, mismatch negativity, P300, N400, P600, CNV and other endogenous potentials (C2) • Discuss factors affecting exogenous and endogenous evoked potentials Stimuli related, acquisition related, subject related (C2) (SGD) • Explain clinical applications (C3) (CBL)	
Unit 5		
Intraoperative monitoring	• Explain physiological tests useful in intraoperative monitoring of auditory function (C2) • Discuss effect of anesthetic agents on electrophysiological responses of the auditory system (C2) • Understand how to perform recording auditory evoked potentials during surgery; requirements, patient preparation (C2) • Explain guidelines for intraoperative monitoring (C2) (SGD) • Explain electroneurenography (C2)	**12**

Learning Strategies, Contact Hours and Student Learning Time (SLT)		
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**
Seminar / Lecture or Tutorial	45	90
Self-directed learning (SDL)	15	30
Total	**60**	**120**

Assessment Methods	
Formative	**Summative**
Mid Semester Exam (theory)	End Semester Exam (theory)
Seminar / Assignments / Class test	

Mapping of Assessment with COs					
Nature of Assessment	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Mid Semester Examination	x	x	x		
Seminar / Assignments / Class test	x	x	x	x	x
End Semester Exam	x	x	x	x	x

Feedback Process	Mid-Semester Feedback
	End-Semester Feedback

Main Reference	• Burkard, R.F., Don, M., & Eggermont, J.J. (Eds.) (2007). Auditory Evoked Potentials: Basic Principles & Applications. Baltimore: Lippincott Williams & Wilkins. • Ferraro, J.A. (1997). Laboratory exercises in auditory evoked potentials. San Diego: Singular Publishing Group Inc. • Hall, J.W. (1992). Handbook of Auditory Evoked Responses. Massachussetts: Allyn and Bacon. • Hall, J.W. (2007). New Handbook of Auditory Evoked Responses. Boston: Pearson. • Hall, J.W., & Mueller, H.G. (1997) Audiologists' Desk Reference. Volume 1: Diagnostic Audiology Principles, Procedures and Protocols. San Diego: Singular Publishing Group. • Hood, L.J. (1998). Clinical applications of auditory brainstem response. San Diego: Singular Publishing Group Inc. • Katz, J. (Ed.). (1994). Handbook of Clinical Audiology. Baltimore: Williams and Wilkins. • Kilney, P.R. (2017). Audiologists handbook of intraoperative neurophysiological monitoring. San Diego: Plural Publishing Group • McPherson, L.D. (1995). Late potentials of the auditory system. London: Singular Publishing Group. • Picton, T. (2010). Human Auditory Evoked Potentials. San Diego: Plural Publishing Group. • Rance, G (2008). Auditory Steady State Responses. San Diego: Plural Publishing Group
Additional References	• Steven J, Luck- An introduction to event-related potential technique – A Bradford Book (2014)

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Advances in the Management of Hearing Loss**
Course Code	**AUD6204**
Academic Year	First
Semester	II
Number of Credits	4
Course Prerequisite	The student should have basic knowledge in Amplification devices and aural rehabilitation
Course Synopsis	The module will provide information regarding advances in hearing aid and hearing assistive technology, selection and fitting of hearing aid and hearing assistive devices, rehabilitation of individuals with hearing impairment and management of individuals with multiple disabilities, and other hearing related disorders including tinnitus and hyperacusis

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Understand the different amplification/assistive devices and their changing technology (C2)
CO2	Select the strategies of hearing aid fitting and optimization (C3)
CO3	Outline the specific needs and know psychosocial and communicative demands (C2)
CO4	Develop need-based programs and intervention strategies for persons with different types of hearing impairment across age groups (C3)
CO5	Assess and manage individuals with tinnitus and hyperacusis (C5)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	x							
CO2		x				x		
CO3	x				x			
CO4		x	x					
CO5		x				x		

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1: Advances in hearing aid and hearing assistive technology		
	• Understand and explain recent advances in hearing aids and hearing assistive technology (C2) ○ 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 • Apply techniques to control ○ acoustic feedback, distortion, circuit noise (C3) ○ improve compatibility of hearing aids with mobile phones (C3) • Earmolds ○ Summarize the application of LASER technology in ear mold production (C2) ○ Explain ear mold modifications for enhancing listening comfort in terms of physical and acoustic modifications (C2) • Electroacoustic measurement ○ Demonstrate electroacoustic measurement of hearing aids (C2) ○ Explain the variables affecting electroacoustic measurements and its implications (C2) ○ Know electromagnetic interference – measurement and its solutions (C1) • Recall the International and Indian standards/legislations for hearing aids and ALDs (C1)	**12**
Unit 2: Selection and Fitting of Hearing Aid and Hearing Assistive Devices		
	• Explain selection, verification and validation of hearing aids and hearing assistive devices (C2) • Outline pre-selection, selection and assessment of listening needs (C2) • Demonstrate objective procedure for hearing aid fitting (ABR, ALR, ASSR and others) (C2) • Utilize hearing aid programming, optimization, verification and validation (C3)	**12**

Content	Competencies	Number of Hours
	• Plan hearing aid fitting for children: ○ pre-selection, selection, verification and validation (C3) ○ explain different protocols used for hearing aid fitting in children (C2) • Plan hearing aid fitting for persons with different types of hearing loss (Sudden hearing loss, unilateral hearing loss, High frequency hearing loss, Cochlear dead region) (C3) • Utilize future trends in hearing aids and hearing aid trial in terms of technology and fitting strategies (C3)	
Unit 3: Speech Perception Through Hearing Aids		
	• Explain and classify auditory plasticity (C2) • Outline the factors affecting speech perception through hearing aids and hearing devices (C2) • Explain the methods to improve speech perception through hearing aids and hearing devices such as Speech cue enhancement - spectral shape, duration, intercity, enhancement of CVR, speech simplification, resynthesize, enhancement of perception of Telephone speech (C2) • Summarize emerging technology for better speech perception (C2) • Explain noise reduction algorithms and nanotechnology in hearing aids (C2)	**12**
Unit 4: Rehabilitation of Individuals with Hearing Impairment		
	• Plan counselling for users of hearing aid and hearing assistive devices regarding - realistic expectations, management options/techniques and adjusting to hearing device (C3) • Demonstrate care and maintenance of hearing aid and hearing assistive devices (C2) • Identify and solve - trouble shooting and fine-tuning optimization of hearing aids and assistive devices (C3) • Management of children with hearing impairment • Explain the criteria for selecting different auditory listening programs (C2) • Explain the criteria for transition from one method to the other as a child grows (C2) • To apply adapting AVT techniques for Indian languages and late identified children (C3)	**12**

Content	Competencies	Number of Hours
	• Plan group listening training activities for children having different listening skills (C3) • Rehabilitation of adults and older adults: • Plan auditory listening /speech reading training for older adults (C3) • Outline the variables that affect the communication and the role of the communication partner (C2) • Summarize the role of auditory plasticity in rehabilitation of adults and older adults (C2) • Plan training activities for adults and older adults (C3) • Plan assertiveness training (C3) • Outcomes measures of different management strategies across age groups • Select the methods and measures of outcome (C3) • Explain the quality of life of hearing impaired (C2) • Choose methods to enhance quality of life of hearing impaired (C3)	
Unit 5: Management of the children/adult with Multiple Disabilities and other Hearing Related Disorders		
	• Management of children and adults with multiple disability (for visual problems, cognitive problems, neuromotor problems): ○ Choose appropriate hearing aid fitting considerations and strategies (C3) ○ Identify the outcome with different strategies (C3) ○ Outline the educational and vocational placement (C2) ○ Explain the role of caregivers (C2) • Audiological assessment and management of tinnitus: ○ Outline the characteristics of tinnitus (C2) ○ To interpret the basis theories of tinnitus (C2) ○ Evaluate tinnitus using audiological test battery (C5) ○ Explain the models related to tinnitus management - patho-physiological and neurophysiological models (C2) ○ Outline the non-audiological management techniques for tinnitus (C2) ○ Decide audiological management techniques for those with normal hearing and different	**12**

Content	Competencies	Number of Hours
	degrees of hearing loss (TRT, counselling, others) and measure their outcomes (C5) • Audiological management of persons with hyperacusis: ○ Select appropriate audiological test battery for hyperacusis (C3) ○ Explain the models related to hyperacusis management (C2) ○ Outline the non-audiological management techniques for hyperacusis (C2) ○ Identify the audiological management techniques for normal hearing and different degrees of hearing loss (C3) ○ Select appropriate measure to evaluate the treatment outcomes (C3)	

Learning Strategies, Contact Hours and Student Learning Time (SLT)		
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**
Seminar / Lecture or Tutorial	45	90
Self-directed learning (SDL)	15	30
Total	**60**	**120**

Assessment Methods	
Formative	**Summative**
Class Seminar	Mid Semester Exam (theory)
Assignments / Class test	End Semester Exam (theory)

Mapping of Assessment with COs					
Nature of Assessment	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Mid Semester Exam (theory)	x	x			x
Seminar / Assignments / Class test	x	x	x	x	x
End Semester Exam	x	x	x	x	x

Feedback Process	Mid-Semester Feedback
	End-Semester Feedback
Main Reference	• Atcherson, S. R., Franklin, C. A., & Smith-Olinde, L. (2015). Hearing assistive and access technology. San Diego: Plural Publishing Inc. • Dillon, H. (2012). Hearing aids. 2nd Edn. Australia: Boomerang Press • 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 & Bacccon. • Cole, E.B., & Carol, F. (2007). Children with hearing loss – Developing listening and talking. United States of America: Plural Publishing Inc. • Estabrooks, W. (2006). Auditory Verbal Therapy & Practice. United States: Alexander Graham Bell Associate 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. • Baugley, D. M., & Andersson, G. (2007). Hyperacusis: Mechanisms, Diagnosis and Therapies. Sand Diego: Plural Publishing Inc. • Jastreboff, P. J., & Hazell, J. W. P. (2004). Tinnitus retraining therapy-implementing the Neurophysiological model. United Kingdom: Cambridge University Press.
Additional References	• Hersh, M. A., & Johnson, M. A. (2003). Assistive Technology for the hearing impaired, Deaf and Deaf-blind. Nottingham: Springer-Verlag London Ltd. • Martini, A., Mazzoli, M., Read, A., & Stephens, D. (2001). Definitions, Protocols and Guidelines in genetic hearing impairment. England: Whurr Publishers Ltd. • Schaub, A., (2008). Digital hearing aids. New York: Theime Medical publishers. • Johnson, C. E. (2012). Introduction to auditory rehabilitation: A contemporary issues approach. New Jersy; 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.

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Clinicals - II**
Course Code	**AUD6231**
Academic Year	First
Semester	II
Number of Credits	6
Course Prerequisite	The student should have a knowledge on basic Audiological assessments
Course Synopsis	The module will provide the student the clinical knowledge in the assessment and management of hearing disorders.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Record auditory evoked potentials and interpret the findings. (C4,P4)
CO2	Demonstrate ability to select appropriate hearing aid based on audiological findings and program the digital hearing aid.(C4,P4)
CO3	Perform electroacoustic measurement of different types of hearing aids (C4,P4)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1		x				x		
CO2		x				x		
CO3		x			x			

Course Content and Outcomes

Content	Competencies	Number of Hours
Know-how (Ability to apply)		
	• Select the protocol for recording exogenous and endogenous auditory evoked potentials. (C3, P5)	**1 SDL**
	• Utilize the latest technological advances available for persons with hearing impairment. (C3)	**2 SDL**
	• Apply appropriate modifications in hearing devices depending on the listening needs. (C3)	**1 SGD 2 SDL**
	• Plan appropriate aural rehabilitation program for persons with hearing impairment. (C3)	**1 SGD 2 SDL**
Show (Demonstrate in a clinical diary/log book based on clinical reports/recordings, etc.)		
	• Demonstrate generation of stimuli for recording AEPs. (C2, P5)	**1 SGD**

Content	Competencies	Number of Hours
	• Demonstrate recording of exogenous and endogenous potentials. (C2, P5) • Analyze auditory evoked potential waveforms. (C4, P5)	**2 SGD** **2 SDL**
	• Take part in programming the digital hearing aid. (C4, P5)	**1 SGD**
	• Take part in ear mold modifications. (C4)	**1 SGD**
Do (Perform on patients/ client contacts)		
	• Record cortical auditory evoked potentials on 5 persons with hearing loss. (C4, P5)	**1 SGD** **1 SDL**
	• Perform electroacoustic measurement of different types of hearing aids. (C4, P5)	**1 SGD** **2 SDL**

Learning Strategies, Contact Hours and Student Learning Time (SLT)			
Learning Strategies	**Contact Hours**		
Small Group Discussion (SGD)	9		
Self-directed learning (SDL)	11		
Clinic	250		
Total	**270**		
Assessment Methods			
Formative	**Summative**		
Clinical assessment (WBPA)	Clinical Viva (external)		
Clinical Viva			
Practical Log Book/ Record Book			
Mapping of Assessment with COs			
Nature of Assessment	**CO1**	**CO2**	**CO3**
Clinical assessment (WBPA)	x	x	x
Clinical Viva	x	x	x
Practical Log Book/ Record Book	x	x	x
Clinical Viva (external)	x	x	x
Feedback Process	Mid-Semester Feedback		
	End-Semester Feedback		

SEMESTER - III

COURSE CODE	:	COURSE TITLE
AUD7101	:	Genetics of Hearing and Pediatric Audiology
AUD7102	:	Implantable Auditory Devices
AUD7103	:	Speech Perception
AUD7104	:	Auditory Processing Disorders
AUD7131	:	Clinicals - III

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Genetics of Hearing and Pediatric Audiology**
Course Code	**AUD7101**
Academic Year	Second
Semester	III
Number of Credits	4
Course Prerequisite	The student should have a basic knowledge on Hearing assessments in children
Course Synopsis	This module will provide understanding of genetic basis of hearing loss and tests/procedures for identification of hearing loss in pediatric population.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	To understand the genetic basis for hearing loss. (C2)
CO2	To understand the tests/procedures for identifying genes for hearing loss (C2)
CO3	To counsel parents or caregivers of children with genetic and non-genetic hearing loss (C3)
CO4	To carry out screening programs to identify hearing loss using appropriate protocols (C4)
CO5	To diagnose and manage hearing loss in children using appropriate tests/protocols and aural management procedures (C4)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	x				x			
CO2	x					x		
CO3	x					x		
CO4	x					x		
CO5	x					x		

Course Content and Outcomes

Content	**Competencies**	**Number of Hours**
Unit 1		
Molecular Genetics for Audiologists	• To describe the basic concepts of genetics (C2) • To list the genes involved in hearing (C1) • To describe gene localization methods, gene mapping (C2)	**12**

Content	Competencies	Number of Hours
Unit 2		
Genetic Hearing Loss	• Explain genetics of hearing impairment, gene database for hearing loss (C2) • Explain importance of genetic evaluation of persons/families with hearing loss, genetic screening (C2) • To explain genotypes and phenotypes of non-syndromic hearing loss (C2) • To explain Genotypes and phenotypes of syndromic hearing loss (C2) • To describe genetic counselling (C4)	**12**
Unit 3		
Hearing Screening	• Explain Neonatal and infant hearing screening (C4) • Compare and contrast the international and national Protocols to identify middle ear disorders; sensory and neural hearing loss (C4) • Explain screening for hearing loss in school children (C4) • Explain screening for central auditory processing disorders in school children (C4) • Critically evaluate the issues related to hearing screening (C5)	**12**
Unit 4		
Pediatric assessment	• Explain the etiology of hearing loss in children (C2) • Explain and perform behavioural tests of hearing evaluation for children (C4) • Explain and perform physiological tests of hearing evaluation for children (C4) • Appraise assessing hearing in children with associated problems (C4) • Explain and perform Speech audiometry in children (C4) • Explain procedure for development of tests for speech audiometry in children (C2 • Critically evaluate the issues related to assessment and diagnosis of hearing loss in children (C5)	**12**
Unit 5		
Team Approach in diagnosis of hearing loss in children	• Interpret results of behavioral and electrophysiological assessment of hearing (C5) • Compare results of audiological evaluation with those of otolaryngological, pediatric,	**12**

Content	Competencies	Number of Hours
	psychological and speech-language evaluation (C5) • Explain the problems faced by children with hearing loss in preschool and school setup (C2) • Explain the challenges/problems faced by children with conductive hearing loss and auditory processing problems (C2) • Plan and design counselling parents/caregivers strategies regarding hearing impairment, sequel and management (C5) • Plan and design counselling strategies and management of children with unilateral hearing loss and mild hearing loss (C5)	

Learning Strategies, Contact Hours and Student Learning Time (SLT)						
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**				
Seminar / Lecture or Tutorial	45	90				
Self-directed learning (SDL)	15	30				
Total	**60**	**120**				
Assessment Methods						
Formative	**Summative**					
Mid Semester Exam (theory)	End Semester Exam (theory)					
Seminar / Assignments / Class test						
Mapping of Assessment with COs						
Nature of Assessment	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	
Mid Semester Examination	x	x	x			
Seminar / Assignments / Class test	x	x	x	x	x	
End Semester Exam	x	x	x	x	x	
Feedback Process	Mid-Semester Feedback					
	End-Semester Feedback					
Main Reference	• Northern, J.L. and Downs, M.P. (2014). Hearing in Children. 6th Ed. San Diego: Plural Publishing • Willems P J. (2004). Genetic Hearing loss. USA: Marcel Deckeer Inc • Tharpe, A. M., & Seewald, R. (Eds.). (2016). Comprehensive Handbook of Pediatric Audiology. Plural publishing					
Additional References	• Bess, F.H. & Gravel, J.S. (2006). Foundations of Pediatric Audiology. San Diego: Plural Publishing Inc • 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 • Shprintzen, R.J. (1997). Genetic, Syndromes and communication disorders. San Diego: Singular Publishing Group 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. • www.jcih.org

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Implantable Auditory Devices**
Course Code	**AUD7102**
Academic Year	Second
Semester	III
Number of Credits	4
Course Prerequisite	The student should have basic knowledge of implantable devices
Course Synopsis	The course deals with the different types of implantable auditory devices, its components, device function and candidacy criteria. The student will be familiar with the mapping parameters and the post implant benefit evaluations and outcome. The course also helps the audiologist to guide the clinical population, understand the schemes and formulate policies relevant to implantable auditory devices.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Identify and describe the types of implantable hearing devices (C3)
CO2	Describe the purpose of different components of implantable hearing devices (C3)
CO3	Evaluate the candidacy for implantable hearing devices using appropriate audiological tools (C5)
CO4	Select appropriate objective and behavioral measures for mapping and to evaluate the device function and integrity (C3)
CO5	Explain post-implant audiological management. and choose appropriate measures to assess benefits from implantable hearing devices and guide the clinical population (C3)
CO6	Explain the various Government policies and schemes relating to implantable hearing devices (C2)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	x							
CO2	x	x						
CO3			x			x		
CO4		x				x		
CO5		x			x			
CO6				x	x			

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1: Development of technology, criteria/ candidacy and program		
	• Explain candidacy assessment 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 (C2) • Analyze the battery of test results for candidacy of implantable hearing devices- Audiological and non-audiological (C4) • Know the safety standards and regulation for IHD (C1) • Know the state and central government schemes for cochlear implants and other implantable devices (C1) • Know the pre- requisite to start a IHD program (C1) • Explain the comprehensive policy issues relating to IHD (C2)	**12**
Unit 2: Bone conduction implantable devices and middle ear implants		
	• Identify the different types of BCID and components (per-cutaneous, trans-cutaneous and intra-oral) (C3) • Identify the different types of MEI and components (C3) • Select appropriate intra- operative and post-operative measurements and assessment for device function (C3) and performance outcomes (C3) • Explain programming of BCID and MEI (C2) • Outline the Contra indications (C2) • Manage device failures and poor performance (C3) • Outline the limitations and future development/ requirement (C2)	**12**
Unit 3: Cochlear Implants		
	• Identify the types and components of CI: External components (sound processor- body worn BTE, off the ear). Internal components (electrode type/ design), totally implantable cochlear implants (C3) • Evaluate the candidacy for CI using audiological and non-audiological tests in the following cases: single sided deafness, ski sloping SN hearing loss, bilateral asymmetric HL; cochlear/ nerve anomaly, auditory neuropathy spectrum disorder (ANSD) and multiple disabilities (C5) • Compare and contrast (based on research evidence) the different speech/ sound coding	**12**

Content	Competencies	Number of Hours
	strategies with reference to the type and its implementation across different devices (C2) • Explain features for enhancing speech and music perception (C2) • Know the surgical procedures: posterior tympanotomy, varia technique, hearing preservation technique; surgical complications and management (C1) • Identify appropriate intra- operative measurements for device function (impedance/ voltage/ compliance telemetry); patient function (eCAP, eSRT, eABR and facial nerve monitoring) (C3) • Evaluating stimulation and recording protocol in anomalous cochlear/ nerve, ANSD and multiple disabilities (C5)	
Unit 4: Programming Cochlear Implants		
	• Demonstrate programming and parameter optimization (pulse width, rate of stimulation, frequency allocation/ re- allocation, map law) (C2) • Pre-requisites for mapping: • Apply the knowledge of pre-implant radiological report, post-implant radiological report; discharge report of surgeon; non-physiological objective measures (electrode impedance, compliance, electrode voltage); special considerations in cochlear/nerve anomaly, ANSD, multiple disabilities and SSD during programming (C3) • Demonstrate the effects of map parameters on perception of loudness, pitch perception, gap detection (C2) • Explain objective measurement-based programing (evidences from research): behavioral maps; objective maps (eCAP, eSRT and eABR based programming); evidence and target based programming (artificial intelligence); self-programming (C2) • Identify ways to document the performance and benefit of CI as a function of MAP optimization- speech and non-speech; electrophysiological measures (eABR and other evoked potentials) (C3) • Maximizing hearing aid fitting in the contralateral ear for bimodal implants; bilateral cochlear implants; electroacoustic stimulation and SSD (C3) • Identify and manage device failures; identifying and managing infection, magnet migration, electrode extrusion; identifying and managing poor	**12**

Content	Competencies	Number of Hours
	performance; decision making in subjects with poor performance; special consideration in revision implantation (C3) • Summarize audit of outcomes for CI (C2) • Outline the limitations and future developments/ requirements (device, techniques and procedures) (C2)	
Unit 5: Auditory Brainstem Implant (ABI) and Auditory Midbrain Implant (MBI)		
	• Identify the types and components of ABI and MBI (C3) • Identify the candidacy for ABI and MBI in children and adults using audiological and non-audiological tests (with evidences from research) for predicting outcome (C2) • Demonstrate counseling and realistic expectations (C2) • Demonstrate understanding of the intra-op procedures (ABI and MBI): eABR, cranial nerve monitoring (C2) • Know the surgical procedures involved in ABI and MBI (C1) • Demonstrate understanding of the different post-op programming methods in 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 (C2) • Choose appropriate speech and non-speech measures for assessment of benefit (C3) • Make use of eABR, aided cortical potentials, PET and fNIRS in programming and monitoring outcomes (C3) • Managing and monitoring subject with ABI: • -Apply the knowledge to plan rehabilitation strategy (C3) • -Identifying and managing complications (device failure, infection, trauma, device migration, radio imaging) (C3) • - Identify poor performance- auditing outcome (C3) • - Make decisions in complications and poor performance (C3)	**12**

Learning Strategies, Contact Hours and Student Learning Time (SLT)						
Learning Strategies	**Contact Hours**		**Student Learning Time (SLT)**			
Seminar / Lecture or Tutorial	45		90			
Self-directed learning (SDL)	15		30			
Total	**60**		**120**			
Assessment Methods						
Formative	**Summative**					
Class Seminar	End Semester Exam (theory)					
Assignments / Class test	Mid Semester Exam (theory)					
Mapping of Assessment with COs						
Nature of Assessment	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Mid Semester Examination	x	x	x	x	x	
Class Seminar / Assignments / Class test	x	x	x	x	x	x
End Semester Exam	x	x	x	x	x	x

Feedback Process	Mid-Semester Feedback
	End-Semester Feedback
Main Reference	• Wolfe, J., & Schafer, E. C. (2015). Programming cochlear implants-Second edition. Plural publishing. • Hughes, M. L. (2013). Objective measures in cochlear implants. Plural publishing. • Møller A.R. (2006). Cochlear and Brainstem Implants (Vol. 64). • Mankekar, G. (2014). Implantable Hearing Devices other than Cochlear Implants. Springer India. • Cooper, H., & Craddock, L. (2006). Cochlear Implants: A Practical Guide. Wiley.
Additional References	• Eisenberg, L. S. (2009). Clinical Management of Children with Cochlear Implants. Plural Publishing. • Gifford, R. H. (2013). Cochlear Implant Patient Assessment: Evaluation of Candidacy, Performance, and Outcomes. Plural Publishing. • Hagr, A. (2007). BAHA: Bone-Anchored Hearing Aid. International Journal of Health Sciences, 1(2), 265–276. • Kim C. S., Chang S. O., & Lim D. (Eds.). (1999). Updates in Cochlear Implantation: The 2nd Congress of Asia Pacific Symposium on Cochlear Implant and Related Sciences, Seoul, April 1999 (Vol. 57). Seoul: KARGER. • Kompis, M., & Caversaccio, M.D. (2011). Implantable Bone Conduction Hearing Aids.Karger Medical and Scientific Publishers. • Clark, G., Cowan, R. S. C., & Dowell, R. C. (1997). Cochlear Implantation for Infants and Children: Advances. Singular Publishing Group. • Dutt, S. N. (2002). The Birmingham Bone Anchored Hearing Aid Programme: Some Audiological and Quality of Life Outcomes. Den Haag: Print Partners Ipskamp. • Niparko, J. K. (2009). Cochlear Implants: Principles & Practices. Lippincott Williams & Wilkins.

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Speech Perception**
Course Code	**AUD7103**
Academic Year	Second
Semester	III
Number of Credits	4
Course Prerequisite	The student should have a basic knowledge Of phonetics of speech sounds .
Course Synopsis	The module will provide information regarding coding of speech in the auditory pathway, theories of speech perception, role of memory in speech perception and aspects of dichotic listening.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Explain coding of speech in the auditory pathway in normal hearing and hearing impaired individuals. (C2)
CO2	Critically evaluate theories of speech perception and methods to synthesis speech perception. (C4)
CO3	Explain speech perception in relation to short term memory. (C2)
CO4	Describe aspects of dichotic speech perception. (C2)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	x	x						
CO2	x					x		
CO3			x			x		
CO4	x					x		

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1		
Theories of Speech Perception	**The student should be able to** • Distinguish basic concepts of speech perception; hearing, listening, perception and comprehension (C4) • Identify acoustic cues of different classes of speech sounds (C3) • Explain the concept of categorical and	**12**

Content	Competencies	Number of Hours
	continuous speech perception (C2) • Explain normalization of vowels and consonants in speech perception (C2) • Explain coding of speech in the auditory pathway - cochlea, auditory nerve and the central auditory pathway (C2) • Compare theories of speech perception (acoustic, neurological, auditory, motor, analysis-by-synthesis, dual stream, reverse hierarchy theory) (C4)	
Unit 2		
Perceptual Cues for Vowels and Consonants	The student should be able to • Identify major and minor cues for perception of vowels and diphthongs in normal - major and minor cues (C3) • Identify Major and minor cues to identify place, manner and voicing features of stops, fricatives, affricates, nasals in normals (C3) • Compare perception of vowels and consonants in the persons with hearing impairment and normal hearing (C4) • Compare perception of vowels and consonants through amplification and implantable devices (C4)	**12**
Unit 3		
Speech Perception of Segmental and Suprasegmental Features	The student should be able to • Explain the effects of co-articulation on speech perception (C2) • Identify cues for perception of suprasegmental features in normal hearing individuals (C3) • Compare perception of segmental and suprasegmental features in persons with hearing impairment and normal hearing individuals (C4)	**12**
Unit 4: Factors related to Speech Perception		
Memory and speech perception	The student should be able to • Identify the stages of memory, its coding and capacity (C3) • Compare models of short term memory: Dual coding Model, Modal model, A model for auditory memory and contrast, Working memory model (C4) • Identify the role of short term memory in the perception of consonants and vowels (C3)	**12**

Content	Competencies	Number of Hours
Dichotic listening	The student should be able to • Explain physiological bases of dichotic listening (C2) • Compare theories of dichotic listening (C4) • Assess dichotic listening and the clinical significance of the results (C5) • List the factors influencing dichotic perception (C4)	
Music perception	The student should be able to • Explain methods used to study perception of music (C2) • Compare perception of music through amplification and implantable devices (C4)	
Unit 5: General issues related to speech perception		
Methods and Study designs	The student should be able to • Explain study designs and methods to study speech perception: EEG/electrophysiological and behavioral methods (C2) • Explain role of cognition in speech perception. (C2)	**12**
Infant speech perception	The student should be able to • Explain methods of studying infant speech perception (C2) • Compare perception of consonants and vowels in infants and adults (C4) • Compare theories of infant speech perception (universal theory, attunement theory, perceptual learning theory, maturational theory, perceptual magnetic theory) (C4)	
Speech perception in animals	The student should be able to • Explain methods of study of speech perception in animals (C2) • Compare perception of consonants and vowels; categorical perception and normalization in animal and humans (C4) • Identify need for studying speech perception in animals (C3)	

Learning Strategies, Contact Hours and Student Learning Time (SLT)		
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**
Seminar / Lecture or Tutorial	45	90
Self-directed learning (SDL)	15	30
Total	**60**	**120**

Assessment Methods				
Formative	**Summative**			
Mid Semester Exam (theory)	End Semester Exam (theory)			
Seminar / Assignments / Class test				
Mapping of Assessment with COs				
Nature of Assessment	**CO1**	**CO2**	**CO3**	**CO4**
Mid Semester Examination	x	x	x	
Seminar / Assignments / Class test	x	x	x	x
End Semester Exam	x	x	x	x

Feedback Process	Mid-Semester Feedback
	End-Semester Feedback
Main Reference	• Raphael, L. J., Borden,G. J.,& Harris K. S. (2011). Speech Science Primer: Physiology, Acoustics, and Perception of Speech (Sixth edition). Baltimore, MD: LWW. • Pickett, J. M. (1998). The Acoustics of Speech Communication: Fundamentals, Speech Perception Theory, and Technology (1 edition). Boston: Pearson • Sanders, D.A (1977).Auditory perception of speech - an introduction to principle and problems. New Jersey: Prentice Hall • Kent, R. D. (2002). Acoustic Analysis of Speech (2nd Revised edition edition). Australia ; United States: Delmar Cengage Learning.
Additional References	• Pisoni, D. B., &Remez, R. E. (Eds.). (2005). The Handbook of Speech Perception. Blackwell Publishing Ltd. • 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 ToHonor 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

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Auditory Processing Disorders**
Course Code	**AUD7104**
Academic Year	Second
Semester	III
Number of Credits	4
Course Prerequisite	The student should have a basic knowledge on Auditory processing disorders
Course Synopsis	The module will provide information regarding assessment, factors influencing assessment, differential diagnosis, and management of auditory processing disorders.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Explain the physiological bases of Auditory processing disorders (APDs); models of auditory and spoken language processing; animal studies of auditory processing; imaging studies in APD (C2)
CO2	Utilize different behavioural and electrophysiological tests for assessment of APD; Develop APD test materials; Plan various management techniques for APD and also the role of team members in management of APDs (C3)
CO3	Examine screening tools for APD; Analyse the factors influencing assessment and management of APDs (C4)
CO4	Discuss the relationship between behavioural and electrophysiological measures of APD with implications for diagnosis; Diagnosis and differential diagnosis of APD; Choose management options for APD with evidence based approach and treatment efficacy (C6)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	x							
CO2	x					x		
CO3	x					x		
CO4	x					x		

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1		
Introduction to Auditory Processing Disorders (APDs)	• Recall terminologies and definitions of APD (C1) • List the underlying neurobiological and neurochemical (genetic) correlates (C1) • Explain the relationship between neural maturation - degeneration and auditory processing (C2) • Explain models to explain auditory and spoken language processing: Relationship between the two (C2) • Explain the methods of studying auditory processing - Animal studies (C2) • Explain Various disorders that lead to APDs (Syndromes, TBI etc.): Signs, symptoms and classification (C2) • Compare developmental communication disorders and APDs (C2)	**12**
Unit 2: Assessment of APDs		
Behavioral assessment	• Overview of behavioral assessment in APDs (C2) • Explain screening for APDs: questionnaires, checklists and tests (C2) • Explain dichotic test (linguistic and non-linguistic) (C2) • Explain monaural tests (linguistic and non-linguistic) (C2) • Explain psychoacoustic tests for assessment of APDs (C2)	**12**
Unit 3: Assessment of APDs		

Electrophysiological assessment	• Electrophysiological measures and their clinical applications in diagnosing APDs
	  • (i). Explain Endogenous potentials (C3,P2)
	  • (ii). Explain Exogenous potentials (C3,P4)
	• Explain Correlation between behavioral and electrophysiological measures: implications for diagnosis (C2)
	• Explain factors influencing assessment of APDs: behavioral and electrophysiological (C2)
		12

Unit 4		
Management of APDs	• Explain management of APDs in children and adults (C3) • Explain direct remediation techniques and meta-cognitive and meta-linguistic approaches (C2)	**12**

Content	Competencies	Number of Hours
	• Explain auditory perceptual training and its methods, applicability and outcome (C2) • Explain evidence based approach and treatment efficacy (C2) • Explain multidisciplinary approach (C2) • Signal enhancement and room acoustics (C3) • Aids and appliances - indication and outcome (C3) • Explain factors affecting management of APDs (C2)	
Unit 5		
Team work in the diagnosis and management of APDs	• Explain electrophysiological and radiological correlates for APDs: implications in management (C2) • Explain findings of Imaging and cognitive tests in APDs (C2) • Diagnosis and differential diagnosis (C6,P2) • Explain procedure for development of APD test materials (linguistic and non-linguistic) (C2) • List open source software for developing diagnostic tests and intervention modules (C1)	**12**

Learning Strategies, Contact Hours and Student Learning Time (SLT)		
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**
Seminar / Lecture or Tutorial	45	90
Self-directed learning (SDL)	15	30
Total	**60**	**120**

Assessment Methods	
Formative	**Summative**
Mid Semester Exam (theory)	End Semester Exam (theory)
Seminar / Assignments / Class test	

Mapping of Assessment with COs				
Nature of Assessment	**CO1**	**CO2**	**CO3**	**CO4**
Mid Semester Examination	x	x	x	
Seminar / Assignments / Class test	x	x	x	x
End Semester Exam	x	x	x	x

Feedback Process	Mid-Semester Feedback
	End-Semester Feedback

Main Reference	• ASHA 2005. CAPD technical report. • Geffner, D., & Ross-Swain, D (2013). APD: Assessment, management, and treatment. 2nd Edn • Musiek Barn Shinn Jones (2012). Disorders of the auditory system • Katz 7th edition, HB of clinical audiology • Musiek Chermak (2014) HB of CAPD: Auditory neuroscience and diagnosis, 2nd edition vol 1
Additional References	• Chermak and Musiek (2016) HB of CAPD – Comprehensive intervention, Vol II • Chermak and Musiek (2002). Auditory training: Principles and approaches for remediating and managing APDs. Seminars in Hearing 23(#). 297-308

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Clinicals - III**
Course Code	**AUD7131**
Academic Year	Second
Semester	III
Number of Credits	6
Course Prerequisite	The student should have a knowledge on basic Audiological assessments
Course Synopsis	The module will provide the student the clinical knowledge in the assessment and management of auditory processing disorders and latest advances in implantable devices for persons with hearing impairment.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Perform audiological assessment on children to identify hearing loss. (C4,P4)
CO2	Carry out assessment for identification of auditory processing disorders.(C4,P4)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1		x				x		
CO2		x				x		

Course Content and Outcomes

Content	Competencies	Number of Hours
Know-how (Ability to apply)		
	• Identify, manage and counsel persons with genetic hearing loss. (C3)	1 SDL
	• Choose appropriate tests/protocols for evaluating children and multiply disabled. (C3)	1 SDL
	• Develop language / culture sensitive APD tests. (C3)	1 SDL
	• Advise clinical clientele on the latest implantable devices available for persons with hearing impairment.	1 SGD 1 SDL
Show (Demonstrate in a clinical diary/log book based on clinical reports/recordings, etc.)		
	• Administration of different tests for APD. (C3, P5)	1 SGD 1 SDL

Content	Competencies	Number of Hours
	• Plan management for 5 persons with APD/at risk for APD. (C3)	1 SGD 2 SDL
Do (Perform on patients/ client contacts)		
	• Perform complete audiological evaluation, behavioural and electrophysiological tests on 10 children with hearing loss and prepare a report explaining the results of the test and make appropriate recommendations. (C4, P5)	1 SGD 1 SDL
	• Administer APD test battery on 5 persons with APD symptoms and prepare a report. (C4, P5)	1 SGD 1 SDL

Learning Strategies, Contact Hours and Student Learning Time (SLT)			
Learning Strategies	**Contact Hours**		
Small Group Discussion (SGD)	5		
Self-directed learning (SDL)	9		
Clinic	256		
Total	**270**		
Assessment Methods			
Formative	**Summative**		
Clinical assessment (WBPA)	Clinical Viva (internal)		
Practical Log Book/ Record Book			
Mapping of Assessment with COs			
Nature of Assessment	**CO1**	**CO2**	
Clinical assessment (WBPA)	x	x	
Practical Log Book/ Record Book	x	x	
Clinical Viva (internal)	x	x	
Feedback Process:	Mid-Semester Feedback		
	End-Semester Feedback		

SEMESTER - IV

COURSE CODE	:	COURSE TITLE
AUD7201	:	Audiology in Practice
AUD7202	:	Vestibular System and its Disorders
AUD7251	:	Dissertation
AUD7231	:	Clinicals - IV

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Audiology in Practice**
Course Code	**AUD7201**
Academic Year	Second
Semester	IV
Number of Credits	4
Course Prerequisite	The student should have a basic knowledge on scope and practice of Audiology
Course Synopsis	The course will provide information on role of audiologist in different set ups, working with professionals in setting up audiology clinic, implement acts and legislations relating to persons with hearing impairment.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	To review implementation acts and legislations relating to persons with hearing impairment (C3)
CO2	To build liaison with other professionals in setting-up an audiology clinic and audit audiology practices in existing set-ups (C6)
CO3	To suggest advise to Government and other agencies on the formulation of policies, legislative acts relating to hearing disability (C6)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	x			x				
CO2			x					x
CO3				x				x

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1: Scope of Practice, Laws, Regulations and Professional Ethics		
	• To explain Scope of practice in global and Indian scenario (C2) • To summarize Professional ethics (C2) • To explain Existing acts, legislations, policies related to persons with communication impairment (C2) • To summarize role of audiologist in the formulation of acts, regulations and policies (C2)	**12**

Content	Competencies	Number of Hours
	• To review implementation of acts, legislations, policies and welfare measures relating to persons with hearing impairment (C3) • To review advocacy groups and rights of citizens (C3) • To summarize National and international standards related to audiology (C2) • To summarize Welfare measures provided by State and Central Government for persons with hearing impairment (C2)	
Unit 2: Specialized Programs in Audiology		
	• To explain need for specialized programs in audiology: Geriatric and persons with multiple disability (C2) • To summarize importance of Forensic audiology (C2) • To summarize Health, wellness, and health care - Health promotion and disease prevention, quality of life and healthcare finances (C2) • To explain disability-friendly environment including public education (C2) • To review prevention and early identification programs including societal participation (C5)	**12**
Unit 3: Service Delivery Models in Audiology		
	• To review Services in different medical / rehabilitation/ research /educational set ups (C5) • To review School based services pertaining to regular and special schools (C5) • To review Community based practice in rural and urban areas (C5) • To review Family empowerment programs (C5) • To review Home based delivery of services • To summarize Autonomous practice in audiology (C2) • To use Apps for hearing screening/assessment (C3)	**12**
Unit 4: Tele-practice in Audiology		
	• To explain Information and communication technology in Audiology practice (C2) • To explain Infrastructure for video-conferencing and tele-practice in audiology (C2) • To identify Techniques/principles of remote	**12**

Content	Competencies	Number of Hours
	testing for screening and diagnostic assessment for hearing, intervention and counselling (C3) • To assess the challenges and limitations of tele-practice in audiology in screening, assessment and evaluation, selection of aids and appliances, therapeutics and counselling.(C5)	
Unit 5: Issues in Audiology Practice		
	• To explain Medico-legal issues (C2) • To explain Entrepreneurship and planning to set up private practice/clinic for audiology practice: Clinical ethics (C2) • To determine documentation in audiology practice: clinical / demographic data, database management and storage (C3) • To summarize ICF framework for documentation / reports (C2) • To review Quality control and auditing in audiology practice (C3) • To summarize Documenting and implementing evidence based practice in audiology (C2) • To review the Understanding of team approach: Work in cohesion with other professionals (C3) • To review Information resources in audiology including books and journals, both electronic and print – Databases (C3)	**12**

Learning Strategies, Contact Hours and Student Learning Time (SLT)		
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**
Seminar / Lecture or Tutorial	45	90
Self-directed learning (SDL)	15	30
Total	**60**	**120**

Assessment Methods	
Formative	**Summative**
Mid Semester Exam (theory)	End Semester Exam (theory)
Seminar / Assignments / Class test	

Mapping of Assessment with COs			
Nature of Assessment	**CO1**	**CO2**	**CO3**
Mid Semester Exam (theory)	x	x	
Seminar / Assignments / Class test	x	x	x
End semester exam	x	x	x

Feedback Process	Mid-Semester Feedback
	End-Semester Feedback
Main Reference	• 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. • Ramachandran, V & Stach, B. A. (2013). Professional Communication Audiology. San Diego: Plural Publishing Inc
Additional References	• Resource Guide for Educational/Pediatric Audiologists. Retrieved from http://www.asha.org/aud/pediatric-ed • Rizzo, S.R., &Trudean, M.D. (1994). Clinical administration in audiology and speech language pathology. San Diego: Singular Publishing Group Inc. • Rushbrooks, E & Houston, K.T. (2015). Telepractice in Audiology. San Diego: Plural Publishing • Stephen, R.R., Jr., Trudeau, D.M. (Eds.) (1994). Clinical administration in audiology & speech language pathology. San Diego: Singular Publishing Group Inc. • Taylor, B. (2015). Marketing in an Audiology practice. San Diego: CA: 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

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Vestibular System and its Disorders**
Course Code	**AUD7202**
Academic Year	Second
Semester	IV
Number of Credits	4
Course Prerequisite	The student should have a basic knowledge on anatomy and physiology of vestibular system
Course Synopsis	The module will revise the concepts of anatomy and physiology of vestibular system and disorders. The student will have understanding on the various assessment tests/protocols and management strategies for vestibular disorders.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Explain normal and abnormal anatomy and physiology of vestibular system. (C2)
CO2	Choose the appropriate test and interpret the test results. (C3)
CO3	Explain the pathophysiology of vestibular disorders. (C2)
CO4	Differentiate different vestibular pathologies. (C4)
CO5	Plan vestibular rehabilitation for each patient.(C3)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	x							
CO2		x			x			
CO3	x					x		
CO4		x						
CO5		x						

Course Content and Outcomes

Content	Competencies	Number of Hours
Unit 1		
Anatomy and Physiology of the Vestibular System	The student should be able to • explain peripheral vestibular system including semicircular canals, utricle, saccule and vestibular nerve (C2) • explain central vestibular pathway (brainstem, cerebellum, cortex) (C2)	**12**

Content	Competencies	Number of Hours
	• summarize reflexes involving vestibular system like vestibuloocular reflex, vestibulo spinal reflex and vestibulo colic reflex. (C2) • compare other systems involved in maintenance of balance like proprioceptive system, visual system etc (C2)	
Unit 2		
Assessment of the Vestibular System	The student should be able to • Compare and perform 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 (C4) • compare and perform screening for vestibular disorders (C4) • design and perform Questionnaires to assess quality of life in persons with vertigo (C5)	**12**
Unit 3		
Pathophysiology of Vestibular Disorders	The student should be able to • explain difference between Peripheral Vestibular Disorders like Benign paroxysmal positional vertigo, Meniere's disease, Vestibular neuritis, Labyrinthitis, Ototoxicity, vestibular neuropathy (C2) • explain Perilymph fistula, Superior semicircular canal dehiscence, Auditory neuropathy spectrum disorders, Vestibular schwannomas (C2) • differentiate 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 (C4) • Explain vestibular disorders in children (C2) • Explain age related changes in vestibular system (C2)	**12**
Unit 4		
Profiling Vestibular Disorders using	The student should be able to • construct profile of Benign paroxysmal positional vertigo, Meniere's disease, Vestibular	**12**

Content	Competencies	Number of Hours
Audio Vestibular Test Battery	neuritis, Labyrinthitis, Ototoxicity, Perilymph fistula, Superior semicircular canal dehiscence, Auditory neuropathy spectrum disorders, Vestibular schwannomas, Multiple sclerosis, Cranial tumors, , vestibular neuropathy (C5) • evaluate and perform Quality of life in persons with vestibular disorders (C5, P5)	
Unit 5		
Management of Persons with Vestibular Disorders	The student should be able to • select medical management (C1) • select surgical management (C1) • choose vestibular rehabilitation: (C3, P4) a. Repositioning Maneuvers b. Adaptation Exercises c. Habituation Exercises d. Imbalance Exercises • transform procedures to meet special considerations for rehabilitation of children with vestibular problems (C2, P3) • select Vestibular implants (C1)	**12**

Learning Strategies, Contact Hours and Student Learning Time (SLT)						
Learning Strategies	**Contact Hours**	**Student Learning Time (SLT)**				
Seminar / Lecture or Tutorial	45	90				
Self-directed learning (SDL)	15	30				
Total	**60**	**120**				
Assessment Methods						
Formative	**Summative**					
Mid Semester Exam (theory)	End Semester Exam (theory)					
Seminar / Assignments / Class test						
Mapping of Assessment with COs						
Nature of Assessment	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	
Mid Semester Exam (theory)	x	x	x			
Seminar / Assignments / Class test	x	x	x	x	x	
End Semester Exam	x	x	x	x	x	
Feedback Process	Mid-Semester Feedback					
	End-Semester Feedback					
Main Reference	• 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 • McCaslin, D. L. (2013). Electronystagmography and videonystagmographyENG / VNG. San Diego: Plural Publishing Inc.
Additional References	• Ackley, R. S., Decker, T. N., & Limb, C. J. (2007). An essential guide to hearing and balance disorders. New Jersey: Lawrence Erlbaum Associates Inc. • Biswas, A. (2009). Clinical audio-vestibulometry for otologists and neurologists. 4thEd. Mumbai, India: Bhalani Publishing House. • Jackler, R. K., & Brackmann, D. E. (2005). Neurotology. 2ndEd. Philadelphia: Elsevier Mosby. • Jacobson, G. P., & Shepard, N. T. (2014). Balance function assessment and management. San Diego: CA: Plural Publishing Inc. • Kaga, K. (2014). Vertigo and balance disorders in children. Tokyo, Japan: Springer. • 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.

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Dissertation**
Course Code	**AUD7251**
Academic Year	Second
Semester	IV
Number of Credits	9
Course Prerequisite	Basic knowledge in Research Methodology and Statistics
Course Synopsis	This project work is to introduce the student to carry out independent research under the guidance. This will enable them to understand the process and stages involved in preparing the research question, planning the study, executing the study and reporting the findings in the acceptable scientific format.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Complete the research project and organize information/data to reveal patterns/themes (C3, P4, A4)
CO2	Analyze and synthesis information/data to generate new knowledge/understanding (C5)
CO3	Demonstrate the ability to write publications aimed at peer review (P5, A4, C2)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1				x		x		
CO2	x						x	
CO3					x	x		

Course Content and Outcomes

Content	Competencies / Activities	Number of Hours
A student should have completed all the previous steps of research such as topic selection, literature search, necessary IRC, IEC, CTRI approval.		
Data collection & coding the data **Statistical analysis & interpretation**	1. Initiating data collection (P5, A2) 2. Organizing the data by scoring and tabulating (C3) 1. Analyze the data using appropriate statistical tools in consultation with the statistician (C4) 2. Interpret and discuss the result to generate new understanding of the data (C5)	195

Content	Competencies / Activities	Number of Hours
Dissertation approval and drafts of publication	1. Prepare final draft of the chapters (Introduction, ROL, Method and Results and Discussion) for approval along with plagiarism report (C5) 2. Revise as per suggestions and make the final submission (C5) 3. Prepare a draft of publication for presentation to appropriate stakeholders and internal/peer review (C3, P2, A2)	

Learning Strategies, Contact Hours and Student Learning Time (SLT)			
Learning Strategies	**Contact Hours**		
Practical	405		
Total	**405**		
Assessment Methods			
Formative	**Summative**		
Research log book (Periodic assessment)	Final research proposal		
	Viva		
Mapping of Assessment with COs			
Nature of Assessment	**CO1**	**CO2**	**CO3**
Research log book	x		
Viva		x	x
Final research proposal	x	x	x
Feedback Process	Mid-Semester Feedback		
	End-Semester Feedback		
Additional reference	• Stephen Polgar, Shane A. Thomas. (2011). Introduction to Research in the Health Sciences. Elsevier Health Sciences.		

Manipal College of Health Professions	
Name of the Department	Speech and Hearing / Audiology & Speech Language Pathology
Name of the Program	Master of Science in Audiology
Course Title	**Clinicals - IV**
Course Code	**AUD7231**
Academic Year	Second
Semester	IV
Number of Credits	6
Course Prerequisite	The student should have a knowledge on Audiological assessments
Course Synopsis	The module will provide the student clinical knowledge in the assessment of vestibular disorders, mapping and troubleshooting of cochlear implants.

Course Outcomes (COs)
At the end of the course student shall be able to**:**

CO1	Administer vestibular tests for the identification of vestibular disorders. (C4,P3)
CO2	Mapping and Troubleshoot cochlear implants (C4, P3)

Mapping of Course Outcomes (COs) to Program Outcomes (POs)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1		x				x		
CO2		x				x		

Course Content and Outcomes

Content	Competencies	Number of Hours
Know-how (Ability to apply)		
	• Choose appropriate tests/protocols for evaluation and management of persons with giddiness. (C3, P5) • Set up audiology clinics / centers in different set ups. (C3) • Procedure for certification of persons with disability. (C3) • Financial planning and insurance policies. (C3)	**3 SDL**
Show (Demonstrate in a clinical diary/log book based on clinical reports/recordings, etc.)		
	• Administration of different tests for vestibular assessment. (C3, P5) • Troubleshoot cochlear implants. (C3, P5)	**3 SGD** **2 SDL**

Content	Competencies	Number of Hours
Do (Perform on patients/ client contacts)		
	• Administer complete vestibular test battery on 5 persons with giddiness. (C3, P5) • Carry out pre-implant counselling for 5 persons with hearing loss. • Carry out mapping for 5 persons using cochlear implants. (C3,P4) • Counsel 5 persons regarding use and maintenance of cochlear implants. (C3)	**2 SGD** **5 SDL**

Learning Strategies, Contact Hours and Student Learning Time (SLT)			
Learning Strategies	**Contact Hours**		
Small Group Discussion (SGD)	5		
Self-directed learning (SDL)	10		
Clinic	255		
Total	**270**		
Assessment Methods			
Formative	**Summative**		
Clinical assessment (WBPA)	Clinical Viva (external)		
Clinical Viva			
Practical Log Book/ Record Book			
Mapping of Assessment with COs			
Nature of Assessment	**CO1**	**CO2**	
Clinical assessment (WBPA)	x	x	
Clinical Viva	x	x	
Practical Log Book/ Record Book	x	x	
Clinical Viva (external)	x	x	
Feedback Process	Mid-Semester Feedback		
	End-Semester Feedback		

7. Program Outcomes (POs) and Course Outcomes (COs) Mapping

Sem.	Course Code	Course Title	Credits	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
I	**ABS6101**	Advanced Biostatistics and Research Methodology	4	CO1 CO2 CO3 CO4 CO5					CO2	CO4	
I	**AUD6101**	Technology in Audiology	4	CO1 CO3 CO4	CO2						
I	**AUD6102**	Cochlear Physiology	4	CO1 CO2				CO3			
I	**AUD6103**	Neurophysiology of Hearing	4	CO1 CO2 CO3							
I	**AUD6104**	Hearing Sciences	4	CO1	CO2 CO3 CO4				CO2 CO3 CO4		
I	**AUD6131**	Clinicals-I	6		CO1 CO2 CO3				CO1 CO2 CO3		
II	**AUD6201**	Auditory Perception	4	CO1	CO2 CO3 CO4				CO2 CO3 CO4		
II	**AUD6202**	Auditory Disorders	4	CO1		CO2 CO3			CO2 CO3		
II	**AUD6203**	Electrophysiological Assessment	4	CO1	CO2 CO3 CO4				CO3 CO4 CO5		
II	**AUD6204**	Advances in the Management of Hearing loss	4	CO1 CO3	CO2 CO4 CO5	CO4		CO3	CO2 CO5		
II	**AUD6231**	Clinicals-II	6		CO1 CO2 CO3			CO3	CO1 CO2		
III	**AUD7101**	Genetics of Hearing and Pediatric Audiology	4	CO1 CO2 CO3 CO4 CO5				CO1	CO2 CO3 CO4 CO5		
III	**AUD7102**	Implantable Auditory Devices	4	CO1 CO2	C02 CO4 CO5	CO3	CO6	CO5 CO6	CO3 CO4		
III	**AUD7103**	Speech Perception	4	CO1 CO2 CO4	CO1	CO3			CO2 CO3 CO4		
III	**AUD7104**	Auditory Processing Disorders	4	CO1 CO2 CO3 CO4					CO2 CO3 CO4		

Sem.	Course Code	Course Title	Credits	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
III	**AUD7131**	Clinicals-III	6		CO1 CO2				CO1 CO2		
IV	**AUD7201**	Audiology in Practice	4	CO1		CO2	CO3				CO2 CO3
IV	**AUD7202**	Vestibular System and its Disorders	4	CO1 CO3	CO2 CO4 CO5			CO2	CO3		
IV	**AUD7251**	Dissertation	7	CO2			CO1	CO3	CO1 CO3	CO2	
IV	**AUD7231**	Clinicals-IV	6		CO1 CO2				CO1 CO2		

8. MCHP PG PROGRAM REGULATION

1. Program Structure

1.1. The program offers a semester based credit system (with few programs offering specialization too).

1.2. An academic year consists of two semesters – Odd semester (July - December) and Even semester (January – June)

1.3 Each semester shall extend over a minimum period of 13 weeks of academic delivery excluding examination days, semester breaks, declared holidays and non-academic events.

1.4 Medium of instruction shall be in English

1.5 Program Regulated by Rehabilitation Council of India (RCI)

2 Credit Distribution

2.1 Each semester has minimum 13 weeks of contact sessions. One credit = 13 hours. The credit distribution hours for Lecture/Seminar, Tutorial, Practical, Clinics and Project are as follows:

Seminar (S)	:	1 Hour /week = 1 credit
Self-Learning (SL)	:	1 Hour /week = 1 credit
Clinics (CL)	:	3 Hours/week = 1 credit
Project work (PW)	:	3 Hours/week = 1 credit

2.2 A semester has courses structured as theory, project and clinics. Each course is of minimum 2 credits. The maximum credits for theory course is 4.

3 Attendance

3.1 Minimum attendance requirements for each course is:

i. Theory : 85 %

ii. Clinics / Practical : 90 %

3.1 As per the directives of MAHE, there will be no consideration for leave on medical grounds. The student will have to adjust the same in the minimum prescribed attendance.

3.2 Students requiring **leave** during the academic session should apply for the same through a formal application to the Head of Department through their

respective Class In-charge/ Coordinator. The leave will be considered as absent and reflected in their attendance requirements.

3.3 No leverage will be given by the department for any attendance shortage.

3.4 Students, Parents/ guardians can access the attendance status online periodically. Separate intimation regarding attendance status would not be sent to parents/students.

3.5 Students having attendance shortage in any course (theory & practical) will not be permitted to appear for the End-semester exam (ESE) of the respective course.

4 Examination

4.1 Exams are in two forms - Sessional examination (conducted as a part of internal assessment) and End semester examination.

4.2 The final evaluation for each course shall be based on Internal Assessment Components (**IAC**) and the End-semester examinations **(ESE)** based on the weightage (as indicated in clause 5.1) given for respective courses.

4.3 IAC shall be done on the basis of a continuous evaluation after assessing the performance of the student in mid semester exam, class participation, assignments, seminars or any other component as applicable to a course.

4.4 All the ESE for the odd semesters **(regular ESE)** will be conducted in November-December. All the ESE for the even semesters **(regular ESE)** will be conducted in May-June.

4.5 For those whose failed to clear any course during regular ESE, a **supplementary/make up exam** is conducted 2 weeks immediately after the ESE result declaration to enable him / her to earn those lost credits. A nominal fee as per MAHE rules will be applicable during this examination.

4.6 For core courses, the duration of ESE for a 2 credit course would be 2 hours (50 marks) and for a course with 3 or more credits, 3 hours (100 marks). For program elective course, the exam duration is 2 hours (50 marks).

5. Weightage for Internal Assessment Component (IAC) and End Semester Exam (ESE)

5.1 Any one or a combination of marks distribution criteria applicable to a course.

IAC Weightage (%)	ESE Weightage (%)
20	80
30	70
50	50
100	Nil
Nil	100

6. Minimum Requirements for Pass

6.1. Pass in a course will be reflected as grades. No candidate shall be declared to have passed in any course unless he/she obtains not less than **"E" grade**

6.2. For all courses (core / non-core), candidate should obtain a minimum of 50% (ESE) to be declared as pass.

6.3 When a student appears for **supplementary examination**, the maximum grade awarded is "C" grade or below irrespective of their performance.

6.4. For students who fail to secure a minimum of 'E' grade for a course, an **improvement examination** is conducted to improve their IAC marks. The student can appear for these examination along with the subsequent batches' mid semester / sessional exams. The marks obtained in other components of IAC can be carried forward without reassessment. A nominal fee is charged as per MAHE for per course of improvement in IAC.

7. Calculation of GPA and CGPA

7.1. Evaluation and Grading (**Relative Grading**) of students shall be based on GPA (Grade Point Average) & CGPA (Cumulative Grade Point Average).

7.2. The overall performance of a student in each semester is indicated by the Grade Point Average (GPA). The overall performance of the student for the entire program is indicated by the Cumulative Grade Point Average (CGPA).

7.3. A ten (10) point grading system **(credit value)** is used for awarding a letter grade in each course.

Letter Grade	A+	A	B	C	D	E	F/I/DT
Grade points	10	9	8	7	6	5	0

DT – Detained/Attendance shortage, I – Incomplete

7.4 Calculation of GPA & CGPA: An example is provided

Course code	Course	Credits (a)	Grade obtained by the student	Credit value (b)	Grade Points (a x b)
AHS 101	Course - 1	4	B	8	32
AHS 103	Course - 2	4	B	8	32
AHS 105	Course - 3	3	A+	10	30
AHS 107	Course - 4	4	C	7	28
AHS 109	Course - 5	5	A	9	45
TOTAL		**20**	**-**	**-**	**167**

1st Semester GPA = Total grade points / total credits

167/20 = **8.35**

Suppose in **2nd semester GPA** = **7** with respective course credit 25

$$\text{Then, } \mathbf{1st\ Year\ CGPA} = \frac{(8.35 \text{ x } 20) \ + \ (7 \text{ x } 25)}{20 \ + \ 25} = 7.6$$

8. Progression Criteria to higher semesters

8.1 There is no separate criteria / credits required in order to be promoted to the next academic year.

8.3 However, in order to be eligible to appear for fourth semester (Theory / practical / project submission), the student should have cleared all his previous semesters (i.e. first, second and third).

8.4 The student must complete all the course work requirements by a **maximum of double the program duration**. For e.g. 2 years' program, all the academic course work needs to be completed within 4 years. Failure to do so will result in exit from the program.

9. Semester Break

9.1 Students will have a short semester break following their odd and even end-semester examinations.

10. Project / Dissertation

10.1 Project / Dissertation will carry credits and marks (as applicable to each program)

10.2 Final copy of dissertation **(e-copy)** to be submitted by end of March for plagiarism check and submission to University. A **single hardcopy (student copy)** of the dissertation to be prepared and presented before the external examiner during the viva-voce.

10.3 **Manuscript** format of the thesis also to be submitted to the respective guides / dept.

11. Award of Degree

11.1 Degree is awarded only on **successful completion of entire coursework**.

Head of the Department **Dean**

Deputy Registrar - Academics **Registrar**