

# **BANGALORE UNIVERSITY**

## **REGULATIONS AND SYLLABUS – SEMESTER COURSE FROM 2014**

### **M.Sc (AUDIOLOGY)**

<b><u>M.Sc (Audiology)</u></b>		
Existing		Modified
Internal Assessment marks – 20 Theory paper – 80 Total - 100		Internal Assessment marks – 30 Theory paper – 70 Total – 100
No credit system		4 credits for Core subjects 2 credits for softcore subjects 8 credits for Clinical Practicum
<b>I SEMESTER</b>		
AUD 101	Research Methods in Speech-Language & Hearing	No Change
AUD 102	Statistics in Speech-Language & Hearing	No Change
AUD 103	Technology for Speech-Language & Hearing	AUD 103 is Basics in Auditory Perception
AUD 104	Auditory Physiology	No Change
AUD 105	Basics in Auditory Perception	AUD 105 Technology for Speech-Language & Hearing
AUD 106	No Paper	AUD 106 is Clinical Practicum
<b>II SEMESTER</b>		
AUD 201	Neurophysiology of Hearing	No Change
AUD 202	Psychophysics of Audition in Normals	No Change
AUD 203	Speech Perception	No Change
AUD 204	Physiological Assessment of the Auditory System	No Change
AUD 205*	(a) Clinical Practicum (Internal) (b) Clinical Practicum Exam (External)	AUD 205 is Audiology in Practice

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	No Paper	AUD 206 is Clinical Practicum
III SEMESTER		
AUD 301	Psychophysics of Audition in Clinical Population	No Change
AUD 302	Seminars in Assessment of Individuals with Hearing Impairment	No Change
AUD 303	Speech Perception in Clinical Population	No Change
AUD 304	Electrophysiological Assessment of the Auditory System	AUD 304 : Electrophysiological Assessment of the Auditory System is Elective subject
AUD 305	Audiology in Practice	AUD 305 is Clinical Practicum
IV SEMESTER		
AUD 401	Assessment and Management of Central Auditory Processing Disorders	No Change
AUD 402	Seminars in Rehabilitative Audiology	No Change
AUD 403	Implantable Devices for individuals with Hearing Impairment	No Change
AUD 404	(a) Clinical Practicum (Internal) (b) Clinical Practicum Exam (External)	AUD 404 is Dissertation
AUD 405	Dissertation	AUD 405 is Clinical Practicum

**REGULATIONS & NORMS**  
**MASTER OF SCIENCE IN AUDIOLOGY**  
**M.Sc (Audiology)**

**1.0 Courses offered and duration of the course**

1.1 M.Sc (Audiology)

1.2 Duration of the course: 4 Semesters / 2 years

**Note:** Each semester shall extend over a minimum period of sixteen weeks.

**2.0 Eligibility for admission**

2.1 Candidates with a BASLP/BSLPA/B.Sc (Speech and Hearing) degree of any recognized University are eligible for admission to the course with 40%.

2.2 There is no upper age limit for admission to the course.

2.3 Admission shall be made on the basis of university norms

**3.0 Scheme of Instruction**

3.1 The detailed scheme of examination and paper titles are as given in **Annexure – I**.

3.2 Dissertation in the IV semester shall be in lieu of a paper.

3.3 The syllabus of every paper shall as far as possible, be divided in to five units.

3.4 Candidates shall attend camps/extension programs/educational tour conducted by the institution.

3.5 Hours of instruction (contact hours) per week

Theory: 4 hours per subject per week and soft core subject for 3 hours/per week

Practical: I Year-16 hours per week

II Year-16 hours per week

**4.0 Attendance**

4.1 Each candidate must have minimum 75% in theory classes and 90% in clinical practicum. Failure to meet the criteria will disqualify the student from attending the University examination of the respective semester and candidate will have to repeat the semester i.e. both theory and clinical practicum in toto.

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4.2 If a candidate represents his/her Institution in Sports/NSS/Cultural or any official activities, he/she is permitted to avail to a maximum of 30 days in an academic year based on the recommendation and prior permission of the Head of the Institution.

### **5.0 Medium of Instruction**

5.1 Medium of instruction shall be English.

### **6.0 Appearance for the Examination**

6.1 Candidates on satisfactorily completing a semester shall apply for the examination in all papers prescribed for that semester.

### **7.0 Scheme of Examination**

7.1 There shall be a University Examination at the end of each semester.

7.2 Duration of examination of theory paper of 70 marks shall be for 3 hours.

7.3 In case of theory paper the internal assessment will be for 30 marks, assessed through tests, seminars, camps and other assignments.

### **7.4 Clinical Practicum**

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

7.4.2 Clinical practicum is part of all the semesters. Internal assessment and Clinical Practicum examination with respect to all semesters shall be conducted at the end of each semester.

7.4.3 Break up of marks of clinical practicum shall be as follows:

(a) 100 marks are allotted for internal assessment which is awarded on the basis of continuous evaluation of the clinical work of the candidate by the faculty of the departments.

(b) 100 marks for Clinical Practicum examination conducted by an External and Internal examiner who shall examine the candidates' clinical skills.

### **7.5 Dissertation work**

7.5.1 There shall be 100 marks for dissertation work. Evaluation of Dissertation shall be similar to that of theory papers

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7.5.2 The candidates shall submit four copies of dissertation before the commencement of theory examination of that semester. Candidates who fail to submit their dissertations on or before the stipulated date shall not be permitted to appear for the final semester examination.

**8.0 Board of Examiners, Valuation**

As per University norms

**9.0 Classification of successful Candidates**

9.1 Minimum for a pass in each paper shall be 40% (exam. proper and internal assessment put together) and 50% in aggregate in each semester.

**10.0 Provisions for Repeaters**

As per University norms.

**11.0. Award of Grace marks**

As per University norms.

**Annexure – I**

**M.Sc (Audiology) Semester Scheme  
Scheme of Examination**

Sem No	Paper No.	Title of the Paper	No. of Hrs per week	Exam Duration (in Hrs)	IA	Marks for		
						Theory	Total	Credits
I Sem Core Subjects	AUD 101	Research Methods in Speech-Language & Hearing	4	3	30	70	100	4
	AUD 102	Statistics in Speech-Language & Hearing	4	3	30	70	100	4
	AUD 103	Basics in Auditory Perception	4	3	30	70	100	4
	AUD 104	Auditory Physiology	4	3	30	70	100	4
Soft Core	AUD 105	Technology for Speech-Language & Hearing	3	3	30	70	100	2
Clinical Practicum	AUD 106	Clinical Practicum	16	6	100	100	200	8
					<b>250</b>	<b>450</b>	<b>700</b>	<b>26</b>
II Sem Core Subjects	AUD 201	Neurophysiology of Hearing	4	3	30	70	100	4
	AUD 202	Psychophysics of Audition in Normals	4	3	30	70	100	4
	AUD 203	Speech Perception	4	3	30	70	100	4
	AUD 204	Physiological Assessment of the Auditory System	4	3	30	70	100	4
Soft Core	AUD 205	Audiology in Practice	3	3	30	70	100	2
Clinical Practicum	AUD 206	Clinical Practicum	16	6	100	100	200	8
					<b>250</b>	<b>450</b>	<b>700</b>	<b>26</b>

III Sem Core Subjects	Paper No.	Title of the Paper	No. of Hrs per week	Exam Durat ion (in Hrs)	IA	Marks for		
						Theory	Total	Credits
	AUD 301	Psychophysics of Audition In Clinical Population	4	3	30	70	100	4
	AUD 302	Seminars in Assessment of Individuals with Hearing Impairment	4	3	30	70	100	4
	AUD 303	Speech Perception in Clinical Population	4	3	30	70	100	4
Elective	AUD 304	Electrophysiological Assessment of the Auditory System	4	3	30	70	100	4
Clinical Practicum	AUD 305	Clinical Practicum	16	6	100	100	200	8
					<b>220</b>	<b>380</b>	<b>600</b>	<b>24</b>
IV Sem Core Subjects	AUD 401	Assessment and Management of Central Auditory Processing Disorders	4	3	30	70	100	4
	AUD 402	Seminars in Rehabilitative Audiology	4	3	30	70	100	4
	AUD 403	Implantable Devices for individuals with Hearing Impairment	4	3	30	70	100	4
	AUD 404	Dissertation	8	3	30	70	100	4
	AUD 405	Clinical Practicum	16	6	100	100	200	8
					<b>220</b>	<b>380</b>	<b>600</b>	<b>24</b>

**Course content as stipulated by Rehabilitation Council of India, New Delhi**

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**M.Sc. (Audiology)**

Subjects	Paper	Instructions hrs/week	Duration of Exam (Hrs)	Marks			Credits
				IA	Exam	Total	
<b>a) I/II Semester of the Postgraduate Program</b>							
Core Subjects	4T	4x4	4x3	4x30	4x70	4x100	4x4
	Clinical Practicum	1x16	1x6	1x100	1x100	1x200	1x8
Soft Core	1T	1x3	1x3	1x30	1x70	1x100	1x2
<b>Total of credits per semester</b>							<b>26</b>
<b>b) III Semester of the Postgraduate Program</b>							
Core Subjects	3T	3x4	3x3	3x30	3x70	3x100	3x4
	Clinical Practicum	1x16	1x6	1x100	1x100	1x200	1x8
Elective/Open Elective	1T	1x4	1x3	1x30	1x70	1x100	1x4
<b>Semester Total of Credits</b>							<b>24</b>
<b>c) IV Semester of the Postgraduate Program</b>							
Core Subjects	3T	3x4	3x3	3x30	3x70	3x100	3x4
	Clinical Practicum	1x16	1x6	1x100	1x100	1x200	1x8
	Project work	8	Dissertation Evaluation	1x30	1x70	1x100	1x4
<b>Semester Total of Credits</b>							<b>24</b>
<b>Program Grand Total of Credits</b>							<b>100</b>

# **MASTER OF SCIENCE IN AUDIOLOGY**

## **I Semester**

### **AUD 101 RESEARCH METHODS IN SPEECH-LANGUAGE AND HEARING**

**(30+70 marks)**

**(52 Hours)**

#### **Unit 1**

**12 hours**

- 1) Review of basic research methods, strategies and designs in Speech language pathology and Audiology.
- 2) Types of Research in speech language pathology and Audiology. Ex-post facto research, Normative research, Standard group comparison, Experimental research, Clinical and applied research, Sample surveys, Evaluation research.
- 3) Methods of Observation and measurement in speech language pathology and audiology.

#### **Unit 2**

**10 hours**

- 1) Experimental designs. The structure and logic of experimental designs, single subject designs and group designs.
- 2) Documentation.
  - a) Organization, format and writing style.
  - b) Legal, ethical and cultural considerations for research in speech language pathology and audiology.

#### **Unit 3**

**10 hours**

Review of studies in speech and hearing as established in standard journals.  
Critical analysis of methods employed and identification of models of research that may be unique to different areas.

#### **Unit 4**

**10 hours**

Evolution of research methods in speech and hearing since 1920s.

#### **Unit 5**

**10 hours**

- 1) Methods of experimental research in allied areas – Linguistics, Neurology, Clinical Psychology, Genetics, Physics and acoustics and their application to speech and Hearing.
- 2) Epidemiological research in Speech and Hearing.

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## **LIST OF BOOKS**

### **AUD 101 – RESEARCH METHODS IN SPEECH-LANGUAGE AND HEARING**

#### **Unit 1, 2 & 4**

Broota (1989). Experimental design in behavioral research. Eastern New Delhi, Wiley.

Doehring (1988). Research strategies in human communication disorders, Austin, Proed.

Frey (1991). Investigating communication. An introduction to research methods. Inglewood cliffs, Prentice Hall.

Grosov. M.S., Sardy. H. (1985). A research primer for the social & behavioral sciences. New York. Academic press.

Hegde, M.N. (1987). Clinical Research in Communicative Disorders. Principles and Strategies, Boston,. College-Hill Press.

Hegde, M.N. (1994). Clinical Research in Communicative Disorders. Principles and Strategies, Austin, ProEd.

Lindlof (1995). Qualitative communication research methods, California, Sage publications.

Maxwellsatake (1997). Research and statistical methods in communication disorders, Baltimore, Williams & Wilkins.

Pannbaker M.H. (1994). Introduction to clinical research in communication disorders, Sandiego, Singular publishing group.

Silverman F.H. (1985). Research design and evaluation in speech language pathology, Audiology. Asking questions & answering, Newjersy, Prentice Hall.

Silverman, F.N. (1988) Research designs in speech pathology and audiology. Boston. Allyn & Bacon.

Schiavetti Metz (1997). Evaluating research in communication disorders, Boston, Allyn & Bacon.

Tucker (1981). Research in speech communication, Prentice Hall. Inglewood cliffs

Ventry. I. M.& Schiavetti N. (1980). Evaluating research in speech pathology and audiology, London. Addison Wesley.

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## **AUD 102 STATISTICS IN SPEECH-LANGUAGE AND HEARING**

**(30+70 marks)**

**(52 hours)**

### **Unit 1**

**12 hours**

Review of basic statistics, statistical measures and their features.  
Statistical inference: Methods of correlation and regression, cause and effect relation, chi-square, population estimate, probability, probability laws and hypothesis testing.  
The concept, theoretical distributions, estimation-point and interval estimation.  
Application to speech-language pathology and audiology with specific examples.

### **Unit 2**

**10 hours**

Analysis of variance and covariance (ANOVA and ANCOVA): Basic models, assumptions, one way and two way classifications. Need for non-parametric tests.  
Consequence of failure of assumptions underlying ANOVA. Tests for additivity, homogeneity, transformation. Post – hoc tests analysis of covariance.Repeated measure.  
Correlation, regression analysis and prediction including multiple regression and path analysis.

### **Unit 3**

**10 hours**

Non-parametric statistics: Non-normal distributions, central limit theorem.

### **Unit 4**

**10 hours**

Analysis of qualitative data: Contingency tables, measures of association, Kappa coefficient, log linear models. Content analysis.

### **Unit 5**

**10 hours**

Multivariate analysis: Need for multivariate analysis, various methods, principal component analysis, factor cluster, discriminant function, MANOVA, MANCOVA, multiple regression and path analysis, logistic regression multidimensional scaling.

## **LIST OF BOOKS**

### **AUD 102 : STATISTICS FOR SPEECH-LANGUAGE AND HEARING**

Aikenwest (1993): Multiple regressions: Testing & interpreting results Sage publications. London

Cocharan (1993): Sampling techniques Wiley eastern New Delhi

Edwards, A.L. (1973): Statistical methods for behavioral sciences, 3rd Ed Holt Rinehart. New York

Festinger, L., & Katz, D. (1966): Research Methods in behavioral sciences, Rinehart & Winston. New York

Garrett, E.H. (1969): Statistics in Psychology and Education: Wakils Feffer. Bombay

Gibbon (1993): Nonparametric statistics – An introduction. Sage publications London

Guilford. (1978): Fundamental Statistics in Psychology Education. McGraw Hill. Tokyo.

Howell (1999): Fundamental statistics for the behavioral science Duxbury press Boston.

Jahoda, M., et al. (1965): Research Methods in Social Relations. USA: Methuen & Co.

Johnsonwichern (1992): Applied multivariate statistical analysis. Prentice hall New Jersey.

Kanji (1999): Statistical tests, Sage publications. London.

Kerlinger, F.N. (1964): Foundations of behavioral research: Rinehart & Winston. New York

Lewis-Beck (1994): Factor analysis & related techniques. Sage publications London.

Plutchik, R. (1968): Foundations of behavioral research. Harper & Row. New York:

Seigal, S. (1956): Non-parametric Statistics for the Behavioral Sciences. McGraw Hill. Tokyo.

Silverman, F.N. (1977): Research designs in speech pathology and audiology: Prentice Hall. New Jersey

Townsend, C.J. (1953): Introduction to experimental method for psychology and social sciences. McGraw Hill. New York

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# AUD 103 BASICS IN AUDITORY PERCEPTION

**(30+70 marks)**

**(52 hours)**

## **Unit 1**

**12 hours**

- a) Psychoacoustic
  - Introduction
  - Psychophysical methods
- b) Theory of signal detection
  - Basic concepts
  - Application

## **Unit 2 – Loudness**

**10 hours**

- MAP and MAF
- Equal loudness contours
- Loudness level
- Scaling
- Temporal integration
- Loudness of complex tones
- Loudness growth
- Parameters of loudness
- Psychophysical power law
- Recruitment in normal ears
- Relationship between loudness and pitch
- Differential sensitivity for frequency and intensity
- Absolute/relative DL's
- Methods for measuring DL's
- Clinical application

## **Unit 3**

**10 hours**

Masking and critical band concept

- Critical band concept
- Masking and excitation pattern
- Non-simultaneous masking
- Frequency resolution
- Tone-on-Tone masking
- Relationship between masking level and threshold shift
- Central masking
- Pulsation threshold (continuity effect)
- Two-tone suppression

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## Unit 4

10 hours

- a) Temporal processing in the auditory system
  - The detection of gaps in broad band noise
  - The detection of temporal gaps in narrowband sounds
  - The detection of gaps in sinusoids
  - Duration discrimination
- b) Auditory pattern perception
  - Timbre perception and object identification
  - Time-invariant pattern and timbre
  - Time varying patterns

## Unit 5

10 hours

### Pitch perception

Factors affecting pitch perception (intensity frequency and duration)

Pitch scales

Pitch of complex tones

Theories of pitch perception

Ohm's acoustic law

Objective beats

Consonance, dissonance, musical intervals

Combination tones

Relationship between frequency and pitch

JND for frequency

Effects of phase on the pitch of complex sound

### LIST OF BOOKS

#### AUD 103 – BASICS IN AUDITORY PERCEPTION

Aage R Moller (1983). *Auditory Physiology*. London, Academic Press Inc.

Brain, C.J. Moore (1995). *Hearing*. Academic Press Inc. CA

Bruce Lindsay (1974). *Physical acoustics*. Pennsylvania: Dowden Hutchinson and Ross Inc.

Cathrine A Smith & Jack A Vernon (1976). *Handbook of Auditory & vestibular research methods USA*, Charles Thom as..

Dallos. P (1973). *The auditory periphery; Biophysics and physiology*. New York: Academic Press.

Denes, P. and Pinson, E. (1964). *Speech chain*. Beltone Lab.

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- Durrant, J.D. and Lovrinic, J.H. (1977). *Bases of hearing science*. Baltimore, William and Wilkins.
- Gullick, W.L. (1971). *Hearing physiology and psychophysics*. New York: Oxford University Press. (Chapters 5, 6, 7 and 9).
- Harry, F. Olson (1967). *Music, physics and engineering*. New York: Dower Publications Inc. (Chapters 1, 2, 3, 5, 6, 7 & 8)
- Hirsh, I.J. (1952). *Measurement of hearing*. New York: McGraw-Hill. (Chapters 6, 7,8 and 9).
- Jerger, J. (1973). *Modern developments in Audiology*. New York: Academic Press.
- Keidel, U.D. and Neff, W.D. (1975). *Auditory system in handbook of sensory physiology*. Vol.2, Berlin:Springer and Verlag. (Chapters 10 and 11).
- Kryter, K.D. (1970). *Effects of noise on man*. New York: Academic Press.
- Lawrence, J. Deutsch and Alan, M. Richards (1979). *Elementary hearing science*, MA, Allyn and Bacon.
- Littler, J.S. (1965). *Physics of the ear*. Oxford: Pargaman Press. (Chapters 9 and 11).
- Markides, A. (1977). *Binaural hearing aids*. London: Academic Press.
- Richard, M. Warren (1999). *Auditory perception - A new analysis and synthesis*. UK: Cambridge University Press.
- Small, A.M. (1978). *Elements of hearing science: A programmed text*. New York: John Wiley.
- Stanley, A. Gelfand. (1998). *Hearing*. New York: Marcel Dekker Inc.
- Stevens, S.S. and Warshofsky, F. (1971). *Sound and hearing*. Netherlands: Time Inc.
- Stuart Rosen and Deter Howell (1991). *Signals and systems for speech and hearing*. CA: Academic Press Inc. (Chapters 2, 3, 6, 7, 8, 9, 10 and 12).
- Tobias, J.V. (1970). *Foundations of modern auditory theory*. Vol . I New York: Academic Press.
- Tobias, J.V. (1983). *Foundations of modern auditory theory*. Vol . II New York: Academic Press.
- Willam, A. Yost (1994). *Fundamentals of hearing*. CA: Academic Press Inc.



## AUD 104 AUDITORY PHYSIOLOGY

**(30+70 marks)**

**(52 hours)**

### **Unit 1**

**12 hours**

- External Ear: Anatomy and physiology of lower animals and humans. Role of Pinna & External auditory meatus in hearing. Resonance properties of external ear in lower animals and human.
- Temporal bone anatomy.

### **Unit 2**

**10 hours**

Middle ear: Anatomy & Physiology of lower animals and humans.

- Middle ear transformer action
- Concept of acoustic impedance
- Acoustic and non acoustic reflex pathways
- Anatomy & physiology of the eustachian tube

### **Unit 3**

**10 hours**

Cochlea: Anatomy in lower animals and human

- Macro & microanatomy
- Blood supply
- Innervation
- Cochlear fluids - Origin, absorption, composition, dynamics and functions

### **Unit 4**

**10 Hours**

Physiology of the Cochlea:

- Modes of bone conduction
- Cochlear mechanics - basilar membrane mechanics -historical and current status.
- Cochlear transduction
- Cochlear electrophysiology
- Cochlear potentials their generation and properties.
- Cochlear non-linearity - two tone suppression, otoacoustic emission & other recent advances.
  - Regeneration/ Repair/ Protection/Cochlear proteins etc.

### **Unit 5**

**10 Hours**

Theories of hearing:

- Historical aspects.
- Place theory - resonance & nonresonance.
- Frequency theory.
- Traveling wave theory.
- Other recent advances like motor theory etc.
- Vestibular system:  
Anatomy and physiology of Vestibular structure and vestibular nerve.

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## LIST OF BOOKS

### AUD 104 - AUDITORY PHYSIOLOGY

- Altschuler, R.A. & Hoffman, D.W. (1986). *Neurobiology of hearing: The cochlea*. New York: Raven Press.
- Beagly, H.A. (1981). *Audiology and audiological medicine*. Oxford: Oxford University Press.
- Bekesy, G.V. (1960). *Experiments in hearing*. New York: Mc Graw Hill.
- Berlin, C.I. (Eds.). (1996). *Hair cells and hearing aids*. SanDiego: Singular Publishing Group.
- Bradford, L.J. (Eds.). (1975). *Physiological measures of the audiovestibular system*. New York: Academic press.
- Dallos, P. (1973). *Auditory periphery: Biophysics & physiology*. New York, Academic press.
- Dallos, P, Popper, A.N. & Fry, R.R. (Eds.). (1996). *The Cochlea*. New York: Springer.
- Davies, D.V. (1969). *Gray's anatomy: Descriptive and applied*. New Delhi: Orient Longmans.
- Durrant, J.D. & Lovrinic, J.H. (1977). *Bases of hearing*. Baltimore, William and Wilkins.
- Flock, A., Ottoson, D. & Ulfendahl, M. (Eds.). (1995). *Active hearing*. Baltimore: Williams & Wilkins.
- Gelfand, S.A. (1998). *Hearing: An introduction to psychological and physiological acoustics (3rd Ed)*. New York: Mared Dkker.
- Gulick, W.L. & Others. (1989). *Hearing: Physiology, Acoustic, Neural coding & psychoacoustic*. New York: Oxford University Press.
- Jahn, A. F. & Santos-Sacchi, J. (Eds.). (1989). *Physiology of the ear*. New York: Academic press.
- Katz, J. (Eds.). (1994). *Handbook of clinical audiology*. Baltimore: Williams & Wilkins.
- Moller, A. R. (2000). *Hearing: Its physiology and Pathophysiology*. Sandiego: Academic Press.
- Moller, A.R. (1983). *Auditory physiology*. New York: Academic press.
- Moore, B.C.J. (Eds.). (1995). *Hearing*. San Diego: Academic press.
- Naunton, R.F. (1975). *The vestibular system*. New York: Academic press.
- Pickles, J. O. (1992). *An introduction to physiology of hearing*. New York: Academic press.
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Popelka, G.R. (1981). *Hearing assessment with the acoustic reflex*. New York, Grune & Stratton press.

Robinette, M.S. & Gattke, T.J. (Eds.). (1997). *Otoacoustic emissions: Clinical applications*. New York: Thieme.

Scott-Brown. (1997). *Otolaryngology: Basic Science*. Vol. I. London: Butterworths- Heinemann.

Van De Water, T.R., Popper, A.N. & Fry, R.R. (Eds.). (1996). *Clinical aspects of hearing*. New York: Springer.

Wever, E.G. (1970). *Theories of Hearing*. New York: Dover.

Yost, S. A. (1994). *Fundamental of hearing: An introduction (3rd Ed)*. San Diego: Academic press, Inc.

Zemlin, W.R. (1998). *Speech and hearing science: Anatomy and physiology (4th Eds.)*. Boston: Allyn & Bacon.

## **AUD 105: TECHNOLOGY FOR SPEECH-LANGUAGE AND HEARING**

**(30+70 marks)**

**(42 Hours)**

### **Unit 1**

**10 hours**

#### **Introduction to Basic Electronics and Computers**

- (a) Basic principle of operation and working of
- Diodes, Transistors, FET's & UJT's, LED's, LCD's & IC's
  - D.C. Power supplies, a-c Voltage stabilizers and UPS
- (b) Fundamentals of Digital Electronics
- Binary number system, Hex code, ASCII code, bit, byte, etc
  - Logic gates, Counters, Flip-flops etc.
- (c) Fundamentals of Computers:
- Block Diagram of a computer and its working
  - Hardware, memory devices and other peripherals
  - Operating system, languages, application soft-wares
  - Programs, Flow charts
  - Internet and networking of computers

### **Unit 2**

**8 hours**

#### **Fundamentals of Digital Signal processing and Communication systems**

- (a) Analog and Digital systems
- Analog signal and Digital Signals
  - Analog to Digital and Digital to analog converters
  - Need and advantages of digital systems and digital signal processing
- (b) Principles of digital signal processing
- IIR system, its realization and implication
  - FIR system, its realization and implication
  - Basics of IIR and FIR filters and their implementation
- (c) Fundamentals of communication systems
- AM transmission and reception
  - FM transmission and reception
  - Digital modulation Techniques such as delta modulation, PCM, PPM, PWM and their application in speech analysis.
  - Satellite communication

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### **Unit 3**

**8 hours**

#### **Biomedical signals and Signal Processing**

- (a) Principles of generation of acoustic stimuli
  - Pure tones, tone bursts, clicks, filtered clicks and warble tones
  - Acoustic/Physical characteristics of all stimuli
  - Generation gating and filtering of stimuli
- (b) Evoked potential
  - Working principle
  - Electrodes
  - Recording of responses
- (c) Electrodes and transducers
  - Signal acquisition techniques from electrodes and transducers
  - Signal processing techniques such as differential amplification, common mode rejection, artifact rejection, filtering, signal averaging etc.
  - Addition and subtraction of waves

### **Unit 4**

**8 hours**

#### **Technology of Hearing Aids & Speech Processing and Analysis**

- (a) Principle and working of
  - Body level hearing aid
  - BTE hearing aid
  - Digital, DSP based/programmable hearing aids
  - FM hearing aid
- (b) Evaluation of hearing aids
  - Electro acoustic characteristics
  - National and Inter-national standards
  - Hearing aid evaluation systems
- (c) Techniques of speech processing and analysis
  - Voice response system
  - Speaker recognition system and speech recognition system
  - Speech synthesis methods

## Unit 5

8 hours

### Advanced Technology for Speech and Language Disorders

- (a) Electro-physiological methods in diagnosis
  - Fundamental principles of EEG
  - Fundamental principles of EMG
- (b) Neuro-radiological methods in diagnosis
  - Working principles
  - Interpretation and implications
- (c) Tools/studies to understand the organization of speech and language disorders and functions
  - Cortical blood flow studies
  - Radio imaging techniques, functional MRI
  - Application of tools in studying genetic bases of speech language disorders

### LIST OF BOOKS

#### AUD 105 – TECHNOLOGY FOR SPEECH-LANGUAGE AND HEARING

Ainsworth, W.A. (1988). Speech recognition by machine. London: Peter Peregrinus.

Ainsworth, W.A. (Ed.) (1990). Advances in Speech, Hearing and Language Processing: Research Annuals; Vol. 1, London: Jaipress.

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.

Bapat (1993). Electronic circuits and systems. New Delhi: McGraw Hill.

Beraneck (1954). Acoustical Engg. New York: McGraw Hill.

Daniloff, R.G (1985). Speech Sciences: Recent advances. London: Taylor and Francis.

Gottingen, M.R.S. (Ed.) (1985). Speech and Speaker Recognition. Basel: Kager.

Graeme (1973). Applications of Opamps. New York: McGraw Hill.

Grob (1982). Electronic circuits and applications. London: McGraw Hill.

Hall. Microprocessors and interfacing programming hardware, New Delhi: McGraw Hill.

Hall, J.W (1992). Handbook of Auditory evoked responses. Massachussettes. Allyn & Bacon.

M.Sc (Audiology)

Haton, J.P. (Eds) (1981). Automatic speech analysis & Recognition. USA, D. Reidel Publishing Company.

Hawley, M.E. (1977). Speech intelligibility & Speaker Recognition. Pennsylvania. Dowden. Hutchinson & Ross Inc.

Hilburn (1973). Manual of active filter design. New York: McGraw Hill.

Jacobson, J.T (Ed) (1994). Auditory brainstem response. Taylor & Francis. London.

Johnson (1992). Introduction to digital signal processing. New Delhi: McGraw Hill.

Johnson, K. & Mullennix, J.W. (Eds.) (1997). Talker Variability in Speech Processing. San Diego: Academic Press.

Jowens, F. (1993). Signal processing of speech. The Macmillan Press Ltd.

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.

Kingsler & Fray (1962). Fundamentals of Acoustics. New York.

Malvino, A.P. (1979). Electronic principles. New Delhi: Tata McGraw Hill.

Markowitz, J.A. (1996). Using Speech Recognition. New Jersey: Prentice Hall.

Mathur (1980). Electronic devices. Applications and integrated circuits. Delhi: Delhi Umesh Publication.

Mathur (1992). Introduction to Microprocessor. New Delhi: Tata McGraw Hill.

Millman, H (1972). Integrated electronics. Tokyo: McGraw Hill.

Morgan, D.P. & Scofield, C.L (1991). Neural Networks and Speech Processing. Boston, Kluwer Academic Publishers.

Nakagawa, S. & etal. (1995). Speech, Hearing and Neural Network Models. Oxford: IOS, Press

Nolon, F. (1983). The phonetic basis of Speaker recognition. Cambridge. Cambridge University Press.

Oppenheim & Schaffer (1989). Digital signal processing. New Delhi: Prentice Hall of India.

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M.Sc (Audiology)

Rabiner, L.R. & Schaffer, R. (1978). Digital processing of speech signals. New Jersey. Prentice Hall Inc.

Rabiner & Gold (1989). Theory & application of digital signal processing. New Delhi: Prentice Hall of India.

Robinette, M.S & Slatke, T.J (Eds) (1997). Otoacoustic emissions: Clinical applications. Thieme. New York.

Ryder (1978). Electronic fundamentals and applications. Integrated and discrete systems. New Delhi: Prentice Hall of India.

Sanders, D.A (1993). Management of the hearing handicapped: from infants to elderly. Prentice Hall Inc. NJ.

Sawashima, M. & Cooper, F.S. (1977). Dynamic aspects of speech production. Japan. University of Tokyo Press.

Shanessy, W.O. Computers in Communication disorders.

Shuzo Saito, (1992). Speech Science and Technology. Ohmsha, IOS Press.

Silverman, F.S. A-37-38. Micro computers in Speech Language Pathology

Thomas, D.B. (1977). Digital computer fundamentals. Tokyo: McGraw Hill.

Volanthen, A (1995). Hearing instrument for the hearing health professional. Thieme. NY.

Waltzman, S.B & Cohen, N.L (2000). Cochlear implants. Thieme. NY.



## **AUD 106: CLINICAL PRACTICUM- I SEMESTER**

**(100+100 marks)**

At the end of Semester I, the student should be able to carry out the following –

1. Impedance Audiometry – 5 Subjects
  - Tympanometry using different probe tone frequencies
  - Wide range tympanometry
  - ARLT
  
2. Otoacoustic Emission
  - Use of different protocol – 2 subjects
  - Contralateral suppression of OAE's – 2 subjects
  
3. Special tests- 3 subjects each
  - DDT
  - SPIN
  - HINT
  - ESPT- on cochlear implant recipients/hearing aid users
  - TEN
  - APD informal test- on children
  - MAIS test- on cochlear implant recipients/hearing aid users
  - HELEN test on hearing aid users
  - SCAP- on children

**M.Sc II Semester**  
**AUD 201 NEUROPHYSIOLOGY OF HEARING**

**(30+70 marks)**

**(52 hours)**

**Unit 1** Auditory nerve:

**12 hours**

Anatomy

- Structure and Tonotopic organization.

Physiology

- Electrophysiology - Action potential, generation and properties.
- Stimulus coding - frequency, intensity and temporal coding.
- Non-linearity seen at auditory nerve.

**Unit 2** Central auditory pathway:

**10 hours**

Anatomy:

- Ascending pathway and Tonotopic organization at the different levels.

Physiology:

- Neurophysiology of the central auditory pathway -stimulus coding.

**Unit 3:** Auditory Cortex

**10 hours**

- Anatomy and Tonotopic organization of the primary and secondary auditory area.
- Neurobiological relationship between auditory cortex and other areas
- Physiology - Neurophysiology of the auditory area - stimulus coding.

**Unit 4** a) Efferent pathway: Anatomy

**10 hours**

Physiology:

- Effect on cochlear physiology and auditory nerve and CN.
- Perception of auditory stimulus.
- Protective function.

b) Anatomy of the cranial nerves related to ear.

**Unit 5** - Neuro transmitters in the auditory system:

**10 hours**

- a)
- Type of synapse
  - Physiology of the nerve
  - Neuro transmitters vs neuro modulator
  - Properties and function of neuro transmitter
  - Afferent and efferent neuro transmitters

b) Neural plasticity, Neural maturation

M.Sc (Audiology)

## LIST OF BOOKS

### AUD 201 : NEURO PHYSIOLOGY OF HEARING

- Aitkin, L. (1990). *Auditory cortex: Structural & functional basis of auditory perception*. London: Chapman & Hall.
- Altschuler, R.A. & Hoffman, D.W. (1986). *Neurobiology of hearing - The cochlea*. New York: Academic press.
- Beagly, H.A. (1981). *Audiology and audiological medicine*. Oxford: Oxford University Press.
- Berlin, C.I. (Eds.). (1996). *Hair cells and hearing aids*. SanDiego: Singular Publishing Group.
- Busser, P., Imbert, M. & Kay, R.H. (1992). *Audition*. Cambridge, MIT Press.
- Dallos, P., Popper, A.N. & Fry, R.R. (Eds.). (1996). *The Cochlea*. New York: Springer.
- Flock, A., Ottoson, D. & Ulfendahl, M. (Eds.). (1995). *Active hearing*. Oxford: Pergamon Press.
- Gelfand, S.A. (1998). *Hearing: An introduction to psychological and physiological acoustics* (3rd Ed). New York: Mared Dekker.
- Gulick, W.L. & Others. (1989). *Hearing: Physiology, Acoustic, Neural coding & psychoacoustic*. New York: Oxford University Press.
- Irvine, D. (1986). *Auditory Brainstem: A review of the structure and function of Auditory Brainstem Processing Mechanism*. Berlin: Springer-Verlag.
- Jahn, A. F. & Santos-Sacchi, J. (Eds.). (1988). *Physiology of the ear*. New York: Raven Press.
- Katz, J. & Others. (1992). *Central auditory processing: A transdisciplinary view*. St. Luis.: Mosby year book.
- Keidel, W.D. & Neff, W.D. (1974). *Handbook of sensory physiology*. Berlin: Springer verlag.
- Moller, A.R. (1983). *Auditory physiology*. New York: Academic press.
- Moore, B.C.J. (Eds.). (1995). *Hearing*. San Diego: Academic press.
- Pickles, J. O. (1992). *An introduction to physiology of hearing*. New York: Academic press.

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Poon, P.W.F. & Brugge, J.F. (1998). *Central Auditory Processing and Neural Modeling*. New York: Plenum Press.

Sahley, T.L., Nodar, R.H. & Musick, F.E. (1997). *Efferent auditory system: Structure and function*. San Diego: Singular Publishing Group.

Stevens, S.S & Davis, H. (1938). *Hearing its psychology and physiology*. New York: John Wiley.

Syka, Y. (Eds.) (1997). *Acoustic Signal Processing in the Central Auditory System*. New York: Plenum Press.

Yost, S. A. (1994). *Fundamental of hearing: An introduction*.(3rd Ed.). San Diego: Academic press, Inc.

Zemlin, W.R.(1998). *Speech and hearing science: Anatomy and physiology (4th Eds.)*. Boston: Allyn & Bacon.

**AUD 202 PSYCHOPHYSICS OF AUDITION IN NORMALS**  
**(30+70 marks) (52 hours)**

**Unit 1** **12 hours**

- a) Auditory Object Perception
- Information used to separate auditory objects
  - Fundamental Frequency
  - Onset Disparities
  - Contrast with previous sounds
  - Correlated changes in amplitude and frequency
  - Sound location
- b) Perception in temporal system
- Perception of Rhythm
  - Auditory streaming/Auditory Scene Analysis (ASA)
  - Judgement of temporal order
  - General principles of perception organization
  - Similarity
  - Figure –ground phenomenon and attention

**Unit 2** **10 Hours**

- a) Adaptation
- Definition
  - Adaptation Vs Fatigue
  - Methods of studying adaptation
  - Stimuli Parameters affecting adaptation
  - Neurophysiological process in adaptation
- b) Space perception
- Binaural hearing
  - Localization Vs. lateralization
  - Localization of pure tones
  - Cues for localization

**Unit 3** **10 Hours**

- Localization of complex tones
- The acuity of lateralizing transients
  - Acuity as a function of frequency
  - Onset disparities Vs ongoing disparities

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- Time-intensity trading
- Binaural adaptation
- Binaural interference

#### **Unit 4**

**10 Hours**

Miscellaneous concepts related to space perception

- Monaural localization and role of pinnae
- The cone of confusion and the role of head movements
- Influence of vision on auditory localization
- Perception of distance
- Factors affecting localization
- Clinical application
- Performance in localization and lateralization
- (Beats, rotating tones, time separation pitch, time-intensity trade, masking level difference)
- Neurophysiological process
- Time-intensity trading
- Sluggishness of binaural system
- Binaural fusion of pulsed stimuli
- Models of binaural hearing
- JND for dichotic phase

#### **Unit 5**

**10 Hours**

Perception of music

- Musical scales/Musical notes
- Factors affecting perception of music

## LIST OF BOOKS

### AUD 202 : PSYCHOPHYSICS OF AUDITION IN NORMALS

- Arthur, N. Popper & Richmond, R. Fay (1996). *Auditory Computation*. (Chapter 6 & 8).
- Brain, C.J. Moore (1995). *Hearing*. Academic Press Inc. CA
- Bruce Lindsay (1974). *Physical acoustics*. Pennsylvania: Dowden Hutchinson and Ross Inc.
- Dallos P (1973). *The auditory periphery; Biophysics and physiology*. New York: Academic press.
- Durrant, J.D. and Lovrinic, J.H. (1977). *Bases of hearing science*. Baltimore, William and Wilkins.
- Gullick, W.L. (1971). *Hearing physiology and psychophysics*. New York: Oxford University Press. (Chapters 5, 6, 7 and 9).
- Harris, J.D. (1969). *Forty germinal papers in human hearing*. Groton. Journal of auditory research.
- Harry, F. Olson (1967). *Music, physics and engineering*. New York: Dower Publications Inc. (Chapters 1, 2, 3, 5, 6, 7 & 8)
- Hirsh, I.J. (1952). *Measurement of hearing*. New York: McGraw-Hill. (Chapters 6, 7, 8 and 9).
- Jerger, J. (1973). *Modern developments in Audiology*. New York: Academic Press.
- Keidel, U.D. and Neff, W.D. (1975). *Auditory system in handbook of sensory physiology*. Vol.2, Berlin: Springer and Verlag. (Chapters 10 and 11).
- Kryter, K.D. (1970). *Effects of noise on man*. New York: Academic Press.
- Lawrence, J. Deutsch and Alan, M. Richards (1979). *Elementary hearing science*, MA, Allyn and Bacon.
- Littler, J.S. (1965). *Physics of the ear*. Oxford: Pargaman Press. (Chapters 9 and 11).
- Markides, A. (1977). *Binaural hearing aids*. London: Academic Press.
- Richard, M. Warren (1999). *Auditory perception - A new analysis and synthesis*. UK: Cambridge University Press.
- Small, A.M. (1978). *Elements of hearing science: A programmed text*. New York: John Wiley.
- Stanley, A. Gelfand (1998). *Hearing*. New York: Marcel Dekker Inc.

M.Sc (Audiology)

Stevens, S.S. and Warshofsky, F. (1971). *Sound and hearing*. Netherlands: Time Inc.

Stuart Rosen and Deter Howell (1991). *Signals and systems for speech and hearing*. CA: Academic Press Inc. Chapters 2, 3, 6, 7, 8, 9, 10 and 12).

Tobias, J.V. (1970). *Foundations of modern auditory theory*. New York: Academic Press.

William, A. Yost (1994). *Fundamentals of hearing*. CA: Academic Press Inc.



## AUD 203 SPEECH PERCEPTION

(30+70 marks)

(52 hours)

### Unit 1

12 hours

- a) Acoustic of speech in relation to production
- b) Coding of speech in the auditory pathway
  
- c) Theories of speech perception
  - Acoustic theory
  - Neurological theory
  - Auditory theory
  - Motor theory
  - Analysis by synthesis
  
- d) Methods used to study speech perception
  - Analysis by synthesis
  - Parametric synthesis
  - Articulatory synthesis

### Unit 2

10 Hours

- a) Cues for perception of vowels and consonants in normals
  
- b) Effects of co-articulation on speech perception

### Unit 3

10 Hours

- Dichotic listening
- Theories
- Factors affecting dichotic perception
- Application in the field of speech and hearing

### Unit 4

10 Hours

- a) Short term memory and speech perception
  - Stages of memory
  - Theories of short term memory
  - Perception of consonants and vowels in short term memory
  
- b) Animal perception
  - Perception of consonants and vowels
  - Categorical perception
  - Animal Vs. human perception

### Unit 5 - Infant perception

10 Hours

- Perception of consonants and vowels in infants
- Comparison of adult and infant perception
- Universality in speech perception

M.Sc (Audiology)

## LIST OF BOOKS

### AUD 203 : SPEECH PERCEPTION

Ainsworth, W.A. (1976). *Mechanism of speech recognition. International series in natural philosophy*. Vol.85, Oxford: Pergamon Press.

Ainsworth, W.A. (1990). *Advances in speech, hearing and language processing*. Vol.1. London: Jai Press Ltd.

Berlin, C. (1984) (Ed.). *Hearing science*. San Diego: College-Hill Press.

Border, G. J. and Harris K.S. (1980). *Speech science primer: Physiology, acoustics and perception of speech*. London: Williams and Wilkins.

Cohen, A. & Nooteboom, S.G. (Eds.), (1975). *Structure and process in speech perception*. New York: Seringer-Verlag.

Denes, P.B., and Pinson, E.N. (1973). *Speech chain: The physics and biology of spoken language*. New York: Anchor.

Eimas, P. & Miller, J.L. (Eds.), (1981). *Perspectives on the study of speech*. New Jersey: Lawrence Erlbaum Associates.

Fant, G., and Tatham, M.A. (Eds.) (1975). *Auditory analysis and perception of speech*. New York: Academic Press.

Flanagan, J.L. (1972). *Speech analysis synthesis and perception*. 2nd Ed, New York: Springer-Verlag.

Flanagan, J.L., and Rabinder, L.R. (Eds.), (1973). *Speech synthesis*. Stroudsburg: Dowden, Hutchinson & Ross, Inc.

Fry, D.B. (1979). *Physics of speech*. Cambridge: Cambridge University Press.

Goodman, J.C. and Nusbaum (1994) (Eds.). *The development of speech perception: The transition from speech sounds to spoken words*. London: A Bradford Book, The MIT Press.

Keller, E. (1994). *Fundamentals of speech synthesis and speech recognition – Basic concepts, state of the art and future challenges*. New York: John Wiley and Sons.

Kent R.D. and Read C. (1995). *The acoustic analysis of speech*. New Delhi: A.I.T.B.S. Publishers and Distributors.

M.Sc (Audiology)

Lass, N.J. (Ed.), (1976). *Contemporary issues in experimental phonetics*. New York: Academic press.

Lieberman and Mattingly (1985). *Motor theory revised*. Haskins laboratory report.

Lieberman, A.M. and Studdert-Kennedy (1978). *Phonetic perception*. In R. Held,

H.W., Leibowitz and H.L. Teuber (Eds.), *Handbook of sensory physiology*. Vol. VIII: Perception, Berlin: Springer-Verlag.

Lieberman, P. (1977). *Speech physiology and acoustic phonetics*. New York: Macmillan Publishing Co. Inc.

Lingard., R. (1985). *Electronic synthesis of speech*. Cambridge: Cambridge University Press.

Miller, J.L and Eimas, P.D (1995). *Speech, Language and Communication*. San Diego: Academic Press.

Nakagawa S., Shikano K. & Tohkura, Y. (1995). *Speech, hearing and neural network models*. Ohmsha IOS Press, Amsterdam.

Pickett, J.M (1980). *The sounds of speech communication: A primer of acoustic phonetics and speech perception*. Boston: Allyn and Bacon.

Rao, P.V.S and Kalia, B.B (1993) (Eds.). *Speech technology for man-machine interaction*. New Delhi: Tata McGraw-Hill Publishing Company Ltd.

Saito S. (1992) (Ed.) *Speech science and technology*. Tokyo: Ohmsha Ltd.

Sanders D.A. (1977). *Auditory perception of speech - An introduction to principle and problems*. New Jersey: Prentice Hall.

Schouten, M.E.H (1992) (Ed.). *The Auditory processing of speech. From sounds to words*. Berlin: Mouton de Gruyter.

Tohkura, Y., Vatikiotis-Bateson, E. and Sagisaka, Y. (1992). *Speech perception, production and linguistic structure*. Tokyo: Ohmsha, IOS Press.

Wathen-Dunn, W. (Ed.) (1967). *Models for the perception of speech and visual form. Proceedings of a symposium*, Cambridge: The MIT Press.

M.Sc (Audiology)

## **AUD 204 PHYSIOLOGICAL ASSESSMENT OF THE AUDITORY SYSTEM**

**(30+70 marks)**

**(52 hours)**

### **Unit 1 – Tympanometry**

**12 hours**

- a) Principle and instrumentation of immittance evaluation
- b) Tympanometry: Low frequency Vs. Multifrequency tympanometry, Single vs. Multicomponent tympanometry,
- c) Variables effecting tympanometry

### **Unit 2 - Reflexometry**

**10 Hours**

Acoustic and non-acoustic reflexes, reflex adaptation, latency of acoustic reflex, reflex averaging, reflex sensitization, temporal summation of acoustic reflex, binaural summation of acoustic reflex

### **Unit 3 - Application of Immittance**

**10 Hours**

- a) Variables effecting their measurement of acoustic reflexes
- b) Implication of Immittance evaluation in differential diagnosis and management, Research needs in immittance evaluation.
- c) Reflectance and Application

### **Unit 4**

**10 Hours**

- a) Origin of OAEs, classification of OAES
- b) Principles in recording of OAEs
- c) Interpretation of OAEs: Amplitude, latency, phase, and reproducibility

### **Unit 5**

**10 Hours**

- a) Factors affecting measurement of OAE
- b) Contralateral suppression, ipsilateral supression of OAE
- c) Implication in differential diagnosis and management, Research needs in OAE

## LIST OF BOOKS

### AUD 204 : PHYSIOLOGICAL ASSESSMENT OF THE AUDITORY SYSTEM

Berlin, C.I. (Ed.) (1996). *Hair cells and hearing aids*. London: Singular publishing group.

Katz, J. (Ed.). (1994). *Handbook of Clinical Audiology*. Baltimore: Williams and Wilkins.

Hall, J.W. and Mueller, H.G. (1997) *Audiologists' Desk Reference Volume 1: Diagnostic Audiology Principles, Procedures and Protocols*, Singular Publishing Group: San Diego.

Rintleman, W.F. (1991). *Hearing Assessment*. Boston: Allyn and Bacon.

Robinette, M.S. and Glatke, T.J. (Eds) (1997). *Otoacoustic emissions: Clinical applications*. Newyork: Thieme

Roser, R.R., Valente, M & Hosford-Dunn, D (Eds) (2000). *Audiology: Diagnosis*, New york, Thieme.

Sahley, T.L., Nodeer, R.H. and Musiek, F.E. (1997). *Efferent auditory system: Structure and function*. San Diego: Singular Publishing Group, Inc.

Van De Water, T.R., Popper, A.N. and Fay. R.R. (Ed) (1996). *Clinical aspects of hearing*. New York: Springer

Wiley, T.L. and Fowler, C.G. (1997). *Acoustic imittance measures in clinical audiology: A primer*. San Diego: Singular Publishing Group, Inc.

## **AUD 205: AUDIOLOGY IN PRACTICE**

**(30+70 marks)**

**(42 Hours)**

### **Unit 1**

**10 hours**

- a) Audiological practice in rural/tribal areas (setting-up the center; equipment for the Center; test protocols; rehabilitation; follow-up)
- b) Audiological practice in a school setup (setting-up the center; equipment for the center; test protocols; rehabilitation; follow-up)
- c) Audiological practices in community based setup (support in their community as far as possible including rural areas.
- Emphasis on UNCRPD, private/public linkages to provide services (interconnected multi-sectorial linkages); ‘employment’ to ‘work’; training different target groups to bring about awareness, social change.
  - Tele technology in practice

### **Unit 2**

**8 hours**

- a) Audiological practice in a paediatric setup (setting-up the center; equipment for the Center; test protocols; rehabilitation; follow-up)
- b) Audiological practice in an otorhinolaryngological setup (setting-up the center; equipment for the center; test protocols; rehabilitation; follow-up)
- c) Audiological practice in a neurological setup (setting-up the center; equipment for the center; test protocols; rehabilitation; follow-up)

### **Unit 3**

**8 hours**

- a) Audiological practice in an industrial setup (setting-up the center; equipment for the Center; test protocols; rehabilitation; follow-up)
- b) Audiologist as a private practitioner

### **Unit 4**

**8 hours**

- a) Medico-legal aspects in Audiology
- Forensic audiology
  - Audiologist as a witness
  - Ethics in practice (in India and other countries)
- b) Legislation - International and national

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## Unit 5

8 Hours

- a) Welfare measures of the person with hearing disorders – including ADIP scheme, language exemption
- b) National/International Standards related to Audiology
- Test environment
  - Equipment
  - Ear Protective Devices
  - Hearing aids

## LIST OF BOOKS

### AUD 205 - AUDIOLOGY IN PRACTICE

Dunn, H.H., Dunn, D.R. and Harford, E.R. (1995). *Audiology Business and practice management*. San Diego: Singular Publishing Group, Inc.

Dunn, H.H., Roeser, R.J. and 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

Rizzo, S.R. and Trudeau, M.D. (1994). *Clinical administration in audiology and speech language pathology*. San Diego: Singular Publishing Group, Inc.

Stephen, R, R, Jr., Trudeau, D, M., (Edrs.) (1994) *Clinical administration in Audiology and Speech-Language pathology*. San Diego: Singular Publishing Group, Inc.

Trivedi, P.R. and Raj Gurdeep (1992). *Noise pollution*. New Delhi: Akashdeep publishing house.

## **AUD 206: CLINICAL PRACTICUM – II SEMESTER**

**(100+100 marks)**

1. Cochlear Implant
  - Candidacy
  - Getting familiarized with different control panels of different implants
2. Real ear measurements – 2 clients
  - Use different stimulus (for analog and digital hearing aids)
  - Programming of all digital hearing aids
  - Electroacoustic characteristics of free Lion's hearing aids as well as analog and digital hearing aids and categorize them as mild, moderate and strong class- 2 hearing aids each
3. Trimmer controls (according to audiogram patterns- 3 clients)
4. Auditory evoked potentials- 2 subjects each
  - ABR: rarefaction & condensation
  - High rate and low rate
  - BC BERA
  - ASSR



**M.Sc III Semester**  
**AUD 301 PSYCHOPHYSICS OF AUDITION IN CLINICAL POPULATION**

**(30+70 marks)**

**(52 hours)**

**Unit 1**

**12 hours**

a) Threshold detection

- Psychometric function for human hearing with clinical population
- Adaptive test procedures in Audiology

b) Loudness perception in person with hearing disorders

- Recruitment
- Dynamic range
- Loudness adaptation

**Unit 2 - Masking Phenomenon**

**10 Hours**

- Threshold shift in person with hearing disorders
- Relationship between masking level and threshold shift in person with hearing disorders
- Central masking
- Forward and Backward masking in person with hearing disorders

**Unit 3 - Auditory Temporality in person with hearing disorders**

**10 Hours**

- Temporal Integration
- Differential Sensitivity for duration
- Acoustic Temporal order
- Auditory Numerosity

**Unit 4 - Pitch perception in person with hearing disorders**

**10 Hours**

- Perception of pitch of pure tones
- The frequency discrimination of pure tones
- Perception of pitch of complex tones

**Unit 5**

**10 Hours**

a) Differential sensitivity & its measurement

b) Binaural Hearing/ Binaural Amplification

- Temporal dimension of binaural hearing in person with hearing disorders
- Binaural phenomenon in person with hearing disorders
- Factors affecting Binaural hearing in person with hearing disorders

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## LIST OF BOOKS

### AUD 301 : PSYCHOPHYSICS OF AUDITION IN THE HEARING IMPAIRED

- Arthur, N. Popper & Richmond, R. Fay (1996). *Auditory Computation*. (Chapter 6 & 8)
- Brain, C.J. Moore (1995). *Hearing*. CA, Academic Press Inc.
- Brain, C.J. Moore (1998). *Cochlear Hearing loss*: London, Whurr Publishers.
- Bramford & Saunders (1994). *Hearing impairment ,auditory perception and language disability*, New Delhi, Laxman & Chand Arya.
- Durrant, J.D. and Lovrinic, J.H. (1977). *Bases of hearing science*. Baltimore, William and Wilkins.
- Gullick, W.L. (1971). *Hearing physiology and psychophysics*. New York: Oxford University Press. (Chapters 5, 6, 7 and 9).
- Jerger, J. (1973). *Modern developments in Audiology*. New York: Academic Press.
- Keidel, U.D. and Neff, W.D. (1975). *Auditory system in handbook of sensory physiology*. Vol.2, Berling: Springer and Verlag. (Chapters 10 and 11).
- Stanley, A. Gelfand (1998). *Hearing*. New York: Marcel Dekker Inc.
- Stuart Rosen and Deter Howell (1991). *Signals and systems for speech and hearing*. CA: Academic Press Inc. (Chapters 2, 3, 6, 7, 8, 9, 10 and 12).
- Tobias, J.V. (1970). *Foundations of modern auditory theory*. Vol. I New York: Academic Press.
- Tobias, J.V. (1983). *Foundations of modern auditory theory*. Vol. II New York: Academic Press.
- Willam, A. Yost (1994). *Fundamentals of hearing*. CA: Academic Press Inc.

# **AUD 302 SEMINARS IN ASSESSMENT OF PERSONS WITH HEARING IMPAIRMENT**

**(30+70 marks)**

**(52 hours)**

## **Unit 1**

**12 hours**

Correlation of audiological findings to histopathological findings in

a) Conductive hearing loss

b) Genetic hearing loss

- Tests for identifying genetic disorders including gene mapping, amniocentesis
- Applications in management

## **Unit 2**

**10 Hours**

Correlation of audiological findings to histopathological findings in Cochlear pathology and Retro-cochlear pathology

## **Unit 3**

**10 Hours**

a) Assessment of auditory disorders in the special population such as deaf-blind, MR, autism, cerebral palsy

b) Assessment of patients with hyperacusis

- Condition/disorders in which it occurs
- tests, interpretation
- implications of findings in rehabilitation

## **Unit 4**

**10 Hours**

a) Evaluation of patients with Vestibular problems

- condition/disorders in which it occurs
- tests, interpretation
- implications of findings in rehabilitation

b) Tinnitus

- Condition associated with tinnitus
- Types of tinnitus
- Evaluation

## **Unit 5**

**10 Hours**

Non-audiological tests

- X-rays, PET, MRI, CT Scan, other tests
- Lab tests for differential diagnosis of auditory disorders

M.Sc (Audiology)

## LIST OF BOOKS

### AUD 302 SEMINARS IN ASSESSMENT OF THE HEARING IMPAIRED

- Hall, J.W. and Mueller, H.G. (1997) *Audiologists' Desk Reference* Volume 1: Diagnostic Audiology Principles, Procedures and Protocols, Singular Publishing Group: San Diego.
- Hayes, D and Northern, J.L. (1996) *Infants and Hearing*, San Diego: Singular Publishing Group.
- Hull, R.H. (1995). *Hearing in aging*. San Diego: Singular Publishing Group, Inc.
- Katz, J. et al. (Ed.). (1994). *Handbook of Clinical Audiology*. Baltimore: Williams and Wilkins.
- Kingsley, R.E. (1996). *Concise text of neuro science*. Philadelphia: Lippincott Williams and Wilkins.
- Luxon, L.M. and Davies, R.A. (Eds.) (1997). *Handbook of vestibular rehabilitation*. San Diego: Singular Publishing Group, Inc.
- Martini, A, et al (Eds) (1996) *Genetics and Hearing impairment*, London: Whurr Publishers
- Mencher, G.T., Gerber, S.E. and McCombe, A. (1997) *Audiology and Auditory Dysfunction*, Boston: Allyn and Bacon.
- Musiek, F.E., Baran, J.A. and Pinherio, M.L. (1994) *Neuro Audiology: Case studies*, San Diego: Singular Publishing Group
- Roland, P.S., Marple, B.F and Meyerhoff, W.L. (1997). *Hearing loss*. New York: Thieme.
- Roser ,R.R., Valente, M & Hosford-Dunn, D (Eds) (2000). *Audiology: Diagnosis*, New york, Thieme.
- Ross, R.J. (1996) *Roeser's Audiology Desk reference: A guide to the Practice of Audiology*, New York: Thieme
- Shprintzen, R.J.(1997). *Genetic, Syndromes and communication disorders*. San Diego: Singular Publishing Group, Inc.
- Van De Water, T.R., Popper, A.N. and Fay. R.R. (Ed) (1996). *Clinical aspects of hearing*. New York: Springer
- Vernon, J. A. (1998). *Tinnitus: Treatment and Relief*. Boston: Allyn and Bacon.

M.Sc (Audiology)

## **AUD 303 SPEECH PERCEPTION IN CLINICAL POPULATION**

**(30+70 marks)**

**(52 hours)**

### **Unit 1**

**12 hours**

- a) Perception of vowels and consonants (different speech sounds) in person with hearing disorders
- b) Perception of coarticulation in person with hearing disorders
- c) Perception of suprasegments in person with hearing disorders

### **Unit 2**

**10 Hours**

- a) Perception of speech through the visual modality - Perception of segmental and suprasegmental cues
- b) Perception of speech through the tactile modality - Perception of segmental and suprasegmental cues

### **Unit 3**

**10 Hours**

Perception of speech through cochlear implants, hearing aids

- Perception of segmental and suprasegmental cues through single channel implants
- Perception of segmental and suprasegmental cues through multi channel implants
- Comparison of speech perception through different devices

### **Unit 4**

**10 Hours**

Speech intelligibility

- Methods: Subjective and objective
- Factors influencing
- Application of Audiology

### **Unit 5**

**10 Hours**

- a) Speech perception in adverse listening conditions
  - comparison of normals vs. person with hearing disorders
  - importance of S/N ratios

(b) Application in research, evaluation and rehabilitation of person with hearing disorders

## LIST OF BOOKS

### AUD 303 SPEECH PERCEPTION IN CLINICAL POPULATION

- Ainsworth, W.A. (1990). *Advances in speech, hearing and language processing*. Vol.1. London: Jai Press Ltd.
- Balley, P.J. (1983). *Hearing for speech: The information transmitted in normal impaired and speech*. In M.E. Lutman and M.P. Haggard (Eds.), *Hearing science and hearing disorders*. London: Academic Press.
- Clark, G.M., Cowan, R.S.C. and Richard, C.D. (1997). *Cochlear implantation for infants and children. Advances*. London, Singular Publishing Group, Inc.
- Cooper, H. (1991) (Ed). *Cochlea implants, a practical guide*. London: Whurr Publishers Ltd.
- Cox, R.M. and McDaniel, D.M. (1989). Development of speech intelligibility rating test for hearing aid comparisons. *Journal of Speech and Hearing Research*, 32, 347-352.
- DeFilippo, C.L. (1982). *Tactile perception*. In D.G. Sims, G.C. Water and R.L. Whitehead (Eds.) *Deafness and Communication*. Baltimore: Williams & Wilkins.
- Fant G. (Ed.), (1972). *International symposium on speech communication ability and profound deafness*. Washington: Alexander Graham Bell Association for the Deaf.
- Flanagan, J.L. (1972). *Speech analysis, synthesis and perception*. 2nd Ed., New York: Springer-Verlag.
- Hirsh, I.R. (1952). *The measurement of hearing*. New York: McGraw Hill Book Company.
- Keller, E. (1994). *Fundamentals of speech synthesis and speech recognition – Basic concepts, state of the art and further challenges*. New York. John Wiley and Sons.
- Kryter, K.D. (Ed.), (1970). *Effects of noise on man*. New York. Van Nostrand Reinhold Company.
- Lim, J.S. (1983). *Speech enhancement*. London: Prentice-Hall International, Inc.,
- Miller, J.L. and Eimas, P.D. (1995) (Eds.). *Speech, language and communication*. New York: Academic Press.
- Owens E. and Kessler D.K. (1989). (Eds.) *Cochlear implants in young deaf children*. Boston: A College-Hill Publication, Little, Brown and Company.
- Pavlovic, C.V. (1987). Derivation of primary parameters and procedures for use in speech intelligibility prediction. *Journal of Acoustical Society of America*. 82, 413-422.
- M.Sc (Audiology)

Pickett, J.M. (1980). *Speech sounds of human communication*. MA. Allyn and Baear Press.  
Pickett, J.M., Ravolie S.G. (1979). Feature discrimination by persons with sensori neural hearing impairment. In B. Lindblom and S. Ohman (Eds.), *Frontiers of speech communication research*. London: Academic Press.

Plant, G and Spens, K.E (1995). (Ed). *Profound Deafness and Speech Communication*. London: Whurr Publishers

Potter, G. and Kopp, A. (1965). *Visible speech*. New Jersey: Murrey Hills.

Sanders, D.A. (1982). *Aural rehabilitation. A management model* (2nd Ed.). New Jersey: Prencice-Hall, Inc.

Summerfield, A.Q. (1983). *Audio-visual speech perception, lip reading, and artificial stimulation*. In M.E. Lutman and M.P. Haggard (Eds.), *Hearing science and hearing disorders*. London: Academic Press.

Tyler R.S. (1993). Ed. *Cochlear implants - Audiological foundations*. Singular Publishing Group, Inc. San Diego.

Warren, R.M. (1999). *Auditory perception - A new analysis and synthesis*. UK: Cambridge University Press.

# **AUD 304 : ELECTROPHYSIOLOGICAL ASSESSMENT OF THE AUDITORY SYSTEM**

**(30+70 marks)**

**(52 hours)**

## **Unit 1**

**12 hours**

- a) Classification and generators of auditory evoked potentials
- Exogenous potentials such as Ecochg, ABR, MLR, LLR
  - Endogenous potentials such as P300, MMN, CNV
  - Steady state evoked potential
- b) General principle in recording of auditory evoked potentials
- Exogenous potentials such as Ecochg, ABR, MLR, LLR
  - Endogenous potentials such as P300, MMN, CNV
  - Steady state evoked potential

## **Unit 2**

**10 Hours**

Factors affecting recording and interpretation of early responses (including Ecochg, ABR)

- Subject variables
- Stimulus variables
- Recording variables

## **Unit 3**

**10 Hours**

- a) Factors affecting recording and interpretation of middle latency response
- Subject variables
  - Stimulus variables
  - Recording variables
- b) Factors affecting recording and interpretation of long latency response
- Subject variables
  - Stimulus variables
  - Recording variables

## **Unit 4**

**10 Hours**

Factors affecting recording and interpretation of endogenous potentials such as P300, MMN, CNV.

- Subject variables
- Stimulus variables
- Recording variables

## **Unit 5**

**10 Hours**

- a) Factors affecting recording and interpretation of early responses, steady state evoked potentials
- Subject variables, Stimulus variables, Recording variables
- b) Implications in differential diagnosis and management, research needs

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## LIST OF BOOKS

### AUD 304 - ELECTRO PHYSIOLOGICAL ASSESSMENT OF THE AUDITORY SYSTEM

Hall, J.W. (1992). *Handbook of Auditory Evoked Responses*. Massachusetts: Allyn and Bacon.

Ferraro, J.A. (1997). *Laboratory exercises in auditory evoked potentials*. San Diego: Singular Publishing Group, Inc.

Hall, J.W. and Mueller, H.G. (1997) *Audiologists' Desk Reference Volume 1: Diagnostic Audiology Principles, Procedures and Protocols*, Singular Publishing Group: San Diego.

Hood, L.J. (1998). *Clinical applications of auditory brainstem response*. San Diego: Singular Publishing Group, Inc.

Jacobson, J.T. (Ed). (1985). *Auditory Brainstem Response*. London: Taylor and Francis.

Jacobson, J.T. (Ed). (1994). *Auditory Brainstem Response*. London: Taylor and Francis.

Katz, J. (Ed.). (1994). *Handbook of Clinical Audiology*. Baltimore: Williams and Wilkins.

McPherson, L.D. (1995) *Late potentials of the auditory system*, London: Singular Publishing Group.

Roser, R.R., Valente, M & Hosford-Dunn, D (Eds) (2000). *Audiology: Diagnosis*, New York, Thieme.

**AUD 305:CLINICAL PRACTICUM – III SEMESTER**  
**(100+100 marks)**

At the end of Semester **IV**, the student should be able to carry out the following –

1. Measurement of noise using SLM in 2 different environments
  
2. Otoacoustic Emissions – 5 subjects
  - Oz template- fine structure DPOAE's
  
3. Auditory evoked Potentials – 2 Subjects
  - Speech ABR
  - MLR
  - LLR
  - P300
  - MMN
  - BIOMAP
  
4. VEMP – Mention the protocol used

**M.Sc IV Semester**  
**AUD 401 ASSESSMENTS AND MANAGEMENT OF CENTRAL AUDITORY**  
**PROCESSING DISORDERS**

**(30+70 marks)**

**(52 hours)**

**Unit 1**

**12 hours**

- a) Theoretical basis for CAPD problems
- b) Classification of CAPDs - Conditions in which CAPD exist

**Unit 2**

**10 Hours**

Behavioral tests in the assessment of CAPD – Paediatric, Adults

**Unit 3**

**10 Hours**

Objective test in the assessment of CAPD – Paediatric, Adults

**Unit 4**

**10 Hours**

- a) Correlation of audiological with non-audiological findings in CAPD
- b) Influence of linguistic variations in assessment and management

**Unit 5**

**10 Hours**

Management of CAPD

- Choice of management based on audiological test results
- Environmental modification- focus more on practical exposure on environmental modifications.
- Devices
- Auditory perceptual training
- Communication strategies
- Cognitive/ language management
- Recording improvement in therapy
- Others

## LIST OF BOOKS

### AUD 401 : ASSESSMENT AND MANAGEMENT OF CENTRAL AUDITORY PROCESSING DISORDERS

Bellis, T.J. (1996). *Assessment and management of central auditory processing disorders in the educational setting -From science to practice*. London: Singular Publishing Group, Inc.

Chermak, G.D. and Musiek, F.E. (1997). *Central auditory processing disorders – New Perspectives*, San Diego: Singular Publishing Group, Inc.

Friel-Patti, S. (1999). Treatment for central auditory processing disorders: Clinical decision - making in the assessment and intervention of central auditory processing disorders, *Language, Speech and Hearing Services in schools*, 30, 345-352.

Katz, J. (1994). (Ed.), *Handbook of clinical audiology*. (4th Ed.), Baltimore: The Williams and Wilkins, Company.

Musiek, J.F., Baran, J.A. and Pinherio, M.L. (1994). *Neuro Audiology: Case studies*, San Diego: Singular, Publishing Group.

Roser ,R.R., Valente, M & Hosford-Dunn, D (Eds) (2000). *Audiology: Diagnosis*, New york, Thieme.

Valente, M. (1996). *Hearing aids standards, options and limitations*. New York: Thieme Medical Publishers,Inc.

Willeford, J.A., Burleigh, J.M. (1985). *Hand Book of CAPD in children*. Orlando: Grune & Stratton, Inc.

**AUD 402: SEMINARS IN REHABILITATIVE AUDIOLOGY**  
**(30+70 marks) (52 hours)**

**Unit 1** **12 hours**

- a) Digital / programmable technology in hearing instruments - Applications in hearing aids, Assistive listening devices
- b) Signal enhancing techniques: including technology to improve SN ratio, frequency response shaping, spectral contrast enhancement, control feedback, reduce distortion and circuit noise, etc.

**Unit 2** **10 Hours**

Electroacoustic performance of hearing instruments and ALDs, related standards

**Unit 3** **10 Hours**

- a) Overview and rationale of selection procedures
- Hearing aids (linear and non-linear)
  - Assistive listening devices
  - Future trends in hearing aid fitting strategies
- b) Aural rehabilitation and effective counseling for:
- Hearing aid use
  - Use of assistive listening devices

**Unit 4** **10 Hours**

- a) Special needs for rehabilitation of children
- Need for early intervention
  - Educational placement - options available including ‘Inclusive Education (Article24’; systems at all levels and vocational training/placement (Article 3)
  - Auditory learning; learning to listen
  - Strategies for management of multiply handicapped children
  - Language training for different age groups
  - Psychosocial aspects in rehabilitation
- b) Special needs for rehabilitation of geriatrics
- Speech reading
  - Communication strategies
  - Assertiveness training
  - Strategies for management of individuals with associated problems
  - Psychosocial aspect in rehabilitation

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## Unit 5

10 Hours

- a) Tinnitus management
  - Use of different techniques for individuals with normal hearing
  - Use of different techniques for individuals with degrees of hearing loss
- b) Hair cell regeneration, gene therapy for hearing loss

### LIST OF BOOKS

#### AUD 402 - SEMINARS IN REHABILITATIVE AUDIOLOGY

Mueller, H, G., Hawkins, D. and Northern, L, J. (1992). *Probe microphone measurements: Hearing aid selection and assessment*. San Diego: Singular Publishing Group, Inc.

Sandlin, E, R.(Edr.) (1995). *Handbook of hearing aid amplification - theoretical and technical considerations*. Vol. I. San Diego: Singular Publishing Group, Inc.

Studebaker, G.A. and Hochberg, I. (1993). *Acoustical factors affecting hearing aid performance*. II Edn. Boston: Allyn & Bacon.

Valente, M. (1994). *Strategies for selecting and verifying hearing aid fittings*. New York: Thieme Medical Publishers, Inc.

Valente, M. (1996). *Hearing aids standards, options and limitations*. New York: Thieme Medical Publishers, Inc.

Valente, M., Dunn, H.H. and Roeser, R.J. (2000). *Audiology- Treatment*. New York: Thieme Medical publishers, Inc.

# **AUD 403 IMPLANTABLE DEVICES FOR PERSON WITH HEARING DISORDERS**

**(30+70 marks)**

**(52 hours)**

## **Unit 1**

**12 hours**

### a) Bone anchored hearing aids (BAHA)

- Candidacy
- Components
- Types
- Rehabilitation
- Assessment of benefit

### b) Middle ear implants

- Candidacy
- Components
- Types
- Rehabilitation
- Assessment of benefit

## **Unit 2**

**10 Hours**

### Cochlear implants

- Biological safety
- Candidacy – pre-operative evaluation
- Components
- Types – design and features
- Evaluation of benefits

## **Unit 3**

**10 Hours**

### a) Psychophysics of cochlear implants - Speech processor and strategies

- Post-operative mapping and follow-up

## **Unit 4**

**10 Hours**

### a) Habilitation of infants and children with cochlear implants

### b) Habilitation of adults with cochlear implants

## **Unit 5**

**10 Hours**

### a) Other implantable devices including brainstem implant.

### b) Current trends and future needs in implantable devices

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## LIST OF BOOKS

### **AUD 403 : IMPLANTABLE DEVICES FOR PERSON WITH HEARING DISORDERS**

Clark, G.M., Cowan, B.S. and Dowell, R.C. (1997). *Cochlear implantation for infants and children: Advances*. San Diego: Singular Publishing Group, Inc.

Niparko, J.K., Kirk, K.I, Mellon, N.K., Robbins, A.M., Tucci, D.L. and Wilson, B.S. (2000). *Cochlear implants – Principles and practices*. Lippincott Williams & Wilkins, Philadelphia

Owens, E, Kessler D.K (1989). *Cochlear implants in young deaf children*. A Collegehill Publication, Boston.

Tyler, R.S. (1995). *Cochlear implants: Audiological foundations*. New Dehli: AITBS Publishers.

Valente.M., Dunn,H.H. and Roeser,R.J. (2000). *Audiology- Treatment*. NY: Thieme.

Waltzman, S.B. and Cohen, N.L. (2000). *Cochlear implants*. NY: Thieme.



## **AUD 404 – DISSERTATION**

**(30+70 marks)**

## **AUD 405: CLINICAL PRACTICUM- IV SEMESTER**

**(100+100 marks)**

**(224 Hours)**

1. Cochlear Implant
  - Mapping on training mode
  - NRT
  - Therapy (focus on OWL)
2. Real ear measurement- 2 subjects
  - Measurement of digital processing delay and signal phase
  - Measurement of attack time and release time
  - Measurement of digital noise suppression
3. Self Assessment Scale for Hearing Aid Users (in Kannada)
4. International Outcome Inventory – Hearing Aids (IOI-HA)
5. Acoustic calibration of instruments
  - Audiometer
  - Impedance Audiometer
  - OAE
  - Loop test

### **List of Journals for reference in subjects related to Audiology**

Asia Pacific Journal of Speech, Language and Hearing

Audiology and Neuro-otology

British Journal of Audiology

Ear & Hearing

Hearing Journal

Journal of Acoustical Society of America

Journal of Speech, Language and Hearing Research

Language, Speech and Hearing Services in School

Noise and Health

Scandinavian Audiology

Seminars in Hearing

Hearing Aid Journal of India