



AMRITA
VISHWA VIDYAPEETHAM

School of
Dentistry

**MASTER OF DENTAL SURGERY (MDS)-
Orthodontics & Dentofacial
Orthopaedics (MDS. ODO)
(As per the Regulations of the Dental Council of India)**



Our Inspiration



**H.H. Mata Amritanandamayee Devi
Hon. Chancellor, Amrita Vishwa Vidyapeetham**

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PROGRAM OUTCOMES

The program outcomes of MDS Orthodontics may be summarized as appended below. At the end of three years of training, a post graduate student in Orthodontics is expected to:

1. Understand the dynamic interaction of biologic processes and mechanical forces acting on the stomatognathic system during orthodontic treatment.

2. Learn the etiology, pathophysiology, diagnosis and treatment planning of various common Orthodontic problems.

3. Understand various treatment modalities in Orthodontics preventive interceptive and corrective.

4. Gain knowledge about basic sciences relevant to the practice of Orthodontics.

5. Knowledge about interaction of social, cultural, economic, genetic and environmental factors and their relevance to management of oro-facial deformities.

6. Factors affecting the long-range stability of orthodontic correction and their management.

7. Knowledge about maintaining personal hygiene and infection control, prevention of cross infection and safe disposal of hospital waste.

PROGRAM SPECIFIC OUTCOMES

A candidate undergoing training for the MDS program in Orthodontics, shall, at the end of the three year training, inculcate the following specific skills:

1. To obtain proper clinical history, methodical examination of the patient, perform essential diagnostic procedures, and interpret them and arrive at a reasonable diagnosis about the Dentofacial deformities.

2. To be competent to fabricate and manage the most appropriate appliance- intra or extra oral, removable or fixed, mechanical or functional, and active or passive- for the treatment of any orthodontic problem to be treated singly or as a part of multidisciplinary treatment of orofacial deformities.

3. Develop an attitude to adopt ethical principles in all aspects of Orthodontic practice.

4. Professional honesty and integrity are to be fostered.

5. Treatment care is to be delivered irrespective of the social Status, cast, creed or colleagues.

6. Willingness to share the knowledge and clinical experience with professional colleagues

7. Willingness to adopt, after a critical assessment, new methods and techniques of orthodontic management developed from time to time based on scientific research, which are in the best interest of the patient.

8. Respect patient's rights and privileges, including patient's right to information and right to seek a second opinion

9. Develop attitude to seek opinion from allied medical and dental specialists as and when required.

EVALUATION AND GRADING SYSTEM

SCHEME OF EXAMINATIONS

PART I MDS EXAMINATIONS

- The DCI, in its revised curriculum, has introduced a University level Examination at the end of the First year of the MDS course, from 2018-2019. As per this curriculum, *“the University shall conduct the Part I MDS Examination in Applied Basic Sciences at the end of the first academic year. This shall consist of One Theory Written Paper of three hours duration, and shall contain ten questions, each carrying ten marks each. The answer sheets shall be valued by one External Examiner and one Internal Examiner from the concerned specialty”*.
- At the end of the 1st academic year (on completion of 12 months after the start of the MDS course), the University shall conduct the Part I MDS Examinations in Applied Basic Sciences, notification for which shall be issued by the Examination Control Division (ECD) of the University two months prior to the date of conduct of these Examinations.
- As part of the **eligibility criteria** to appear for the Part I MDS Examinations, each MDS student shall have secured a **minimum of 80% attendance** in the first year of the MDS course, and shall have completed all the Pre-clinical work/exercises or any such course work, as mandated by the DCI, in its Modified Regulations (2017) or

- by the Head of the concerned Department /Principal of the Institution. The Principal shall send a list of students eligible to appear for the Part I MDS Examinations, to the ECD, at least 2 weeks prior to the start of the Examinations, so as to enable the University to issue hall tickets to eligible candidates
- The Part I MDS Examinations in **Applied Basic Sciences** shall consist of *one (1) Theory Written Paper*, of three (3) hours durations, for a total of one hundred (100) marks. The Theory Written paper shall have a total of ten (10) questions, each carrying 10 marks. The single paper carrying a total of 100 marks, can comprise varied types of questions that could help assess the knowledge of the candidates in a better manner.
 - A grand viva voce on the topics covered for the Theory Examinations can be conducted by the External and Internal Examiners appointed by the University for paper Evaluation. This will impart a better value and credibility to the Part I Examination system. The Viva voce can be conducted in the respective Departments of the Dental School, on the same day as notified by the University for evaluation of the Theory answer sheets.
 - The University can appoint as Question paper setters for the Part I MDS examinations, those Examiners from the concerned specialty, who fulfill the same general criteria laid down by the DCI, to qualify as Examiners for the Part II MDS Examinations. The Examiners may take care to set the questions which apply to the Basic Science topics in their concerned specialty, as mandated in the syllabus for the same by the DCI.
 - The candidates need to secure 50% marks separately for theory written and Grand viva to be declared '**Passed**' for the Part I MDS Exams. **Candidates who have failed in the Part I MDS Examination**, will have a chance to appear for the supplementary Examinations

- that shall be conducted by the University six months after the conduct of the Regular Examinations. To become eligible to appear for the Part II MDS Examinations at the end of the third year of the course, the candidate shall have passed the Part I Examinations at least 6 months prior to the Part II Examinations. There shall be *NO reevaluation of the answer sheets* of the Part I MDS Examinations.
- **The syllabus for the Part I MDS Examinations** shall be according to that specified by the DCI for each Specialty in its MDS Course Regulations, 2017.

Part II MDS Examinations:

1. Shall be conducted at the end of three years of completion of the MDS course. Notification for these Examinations shall be given by the ECD three months prior to the actual dates of the Examinations.
2. Every MDS student shall submit to the University (ECD) four printed copies of the completed **Dissertation work** duly signed and approved by the Guide/HOD, through the Principal, six months prior to the scheduled date of Examinations. *Acceptance of Dissertation by all the appointed Examiners is a mandatory pre-requisite to enable the candidate to become eligible to appear for the subsequent Part II MDS Examinations.*
3. Hall tickets shall be issued to the candidates for the Part II MDS Examinations, based on: (a) Acceptance of Dissertations by the appointed Examiners, (b) Report of eligibility of candidates from the Principal, after taking into account the completion of the required quantum of work in each specialty and (c) a minimum of 80% total attendance for each candidate.
4. There shall be *three (3) Theory Written Papers, followed by the Practicals and Viva-voce.*

5. Each **Theory Written Paper** (Paper I, II & III) will have the syllabus and contents, as prescribed in the MDS Course Regulations, for each specialty. The nomenclature of each paper for each specialty will also be in accordance with these Regulations. Each paper shall be of three hours durations, and maximum marks of One hundred (100). For Papers I and II, there shall be two essay questions, each carrying twenty five (25) marks, and five (5) short questions, each carrying ten (10) marks. For Paper III, there shall be Three (3) Essay questions of which the candidates need to answer any two (2), carrying 50 marks each. Each paper shall be of 3 hours duration.

Paper I: Orthodontic history, concepts of occlusion and esthetics, Child and Adult Psychology, Growth and Development, Anthropology, Etiology and classification of malocclusion, Dentofacial Anomalies, Diagnostic procedures and Radiology, Practice Management in Orthodontics.

Paper II: Treatment Planning, Clinical Orthodontics, Bio Mechanics, Tissue changes, and Orthodontic Techniques.

Paper III: Essay – Advances in Orthodontics

The topics assigned to the different papers are generally evaluated under that section. However a strict division of the subject may not be possible and some overlapping of topics is inevitable. Students should be prepared to answer overlapping topics

B. **Practical/ / Clinical Examination: 200 Marks**

Exercise No 1: Bite Registration for Functional Appliance: 50 Marks

- Selection of case for functional appliance and recording of construction bite.
- Fabrication and delivery of the appliance the next day.

Exercise No 2: Multiband exercise: 50 Marks

- III stage with auxiliary springs
OR
- Bonding of SWA brackets and construction of suitable arch wire.

Exercise No. 3: Display of records of the treated cases (minimum of 5 cases) 5 cases * 15 marks = 75 marks

Exercise No.4: Long case discussion: 25 marks

Sl.NO	Exercise	Marks Allotted	Approximate Time
1	Bite Registration for Functional appliance and Appliance fabrication	50	1 hour 1 hour
2	III stage mechanics / Bonding and arch wire fabrication	50	1hr 30 min
3	Display of case records (a minimum of 5 cases to be presented with all the cases)	75	1 hour
4	Long cases	25	2 hours

C. Viva Voce 80 Marks

All examiners shall conduct viva voce on candidate's comprehension, analytical approach, expression, interpretation of data and communication skills .It includes all component of course content. It include presentation and discussion of dissertation

Pedagogy 20 Marks

A topic is given to each candidate in the beginning of clinical examination. He/she is asked to make a presentation on topic for 8-10minutes

MARKS DISTRIBUTION

Part I Applied Basic Sciences Examination	Maximum Marks	Marks required for Pass
Theory Written Exam	100	50 out of 100
Grand Viva	50	25 out of 50
Part II Examinations		
Theory Written Exams (3 papers)	300 (100 marks each)	150
Practical and Viva-voce	300 (200 for Practicals, 80 for Grand Viva, 20 for Pedagogy)	150
Total for Part II Exams	600 (300 + 300)	300

COURSE DETAILS

SI#	COURSE NAME	COURSE CODE
1	Applied Basic Sciences	MORT1
2	Orthodontic history, concepts of occlusion and esthetics, child and adult psychology, malocclusion, dentofacial anomalies, diagnostic procedures and treatment planning, practice management	MORT2
3	Treatment planning, Clinical Orthodontics, Biomechanics, Tissue changes and Orthodontic techniques	MORT3
4	Recent Advances	MORT4

COURSE OUTCOMES

Applied Basic Sciences (MORT1)

CO1	Acquire knowledge about the basics of growth and development of oral and facial structures with special emphasis on maxilla and mandible
CO2	Knowledge of the regional anatomy, histology, embryology and osteology of head and neck with general disposition of thorax, abdominal and pelvic organs and translating this knowledge in Orthodontic practice

Orthodontic history, concepts of occlusion and esthetics, child and adult psychology, malocclusion, dentofacial anomalies, diagnostic procedures and treatment planning, practice management (MORT2)

CO1	Acquire knowledge about the concepts of occlusion and esthetics and the skill to diagnose related orthodontic problems and evolve an orthodontic treatment planning as per the need of the patient
CO2	Knowledge of dentofacial anomalies, diagnostic procedures and treatment planning in relation to orthodontic practice

Treatment planning, Clinical Orthodontics, Biomechanics, Tissue changes and Orthodontic techniques (MORT3)

CO1	Acquire knowledge and expertise for proper treatment planning depending on the need of the patient, in order to correct the orthodontic problems
CO2	Expertise in fabricating removable and fixed orthodontic appliances and delivering them to the patients as per the requirement.

COURSE SYLLABUS

I. GROWTH AND DEVELOPMENT AND APPLIED ANATOMY

6 hrs.

1. Growth pattern, variability and timings.
2. Methods of studying physical growth – Measurement approach -
Experimental approach – other methods.
 - Nature of skeletal growth.
 - Primary cartilage.
 - Secondary cartilage.
 - Growth center.
 - Growth site.
3. Prenatal growth –
 - Cranial vault:
 - Cranial base
 - Maxilla
 - Mandible
4. Postnatal growth –
 - Cranial vault
 - Cranial base
 - Maxilla
 - Mandible
5. Wolfe's law of transformation
6. Trajectories of force
7. Theories of growth
 - Genetic theory
 - Sutural theory
 - Cartilage theory
 - Functional matrix theory

- Enlow's V principle
 - Van Limborg theory
 - Cybernetics & Servosystem
 - Growth relativity hypothesis
8. Growth rotations
 9. Implications of growth
 10. Growth spurts
 11. Early stages of development – Embryologic development
 - Late foetal development and birth
 12. Infancy and early childhood:
 - The primary dentition years.
 - Physical development in preschool years.
 13. Maturation of oral function – Buccinator mechanism:
 - Infantile swallow.
 - Transitional swallow.
 - Adult swallow – Eruption of primary teeth late childhood – Physical development in late childhood - Exception of permanent teeth – Space relationship in replacement of incisors – incisor liability – Space relationship in replacement of canine and primary molar- Development of occlusion - Skeletal maturity indicators.
 - Cervical vertebra.
 - Hand wrist X ray methods.
 - Miscellaneous.
 14. Later stages of development – Adolescence:
 - Early permanent dentition.
 - Limitation of adolescence.
 - Timing of puberty.
 - Dimensional changes.
 - Rotation of jaws – Maturation and aging.
 - Changes in teeth and supporting structures.
 - Changes in alignment and occlusion soft tissue changes in ageing facial growth in adults - Development of palate and

clinical implications – Development of tongue – Development of cleft - palate – Dynamics of facial growth – Differential growth – Functions of the stomatognathic system – Development of TMJ - maturation of orofacial musculature.

- Orofacial muscles.
- Basic concepts of orofacial neuromuscular physiology.
- Reflex determinants of mandibular registration position.
- Growth and adaptation of orofacial muscles – Interaction of
- Orofacial muscles with development of craniofacial skeletal dentition – Role of craniofacial skeletal growth in Orthodontics – Growth prediction – Archial growth – Malocclusion associated with syndrome- Mandibular skeletal jaw dysmorphology – Mechanism of bone growth – Mechanism of bone transformation – Embryologic origin of the cartilage replacement mechanisms of the head - Law of electrogenesis – synchondroses – Principles of bone growth – Theories of tooth eruption – Functional matrix revisited – Mitosis – Meiosis - Recent advances.

II. PHYSIOLOGY 2hrs.

1) Endocrinology and its disorders

- Growth hormone, Thyroid hormone, parathyroid hormone, ACTH, pituitary gland hormones, Calcium and phosphorous homeostasis.

2) Nutrition

Role of vitamins.

- Enzymology.
- Balanced diet.
- Role of nutrition.
- Nutrition and malocclusion.

3) Muscle physiology

4) **Craniofacial Biology:** Cell adhesion molecules and mechanism of adhesion

5) **Bleeding disorders in orthodontics; Hemophilia**

III. DENTAL MATERIALS 5 hrs.

- **Gypsum products:** dental plaster, dental stone and their properties, setting reaction etc .
- **Impression materials:** impression materials in general and particularly of alginate impression material.
- **Acrylics:** chemistry, composition physical properties.
- **Composites:** composition types, properties, setting reaction
- **Banding and bonding cements:** Zn (PO₄)₂, zinc silicophosphate, zinc polycarboxylate, resin cements and glass ionomer cements.
- **Wrought metal alloys:** deformation, strain hardening, annealing, recovery, recrystallization, grain growth, properties of metal alloys.
- **Orthodontic arch wires:** stainless steel gold, wrought cobalt chromium, nickel alloys alpha & beta titanium alloys.
- **Elastics:** Latex and non latex elastics.
- **Applied physics:** Bioengineering and metallurgy.
- **Specification and tests** methods used for materials used in Orthodontics
- **Survey of all contemporary literature and recent advances** in above mentioned materials.

IV. GENETICS 2 hrs.

Principles and terminology

- Laws of inheritance
- Mode of inheritance
- Twin studies
- Mutation.

- Recent advances in genetics and molecular biology
- Role of homeobox genes
- Molecular genetics in oral and craniofacial dysmorphology
- Heritability of skeletal malocclusion
- Heritability of local occlusal variables
- Genetic influence on tooth number, size and morphology
- Clinical implications
- Chromosomal aberrations
- Recent advances

V. PHYSICAL ANTHROPOLOGY

2hrs.

- **Ontogeny**
- Phylogeny
- Evolution of human face
- Evolution of TMJ
- Evolution of mandible
- Vestigial organs
- Evolution of dentition
- Dryopaethicus
- Anthropometric studies

VI. PATHOLOGY

- Inflammation
- Necrosis

VII. BIOSTATISTICS 2 hrs.

- Statistical principles
- Data Collection
- Method of presentation

- Method of Summarizing
- Methods of analysis- different tests/ errors
- Sampling and Sampling technique
- Experimental models, design and interpretation
- Development of skills for preparing clear concise and cogent scientific abstracts and publication

VIII. APPLIED RESEARCH METHODOLOGY IN ORTHODONTICS 2 hrs.

- Experimental design
- Animal experimental protocol
- Principles in the development, execution and interpretation of methodologies
- Critical scientific appraisal of literature.

IX. APPLIED PHARMACOLOGY 1 hrs.

X. ORTHODONTIC HISTORY 2 hrs.

- Historical perspective.
- Evolution of orthodontic appliances,
- Pencil sketch history of Orthodontic peers
- History of Orthodontics in India

XI. CONCEPTS OF OCCLUSION AND ESTHETICS 4 hrs.

- Structure and function of all anatomic components of occlusion
- Mechanics of articulation.
- Recording of masticatory function.
- Diagnosis of occlusal dysfunction.
- Relationship of TMJ anatomy and pathology and related neuromuscular physiology.

XII. ETIOLOGY AND CLASSIFICATION OF MALOCCLUSION 4 hrs

- A comprehensive review of the local and systemic factors in the causation of malocclusion
- Various classifications of malocclusion

XIII. DENTOFACIAL ANOMALIES 3hrs.

- Anatomical, physiological and pathological characteristics of major groups of developmental defects of the orofacial structures.

XIV. CHILD AND ADULT PSYCHOLOGY 3 hrs.

- 1) Learning and development of behavior
 - Classical conditioning
 - Operant conditioning
 - Observational conditioning
- 2) Stages of emotional and cognitive development
Emotional development:-
 - Sigmund Freud's Psychoanalytic theory of personality development.
 - Erik Erikson's eight stages of emotional development.Cognitive development:-
 - Jean Piaget's
 - Assimilation and accommodation
 - Four periods of cognitive development
 - Sensorimotor
 - Pre operational
 - Concrete Operational
 - **Period of formal operations**
 - Elkinel imaginary audience

- Personal fable
- 3) Behavioral Sciences:-
 - The adolescent patient
 - The complaint adult patient
 - The orthodontist
- 4) Social psychology of Orthodontics
- 5) Orthodontic motivational Psychology
- 6) Educational
 - Learning patterns
 - Sensitivity threshold
 - Patient oriented Approach
- 7) Psychological outcomes of Orthodontic treatment
 - Self-concept
 - Self-esteem
 - Body images
- 8) Management of handicapped child in Orthodontic office
- 9) Kinds of Behavior
 - Fear
 - Anxiety
 - Cry
- 10) Behavior rating scales
- 11) Psychological aspects of habits
- 12) Child abuse

XV. DIAGNOSTIC PROCEDURES AND TREATMENT PLANNING IN ORTHODONTICS 6 hrs.

- Emphasis on the process of data gathering, synthesis and translating it into a treatment plan
- Problem cases- analysis of cases and its management
- Adult cases , handicapped and mentally retarded cases and their special problems
- Critique of treated cases

XVI. CEPHALOMETRICS 10 hrs.

- 1) Significance of Radiographic cephalometry:
 - Contribution factors to facial disharmony
 - Limitations of classification of malocclusion from dental cases
 - Incisor inclination
 - Importance of differential diagnosis in class – II and class – III
 - Growth and Maturation
- 2) Twenty centuries of Cephalometry
 - Classifying physique
 - Measurement and proportion
 - Renaissance to Twentieth century
 - The divine proportion
 - A search for an ideal
- 3) Radiographic Cephalometric techniques:
 - **Factors affecting Cephalometric Radiographs**
 - Patient positioning
 - X- ray grids
 - Film / screen combinations
 - X-ray generators
 - Film processing
 - Radiographic protection principles
- 4) Tracing Techniques and identification of landmarks:
 - Tracing techniques
 - Identification of Cephalometric landmarks
- 5) Down's Analysis
- 6) Steiner Analysis
- 7) Ricketts Analysis
- 8) Wits Appraisal
- 9) McNamara Analysis
- 10) Pitchfork's Analysis
- 11) Bork's Analysis

- 12) Tweed's Analysis
- 13) Schwarz Analysis
- 14) COGS Analysis
- 15) The geometry of Cephalometry
- 16) The complexity of facial growth analysis:
 - **Analysis of growth changes**
 - Prediction
- 17) Superimposition of Cephalometric Radiographs:
Natural head position – The key to Cephalometry
- 18) The continuous and Dynamic measurement of Natural Head posture and position
- 19) Proportional Analysis of the human face in a mesh coordinate system
- 20) Template analysis
- 21) The Proportional template
- 22) Soft tissue evaluation
 - Frontal view
 - Profile view
- 23) Soft tissue analysis
- 24) Advances in Cephalometric prediction
- 25) Videocephalometry
- 26) Facial analysis in two and three dimensions
- 27) Reliability of cephalometric prediction
- 28) Record and transfer case guidelines
 - Guidelines for Temporomandibular dysfunction assessment
- 29) Possibilities and limitations of various Cephalometric variables
- 30) Sources of error in Cephalometry
- 31) Postero anterior (frontal) cephalometry
- 32) Finding pathology in Cephalometric radiographs
- 33) Clinical research applications of cephalometry
- 34) Cephalometric assessment of Craniocervical angulation
- 35) Pharyngeal relationships, soft palate dimensions, hyoid bone and tongue positions
- 36) Other Analysis:

- **Colben craniofacial and dentition Analysis**
- Di Paolo's Quadrilateral Analysis
- Farkas and coworkers Analysis
- Harvold Analysis
- Hassund (Bergen) Analysis
- Jarabak Analysis
- Legan and Burstone soft tissue Analysis for Orthodontic surgery
- Ricketts comprehensive computer description analysis
- Riedel Analysis
- Sassouni Analysis
- Wylie Analysis
- Arnett and Bergman soft tissue Analysis

37) Soft Tissue Analysis

- **Profile Analysis**
- Reference points used in profile analysis
- Assessment of total profile
- **Reference planes for lip profile assessment analysis of tongue position by cephalometric radiography.**
- Analysis of tongue position by cephalometric radiography
- Tongue parameters
- Average findings
- Functional Analysis based on Cephalometric Radiography

38) Cephalometric Radiography and Growth

- Prediction of growth
- Methods of prediction of growth
- Sources of error in growth prediction
- Post Treatment growth changes
- Fine adjustment of occlusion after treatment
- Holdaway growth prediction

XVII. PRACTICE MANAGEMENT IN ORTHODONTICS 4 hrs.

- Economics and dynamics of solo and group practices
- Personal management
- Materials management
- Public relations
- Professional relationship
- Dental ethics and jurisprudence
- Office sterilization procedures
- Community based Orthodontics

XVIII CLINICAL ORTHODONTICS 25 hrs.

- 1) Malocclusion and dentofacial deformity in contemporary society –
 - Epidemiology of malocclusion
 - Classification of malocclusion
 - Need for orthodontic treatment
 - Demand for orthodontic treatment
 - Why is malocclusion so prevalent?
- 2) The etiology of Orthodontic problems:
 - ❖ Specific causes of malocclusion:-
 - Disturbances in embryonic development
 - Skeletal growth disturbances
 - Muscle dysfunction
 - Acromegaly and hemimandibular hypertrophy
 - Disturbances of dental development
 - ❖ Genetic influences
 - ❖ Environmental theory and development of the dental occlusion:-
 - Functional influences on dentofacial development
 - ❖ Etiology in contemporary perspective:-
 - Changing views of etiology perspective
 - Etiology of crowding and alignment

- Etiology of skeletal problems
- 3) Orthodontic diagnosis: The development of a problem list – The Problem
- Oriented approach:
- Questionnaire/ Interview – (i) Chief complaint, (ii) Medical and Dental history (iii) Physical Growth Evaluation (iv) Social and Behavioral Evaluation.
 - Clinical Evaluation – (i) Evaluation of oral health, (ii) Evaluation, of jaw and occlusal function, (iii) Evaluation of facial proportions (iv) Which diagnostic records are needed?
 - Analysis of Diagnostic Records – (i) Cast Analysis- symmetry and space, (ii) Cephalometric analysis
 - Orthodontic classification- (i) Development of classification systems, (ii) Classification by the characteristics of malocclusion
 - Development of a problem list
- 4) Orthodontic treatment planning
- Timing of treatment
 - Treatment planning of preschool children (primary dentition) Alignment problems
 - Incisor protrusion -retries
 - Cross bite
 - Anteroposterior discrepancies
 - Vertical problems – (i) Treatment Planning for pre adolescents (early mixed dentition) (ii) Treatment planning for adolescents (late mixed and early permanent dentition), (iii) Treatment planning for Orthodontic problems in adults.
- 5) Orthodontic treatment planning:
- Limitations, controversies and special problems
 - Extraction in the treatment of malocclusion
 - Growth modifications in the treatment of skeletal problems
 - Skeletal problems in older patients , camouflage Vs surgery
 - Treatment planning in special circumstances

- Patients with systemic diseases
 - Anomalies and injuries
 - Cleft lip and palate
- 6) Physiology of the stomatognathic system – Myology
- The buccinator mechanism
 - Functional movements
 - Temporomandibular joint – its disorders and management, Functions of the stomatognathic system
 - Mastication
 - Deglutition
 - Respiration
 - Speech
- 7) PREVENTIVE ORTHODONTICS **4 hrs.**
- Maintenance of a normal occlusion
 - Space maintenance
 - Abnormal resorption
- 8) INTERCEPTIVE ORTHODONTICS **7 hrs.**
- Development schedule and guidance of occlusion
 - Equilibration of occlusal disharmony
 - Habits and its management
 - Muscle exercise
 - Serial extraction
 - Surgical uncovering of impactions, positioning and transpositioning
 - Minor surgical procedures for orthodontics
- 9) CORRECTIVE ORTHODONTICS **15 hrs.**
- 1) Removable and functional appliance – Active plate:
- Parts of the appliance
 - Classification of removable appliance
 - Clasps
 - Active elements –(i) Labial bow, (ii) Springs, (iii) Screws, (iv) Elastics
 - Fabrication of plates

- 2) Functional appliances – Concepts of functional jaw orthopedics
- Definitions, History
 - Scientific concepts and validation of functional appliances –
 - (i) Research methodology and findings in Applied Craniofacial growth studies
 - (ii) Studies of functional appliances therapy
 - Principles of functional appliances
 - Cephalometric diagnosis for functional appliance therapy
 - A detailed knowledge of mechanism of action, principles, indications, advantages, disadvantages, modifications, fabrication, management, parts, construction bite, effects and studies on following appliances–
 - (i) Activator and its modifications, (ii) Bionator, (iii) Frankel, (iv) Twin block, (v) Magnetic functional system, (vi) Combined extra oral and functional appliances, (vii) Fixed functional appliances, (viii) Maxillary retraction and intrusion splints, (ix) Combined fixed and removable appliances
 - Management of class - II, class III and open malocclusions with functional appliances
- 3) Headgears - principles
- Biomechanics of headgears
 - Orthopedic forces
 - Types
 - Role of headgear in skeletal and dental correction
 - Studies on headgear effects
- 4) Fixed Appliances:
- Basic principles of Mechanotherapy
- Design
 - Construction
 - Fabrication
 - Management
 - Review of current literature on treatment methods and results
 - 1) Tip edge- principles:
 - Bracket system and newer modifications

- Stages of treatment
- NiTi torque bar
- Finishing
- Advantages
- Recent advances
- Straight edge

2) Pre adjusted Edgewise – principles

- Bracket system
- Wire sequencing
- Different modes of retraction
- Variations in different extractions patterns, clinical management, anchorage, recent advances in the following techniques – (i) Andrews, (ii) Roth, (iii) VSD, (iv) MBT, (v) Bio- progressive therapy, (iv) Combination techniques, (vii) Other PAE systems

3) Begg Mechanotherapy – evolution

- Principle
- Stages of treatment – (i) Stage – I Principles, (ii) Stage II Principles, (iii) Stage III principles
- Bracket (i) Types (ii) Modification
- Springs (i) Uprighting (ii) Rotation (iii) Torquing
- Wires (i) Types (ii) Dimensions (iii) Uses
- Modern Begg (i) Stages (ii) Wires (iii) Auxillaries— a) Springs b) Lockpins c) wires
- Mechanical aspects of anchorage control – (i) Frictional effects (ii) Changes in auxillary morphology

10) ADULT ORTHODONTICS 4 hrs.

- Adult orthodontics Treatment Objectives
- Ideal Orthodontic treatment goal and the adult patient
- Diagnostic consideration in adult patient
- Periodontal Diagnosis

- Diagnosis of Temporomandibular Joint Dysfunctions
- Adult Orthodontic Treatment Planning
- Adult Patient Management
- Concept of treatment sequencing
- Management of Dentofacial Deformities

Retention and Stability after active comprehensive therapy

XIX. COMBINED SURGICAL AND ORTHODONTIC TREATMENT 8 hrs.

- 1) Indications for surgery – Development of orthognathic surgery:
 - Severity as an indication for orthognathic surgery: the envelope of discrepancy
 - Esthetic and psychosocial considerations
 - Psychological reactions to orthognathic surgery
 -
- 2) Surgical procedures and treatment possibilities – Correction of anteroposterior relationships
 - Correction of vertical relationships
 - Correction of transverse relationships
 - Genioplasty in orthognathic treatment
 - Integration of orthognathic and other facial surgery
- 3) Timing and sequencing of surgical treatment – Early Vs Later surgery
 - Treatment sequencing
- 4) Integration of surgical and orthodontic treatment – Interactive treatment planning
 - Pre-surgical orthodontics
- 5) Patient management at surgery – Surgical management.
- 6) Post- surgical stability and clinical success

XX. CLEFT LIP AND PLATE REHABILITATION 3hrs.

- Diagnosis and treatment planning
- Mechanotherapy

- Special growth problems of cleft cases
- Speech physiology, pathology and elements of therapy as applied to orthodontics
- Team rehabilitative procedure.

XXI. INTERDISCIPLINARY ORTHODONTICS 2 hrs.

- Principles of interdisciplinary patient treatment
- Common problems and their management

XXII. TISSUE REACTIONS 10 hrs.

- Tooth supporting tissues – Gingival, Periodontal ligament, Root cementum, Alveolar bone, Bone physiology and metabolism.
- Physiologic tooth movement – eruption of teeth, occlusal equilibrium.
- Orthodontic tooth movement – tissue response in periodontium, transmission of mechanical influence into cellular reaction, biomechanical factors and tissue reaction in the periodontium.
- Orthodontic forces: types of forces- interrupted force, intermittent force, magnitude of forces, and duration of force.
- Types of tooth movement : tipping, torque, bodily movement rotation, intrusion, extrusion
- Theories of tooth movement
- Tissue reaction to certain types of tooth movements
- Tissue response in sutures – structures of suture, suture responsible to orthopedic forces
- Tissue response in the TMJ region – structure of T.M.J, T.M.J response to orthopedic forces
- Drug effects on response to orthodontic forces
- Iatrogenic response of supporting tissues in orthodontics- Damages to periodontal tissues- Gingival inflammation, Alveolar bone loss, Marginal bone recession, Damage to tooth

enamel surfaces, pulpal reaction, root resorption –root resorption not related to orthodontic, Root resorption caused by orthodontics – (superficial resorption , Apical resorption) , Factors affecting resorption – (Tooth vulnerability, orthodontic appliances, magnitude of force, duration of force, direction of tooth movement), Risk of TMJ dysfunction

- Post treatment stability
- Recent advances

XXIII. BIOMECHANICS 18 hrs.

- Introduction
- Principles of engineering and biophysics
- Sign conventions
- Biomechanics of tooth movement- center of rotation, Force magnitude and rate of tooth movement, Relationship of force magnitude to pain and tooth mobility, optimal force and stress
- The orthodontic appliances—Active and reactive members, moment to force ratio, load deflection rate, maximal elastic movement, manner of loading.
- Clinical correlations: Biomechanics of space closure, overbite control, transverse control.
- Anchorage and its control: Definition, Anchorage types, Principles, Situations, significance of anchor loss, Adjuncts used in anchorage conservation, management of anchorage in the transverse, Vertical and sagittal planes of space
- Recent advances

XXIV. ORTHODONTIC MATERIALS 4hrs.

- Structure and properties of orthodontic materials – (i) Metallic, (ii) Ceramic (iii) Polymeric
- Mechanics and mechanical testing of orthodontic materials

- Orthodontic wires – (i) General terminology – a) Resiliency, b) Stiffness, c) Stress d) Strain e) Proportional limit, f) Deflection, g) contact point, h) range of action
- Desirable properties of wires
- Manufacturing
- Wire alloys – gold alloys, stainless steel wires, cobalt chromium nickel wires, nickel titanium wires, alpha and beta titanium wires
- Clinical selection of orthodontic wires
- Comparison of contemporary arch wires
- Effect of diameter and cross section
- Effect of length and attachments.

XXV. BONDING 4 hrs.

- Types and principles
- Enamel etching and bond strength
- Orthodontic adhesive resins and composites – (i) Adhesives – a) Composition, b) Modifications – 1) Generations, 2) Self etching primer, 3) Light cure primer – Hydrophobic, Hydrophilic, 4) MISIP
- Composite – (i) Composition (ii) Self curing- Types (iii) Light curing – types
- Principles of adhesion, bonding to non conventional surfaces
- Recent advances in bonding materials
- Cements in orthodontics
- Impression materials
- Elastic materials and the production of orthodontic force – (i) The basic properties (ii) Rubber and plastic sources of elastic force (iii) Elastomeric ligatures and chain – a) Properties b) types c) Use d) Force degradation
- Causes of failure

- Orthodontic bracket – (i) Metallic bracket (ii) Aesthetic bracket (iii) Lingual brackets
- Debonding – (i) Techniques, (ii) enamel damage (iii) Magnets as a source of orthodontic force a) Properties and composition b) Types c) Uses d) Advantages and disadvantages e) Modifications
- Soldering and welding
- Principle of biocompatibility
- Allergic reactions and safety concerns
- Recent advances in orthodontic materials

XXVI. RETENTION AND RELAPSE 3 hrs.

- Definition
- History of retention
- Importance of retention
- Basic theorems
- Periodontal and gingival reorganization
- Occlusal stability
- Tooth size discrepancy
- Axial inclinations
- Transverse discrepancies
- Relationship third molar
- Growth factors
- Further implications of growth
- Duration of retention
- Retention appliances
- Relapse – definition
- Causes of relapse
- Recovery after relapse

XIX. RECENT ADVANCES IN ORTHODONTICS 7 hrs.

- Use of implants

- Lasers
- Application of F.E.M.
- Distraction Osteogenesis
- Lingual Orthodontics
- Nano technology
- 3 dimensional imaging
- Cone Beam C T

**Basic Pre –Clinical Exercise Work for the MDS Students:
First 6 Months**

1. NON-APPLIANCE EXERCISES

All the following exercises should be done with 0.7 or 0.8mm wire

SL No	Exercise	No
1	Straightening of 6" & 8" long wire	1each
2	Square	1
3	Rectangle	1
4	Triangle of 2" side	1
5	Circle of 2" side	1
6	Bending of 5V's	1
7	Bending of 5V's	1

2. CLASPS

Sl. No	Exercise	No
1	$\frac{3}{4}$ Clasps	2
2	Full clasps	2
3	Triangular Clasps	2
4	Adam's clasp- upper molar	2
5	Adam's Clasp-lower molar	2
6	Adam's Clasp-Pre-molar	2

7	Adam's Clasp-Incisor	2
8	Modification of Adam's-with Helix	2
9	Modification of Adam's –with distal extension	2
10	Modification of Adam's- with soldered tube	2
11	Duyzing Clasps on Molars	2
12	Southend Clasp	1

3. LABIAL BOWS

Sl No	Exercise	No
1	Short labial bow (upper & lower)	1
2	Long labial bow (upper & lower)	1
3	Robert's retractor	1
4	High labial bow- with apron spring's	1
5	Mill's labial bow	1
6	Reverse loop labial bow	1
7	Retention labial bow soldered to Adam's clasp	1
8	Retention labial bow extending distal to second molar	1
9	Fitted labial bow	1
10	Split high labial bow	1

4. SPRINGS

Sl No.	Exercise	No
1	Finger spring –mesial movement	2
2	Finger spring- distal movement	2
3	Double cantilever spring	2
4	Flapper spring	2
5	Coffin spring	2
6	T spring	2

5. CANINE RETRACTORS

Sl No	Exercise	No
1	U loop canine retractor	2 PAIRS
2	Helical canine retractor	2 PAIRS
3	Palatal canine retractor	2 PAIRS
4	Self- supporting canine retractor	2 PAIRS
5	Self-supporting canine retractor	2 PAIRS

6. APPLIANCES

Sl No	Exercise
1	Hawley's retention appliance with anterior bite plane
2	Upper Hawley's appliance with posterior bite plane
3	Upper expansion appliance with coffin spring
4	Upper expansion appliance with coffin spring
5	Upper expansion appliance with expansion screw
6	Habit breaking appliance with tongue crib
7	Oral screen and double oral screen
8	Lip bumper
9	Splint for Bruxism
10	Catalans appliance
11	Activator
12	Bionator
13	Frankel- FR 2 appliance
14	Twin block
15	Lingual arch

16	TPA
17	Quad helix
18	Bihelix
19	Utility arches
20	Pendulum appliance

7. Soldering exercises

Sl No	Exercise	No
1	Star	1
2	Comp	1
3	Christmas tree	1
4	Soldering buccal tube on molar bands	1

8. Welding exercise

Sl No	Exercise	
1	Pinching and welding of molar, premolar, canine and Incisor bands	
2	Welding of buccal tubes and brackets on molar bands and incisor bands	

9. Impression of upper and lower arches in alginate

10. Study model preparation

11. Model analysis

Sl No	Exercise
1	Impression of Upper and Lower dental arches
2	PREPARATION OF STUDY MODEL-1 And all the permanent dentition analyses to be done.
3	PREPARATION OF STUDY MODEL-2

	And all the permanent dentition analyses to be done
4	PREPARATION OF STUDY MODEL-3 And all the mixed dentition analyses to be done

12. Cephalometrics

Sl No	Exercise
1	Lateral cephalogram to be traced in five different colors and super Imposed to see the accuracy of tracing
2	Steiner's analysis
3	Down's analysis
4	Tweed analysis
5	Rickett's analysis
6	Burrstone analysis
7	Rakosi's analysis
8	Mc Narmara analysis
9	Bjork analysis
10	Coben's analysis
11	Harvold's analysis
12	Soft tissue analysis –Holdaway and Burstone

13. Basics of Clinical Photography including Digital Photograph

14. Light wire bending exercises for the Begg technique

Sl No	Exercise
1	Wire bending technique on 0.016' wire circle "Z" Omega
2	Bonwill-Hawley diagram
3	Making a standard arch wire
4	Inter maxillary hooks –Boot leg and Inter Maxillary type
5	Upper and Lower arch wire

6	Bending a double back arch wire
7	Bayonet bends (vertical and horizontal offsets)
8	Stage –III arch wire
9	Torquing auxiliary (upper)
10	Reverse Torquing (lower)
11	Up righting spring

15. Typhodont Exercises (Begg or P.E.A. method)

Sl No	Exercise
1	Teeth setting in Class-I division I malocclusion with maxillary anterior Proclination and mandibular anterior crowding
2	Band pinching, welding brackets and buccal tubes to the bands
3	Stage-I
4	Stage-II
5	Pre Stage – III
6	Stage -III

CLINICAL WORK

Once the basic pre-clinical work is completed the students can take up clinical cases and the clinical training is for the two and half years.

Each postgraduate student should start with a minimum of 50 cases of his/her own. Additionally he/she should handle a minimum of 20 transferred cases.

The type of cases can be as follows.

- i. Removable active appliances-5cases
- ii. Class-1 malocclusion with Crowding
- iii. Class-1 malocclusion with bi-maxillary protrusion
- iv. Class II division-1
- v. Class –II division-2

- vi. Class –III(Orthopedic, Surgical , Orthodontic cases)
- vii. Inter disciplinary cases
- viii. Removable functional appliance cases like activator, Bionator, functional regulator twin block and new developments
- ix. Fixed functional appliances- Herbst appliance, jasper jumper etc- 5cases
- x. Dento –facial orthopedic appliances like head gears, rapid maxillary expansion Niti expander etc,- 5 cases
- xi. Appliance for arch development such as molar distalization m 5 cases
- xii. Retention procedures of above treated cases.

Other work to be done during FIRST YEAR

1. **Seminars:** At least one Seminar per week to be conducted in the department. A minimum of five seminars should be presented by each student each year
2. **Journal club:** At least one Journal club per week to be conducted in the department. A minimum of five seminars should be presented by each student each year
3. **Dissertation topic** to be decided and the Synopsis for the same should be submitted to the University during the later half of the 1st year as per University rules to the Registrar, Amrita Vishwa Vidyapeetam, through proper channel
4. **Under graduate classes:** Around 4-5 classes should be handled by each post- graduate student.
5. **Field survey:** To be conducted and submit the report
6. **Inter – department meetings:** should be held once in a month.
7. **Case discussions** and treatment planning of patients allotted (after completion of pre- clinical exercises) during the later half of the 1st year. Treatment plan should be approved and countersigned by the staff concerned prior to initiating treatment.
8. Treatment to be initiated for cases that have been approved.
9. **Library dissertation** to be submitted before the end of the year.
10. **Field visits:** To attend dental camps and to educate the masses

11. Basic subjects classes
12. Internal assessment or Term paper

SECOND YEAR:

The clinical cases taken up should be followed under guidance of the staff concerned. More case would be allotted for discussions and treatment.

Other routine work as follows.

1. **Protocol** for dissertation to be submitted in the first half of the year.
2. **Seminars:** At least one Seminar per week to be conducted in the department .Each student should present a minimum of five seminars each year.
3. **Journal club:** At least one Journal club per week to be conducted in the department. Each student should present a minimum of five seminars each year.
4. **Undergraduate classes:** Each post- graduate student should handle around 4-5 classes.
5. Inter –departmental meetings should be held once in a month
6. **Case discussions**
7. **Field visits: To attend dental camps and** to educate the masses.
8. **Dissertation work:** On getting the approval from the university work for the dissertation to be started.

THIRD YEAR

The clinical cases taken up should be followed under the guidance. More cases discussions and cases to be taken up.

Other outline work as follows.

1. **Seminars:** At least one Seminar per week to be conducted in the department. Each student should present a minimum of five seminars each year.

2. **Journal Club:** At least one Journal club per week to be conducted in the department. A minimum of five seminars should be presented by each student each year.
3. **Under graduate classes:** Each post –graduate student should handle around 4-5 classes.
4. Inter departmental meetings should be held once in a month.
5. The completed dissertation should be submitted six months before the final examination.
6. Case discussions
7. **Field visits:** To attend dental camps and to educate the masses.
8. Finishing and presenting the cases taken up.
9. **Preparation of finished cases and presenting the cases(** to be presented for the examination)
10. Mock examination