

UNIVERSITY OF DELHI

Scheme of Examination and

Course of Reading for

Master of Physiotherapy Programme (2 year duration)

Musculoskeletal Physiotherapy Neurological Physiotherapy



UNIVERSITY OF DELHI

**RULES, REGULATIONS, SCHEME OF
EXAMINATIONS, CURRICULUM HOURS AND
COURSES OF READING FOR**

**MASTER OF PHYSIOTHERAPY
(2 YEARS DURATION)**

- 1. MUSCULOSKELETAL PHYSIOTHERAPY**
- 2. NEUROLOGICAL PHYSIOTHERAPY**

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**UNIVERSITY OF DELHI
(FACULTY OF SCIENCE)**

1. Short title and commencement

THESE REGULATIONS SHALL BE CALLED "THE REGULATIONS FOR THE MASTER OF PHYSIOTHERAPY DEGREE COURSE OF THE UNIVERSITY OF DELHI"

These regulations shall come into force soon after the commencement of the course.

The Regulations and the Syllabi are subject to modification by the Courses Committee and approvals from Academic Council of the University of Delhi.

2. Aim and objectives

Aim:

The Master of Physiotherapy Program (MPT) is directed towards rendering training in the respective Physiotherapy Specialty so as to enhance individual competence in order to fulfill requirements and to meet global standards of Physiotherapy Education and Practice.

Objectives:

- To apply advance physiotherapy skills in different clinical settings safely & effectively.
- To design, implement and monitor therapeutic interventions in accordance with the latest evidence.
- To promote and conduct independent research in the field of physiotherapy.
- To work as an important and critical member of the healthcare team relevant to the specialty.

- To promote higher education in the field of physiotherapy and to be able to understand contemporary trends in physiotherapy.
- To understand organizational and administrative issues relevant to Physiotherapy practice, education and policy.
- To recognize relationships and differences between different specialty areas.
- To identify and appreciate innovative perspectives on the subject and demonstrate it

3. Nature

Regular and full-time: 4 semesters of 6 months each (Total 4 semester/2 years)

Candidate shall not be enrolled in any other university or any other course in the University of Delhi, during the period he/she is enrolled for the MPT program. At any point of time during the course, if it is found that the student has been enrolled in any other regular course at any other university, the admission may be cancelled. If the same is found after the completion of the course the degree certificate of University of Delhi shall stand null and void. However, unrelated distance education courses from institutions such as IGNOU will be exempted under this rule.

4. Course Outline

The duration of the Master's Degree in Physiotherapy is 2 (two) years (4 semesters of 6 months each) course. It comprises of classroom teaching, clinical training, research activities, presentations, case discussions and culminates in a dissertation on a topic of choice.

Students will be encouraged to attend conferences and workshops to enhance their knowledge during their entire course of the study. University examinations will be held at the end of each semester. The students will be considered to have successfully completed

the course only if he/she has met all attendance requirements, successfully passed all theory and practical examinations, and successfully completed their dissertation requirements.

5. Mode of admission

The selection of candidates for admission to the Master of Physiotherapy (Musculoskeletal / Neurological Physiotherapy) course will be made on the basis of merit in an entrance examination. The examination will be of 3 hours duration & shall consist of 200 objective type questions based on at minimum the Bachelor of Physiotherapy curriculum (University of Delhi).

6. Eligibility criteria for admission

To be eligible to appear in the Entrance examination for admission to the Master of Physiotherapy, candidates should have fulfilled at least **one** of the following conditions:

- i) Successful completion of an undergraduate physiotherapy degree (B.Sc. (PT) / BPT) from a recognized college/institute/university within India of not less than 4½ years duration (including 6 months of internship) with 55% of aggregate marks (50% for SC/ST) in university exams. Candidates who have completed 3 ½ years course and an additional bridge course of 1 year will be considered equivalent to 4 ½ years course.
- ii) An undergraduate physiotherapy qualification (B.Sc. (PT) / BPT etc.) of 3 ½ years duration from a recognized college/institute/university plus at least 10 years of work experience.

7. Age limit

There will be no minimum or maximum age limit for admission to MPT course as per University of Delhi norms

8. Commencement of the course

The course shall commence from 1st August of each academic year.

9. Scheme of Examination

**MASTER OF PHYSIOTHERAPY - MUSCULOSKELETAL
PHYSIOTHERAPY**

MPT (Semester I)

SUBJECT & PAPER CODE	THEORY			PRACTICAL		
	M.M Annual	M.M Internal	TOTAL	M.M Annual	M.M Internal	TOTAL
PAPER I	70	30	100			
PAPER II	70	30	100			
PAPER III	70	30	100			
PRACTICAL PAPER I				70	30	100
	Theory Marks		300	Practical Marks		100
				TOTAL MARKS		400

MPT (Semester II)

SUBJECT & PAPER CODE	THEORY			PRACTICAL		
	M.M Annual	M.M Internal	TOTAL	M.M Annual	M.M Internal	TOTAL
PAPER IV	70	30	100			
PAPER V (MPT-105)	70	30	100			
PRACTICAL PAPER II				70	30	100
PRACTICAL PAPER III PR(MS)III				70	30	100
	Theory Marks		200	Practical Marks		200
				TOTAL MARKS		400

MPT (Semester III)

SUBJECT & PAPER CODE	THEORY			PRACTICAL		
	M.M Annual	M.M Internal	TOTAL	M.M Annual	M.M Internal	TOTAL
PAPER VI (MPT-106)	70	30	100			
PAPER VII (MPT-107)	70	30	100			
PRACTICAL PAPER IV PR(MS)IV				70	30	100
PRACTICAL PAPER V PR(MS)V				70	30	100
	Theory Marks		200	Practical Marks		200
				TOTAL MARKS		400

MPT (Semester IV)

SUBJECT & PAPER CODE	THEORY			PRACTICAL		
	M.M Annual	M.M Internal	TOTAL	M.M Annual	M.M Internal	TOTAL
PAPER VIII (MPT-108)	70	30	100			
DISSERTATION*	200	--	200			
PRACTICAL PAPER VI PR(MS)VI				70	30	100
	Theory Marks		300	Practical Marks		100
				TOTAL MARKS		400
GRAND TOTAL				1500		

PR (MS) - Practical (Musculoskeletal Physiotherapy)

**Marks including thesis Presentation.*

Subjects-Musculoskeletal Physiotherapy

Semester I:

Theory

- Paper I - Management & Education
 Paper II- Research Methods & Biostatistics
 Paper III- Exercise Physiology, Health & Nutrition.

Practical

- Paper I - Exercise Physiology, Health & Nutrition

Semester II:

Theory

- Paper IV - Applied Biomechanics
 Paper V - Diagnostics in Musculoskeletal Physiotherapy

Practical

- Paper II- Applied Biomechanics
 Paper III- Diagnostics in Musculoskeletal Physiotherapy

Semester III:

Theory

Paper

Paper

VI - Physiotherapy in Musculoskeletal Conditions I
VII - Advanced Therapeutics in Musculoskeletal
Physiotherapy

Practical

Paper

Paper

IV - Physiotherapy in Musculoskeletal Conditions I
V - Advanced Therapeutics in Musculoskeletal
Physiotherapy

Semester IV:

Theory

Paper

VIII- Physiotherapy in Musculoskeletal Conditions II

Practical

Paper

VI - Physiotherapy in Musculoskeletal Conditions II

Dissertation

MASTER OF PHYSIOTHERAPY - NEUROLOGICAL PHYSIOTHERAPY

MPT (Semester I)

SUBJECT	THEORY			PRACTICAL		
	M.M Annual	M.M Internal	TOTAL	M.M Annual	M.M Internal	TOTAL
PAPER I	70	30	100			
PAPER II	70	30	100			
PAPER III	70	30	100			
PRACTICAL PAPER I				70	30	100
	Theory Marks		300	Practical Marks		100
				TOTAL MARKS		400

MPT (Semester II)

SUBJECT	THEORY			PRACTICAL		
	M.M Annual	M.M Internal	TOTAL	M.M Annual	M.M Internal	TOTAL
PAPER IV	70	30	100			
PAPER V (MPT-205)	70	30	100			
PRACTICAL PAPER II				70	30	100
PRACTICAL PAPER III				70	30	100
PR(N)III						
	Theory Marks		200	Practical Marks		200
				TOTAL MARKS		400

MPT (Semester III)

SUBJECT	THEORY			PRACTICAL		
	M.M Annual	M.M Internal	TOTAL	M.M Annual	M.M Internal	TOTAL
PAPER VI(MPT-206)	70	30	100			
PAPER VII(MPT-207)	70	30	100			
PRACTICAL PAPER IV				70	30	100
PR(N)IV						
PRACTICAL PAPER V				70	30	100
PR(N)V						
	Theory Marks		200	Practical Marks		200
				TOTAL MARKS		400

MPT (Semester IV)

SUBJECT	THEORY			PRACTICAL		
	M.M Annual	M.M Internal	TOTAL	M.M Annual	M.M Internal	TOTAL
PAPER VIII(MPT-208)	70	30	100			
DISSERTATION*	200	--	200			
PRACTICAL PAPER VI PR(N)VI				70	30	100
	Theory Marks		300	Practical Marks		100
				TOTAL MARKS		400
GRAND TOTAL				1500		

PR (N) - Practical Examination (Neurological Physiotherapy).

***Marks including thesis presentation**

Subjects - Neurological Physiotherapy

Semester I:

Theory

Paper I- Management & Education

Paper II- Research Methods & Biostatistics

Paper III- Exercise Physiology, Health & Nutrition.

Practical

Paper I- Exercise Physiology, Health & Nutrition

Semester II:

Theory

Paper IV- Applied Biomechanics

Paper V- Diagnostics in Neurological Physiotherapy

Practical

Paper II - Applied Biomechanics

Paper III - Diagnostics in Neurological Physiotherapy

Semester III:

Theory

Paper VI - Physiotherapy in Neurological Conditions I

Paper VII- Advanced Therapeutics in Neurological Physiotherapy

Practical

Paper IV- Physiotherapy in Neurological Conditions I

Paper V -Advanced Therapeutics in Neurological Physiotherapy

Semester IV:

Theory

Paper VIII - Physiotherapy in Neurological Conditions II

Practical

Paper VI - Physiotherapy in Neurological Conditions II

Dissertation

10. Pass Percentage

The minimum pass marks in the main theory and practical papers (separately) is 50%.

11. Promotion Criteria

The candidate will be promoted to the next semester on the following basis:

1st semester - He / she has successfully passed at least 2 papers (Out of a total of 4 including theory and practical)

2nd semester- He/ she has successfully passed all examinations of 1st & 2nd semester and the research proposal has been approved by the Research Committee.

3rd Semester- He / she has successfully passed at least 3 examinations of 3rd semester (Out of a total of 4 including theory and practical)

Criteria for successful completion of course:

The candidate should pass all theory & practical examinations (including the fulfillment of all dissertation requirements) within three (3) years from the date of admission, failing which he / she will have to be readmitted to the course.

12. Classification of results: The successful candidates who qualify for the award of the degree in Master of Physiotherapy will be classified into following categories:

- | | |
|--------------------------------|--------------------------|
| i) Passed with distinction | - 75% and above |
| ii) Passed with first division | - between 60% and 74.99% |
| iii) Passed | - between 50% and 59.99% |

13. Methods of Training

Post graduate students shall be trained to acquire responsibilities in the advanced management of patients with ethical standards of practice. They will be made to actively involve themselves in seminars, case presentations, journal review meetings and clinical discussions. Every MPT candidate will be required to create lesson plans and teach undergraduate students under supervision of regular faculty. In addition they will conduct research activities under the guidance of the research supervisors.

14. Dissertation

- i. All candidates will be required to submit a synopsis of their proposed dissertation within 6 months of the date of commencement of the course on or before the dates notified by the Institute. The proposed topics will be reviewed and approved by a Research Committee. Once approved no change (s) in the dissertation topic or supervisor shall be made without prior approval of the committee.
- ii. The application shall be submitted through the Onsite Supervisor who shall state on the application form that the subject of the dissertation and the proposed outline of research have his/her approval and he/she is willing to supervise and guide the research work of the candidate onsite.
- iii. The Supervisor will be a Senior PT/In-charge PT and will possess a minimum of 3 years of clinical/academic experience. However if the Supervisor is not from the clinical posting site, he/she will possess a minimum of post graduate degree in physiotherapy.
- iv. The Internal supervisor/Co-supervisor will possess a minimum of a post graduate degree. He/she will guide/advise and help facilitate the student's research project.

- v. The candidate will conduct the research work at his/her clinical placement. However, it is understood that candidates will have to comply with all curriculum and attendance requirements.

The candidate shall regularly meet and discuss with the internal supervisor/Co-supervisor the plans and progress of his/her research work.

- vi. When the dissertation is ready for submission to the University, he/she will inform the In-charge /Head of the course in written, who will then arrange a pre-submission presentation in the presence of the Research Committee of the institute.
- vii. After final approval from the Research Committee, four copies of dissertation shall be submitted to the Head of Department, three months before final examination of 4th semester. A maximum of 4 weeks will be given to the examiner to evaluate the contents of the research work. Following this, the research Committee will conduct a Dissertation Presentation in the presence of the External Supervisor, Internal supervisor, Invited experts and the members of the Research Committee. The external examiner will be required to submit the results of dissertation on the prescribed format thereafter.
- viii. If the examiner recommends revision/corrections, the candidate shall be permitted to submit the dissertation with revisions within 4 weeks from the date of presentation or as specified by the University.
- ix. If the dissertation is rejected in the final presentation, the candidate will have to submit the dissertation again which will be examined in the next semester as per rules. If the candidate has passed all the theory & practical examination, he/she will only have to appear only for the Dissertation presentation. A total of 3 (THREE) chances will be given to pass the Dissertation (ONE main and TWO in the subsequent semesters), subject to a total duration of 3 years for completion of the course including all theory and practical examination.

- x. In case of Rejection of dissertation, candidate will be referred to research committee for review who will take a final decision.
- xii. The advisor/student ratio should be (preferably) 1:5.

15. Attendance

- i. The students must attend every lecture /practical /demonstration held in each subject. However, to account for late joining or other such contingencies, the attendance requirement for appearing in the examination shall be a minimum of 75% of the classes held from the date of admission.
- ii. In order to maintain the attendance record of a particular subject, a roll call will be taken by the teacher in every scheduled lecture and practical.
- iii. The instructor in-charge will consolidate the attendance record for theory & practical separately for each academic year. Attendance on account of participation in the Educational Tour, Field Work, Rehabilitation camp, professional camps, conference, workshops, sports competitions or any other extra-curricular activity etc. shall be credited to the aggregate, provided the attendance record is duly attested by relevant authority and/or there is credible proof of participation and is sent to the Director within two weeks of the function/ activity.
- iv. Any continuous and uninformed absenteeism is liable for disciplinary action against the student. The Course Coordinator/ Head of Department may issue written notice to such students at any point of time and the case will be reviewed by the Attendance Review Committee of the college for further action. A copy of the order shall be communicated to the student.
- v. A student with less than 75% attendance in theory and practical separately of each subject will be detained from appearing in the final examination. Students detained on account of shortage of attendance will have to repeat the semester and will only be allowed to appear in the subsequent examination if they achieve

the required attendance. Any special considerations such as medical reasons, deputation etc. will have to approved by the concerned authorities.

- vi. Students on clinical postings will follow leave and work policies of the work place they are posted at.

16. CURRICULUM HOURS

MPT - MUSCULOSKELETAL PHYSIOTHERAPY

SEMESTER	PAPER NO	SUBJECT	NO OF HOURS	
			Theory	Practical
I	I	Management & Education	75	25
	II	Research Methods and Biostatistics	75	25
	III	Exercise Physiology, Health & Nutrition.	75	25
		Clinical Affiliation	200	
		Seminars-Evidence Based Practice	50	
TOTAL NO OF HOURS			550	
II	IV	Applied Biomechanics	100	50
	V	Diagnostics in Musculoskeletal Physiotherapy	100	50
		Clinical Affiliation	200	
		Seminars-Topical Therapeutic Techniques	50	
TOTAL NO OF HOURS			550	
III	VI	Physiotherapy in Musculoskeletal Conditions I	125	75
	VII	Advance Therapeutics in Musculoskeletal Physiotherapy	50	50
		Clinical Affiliation	200	
		Topical Seminars	50*	
TOTAL NO OF HOURS			550	

IV	VIII	Physiotherapy in Musculoskeletal Conditions II	125	75
		Clinical Affiliation	300	
		Topical Seminars	50	
TOTAL NO OF HOURS			550	
GRAND TOTAL			2200	

MPT - NEUROLOGICAL PHYSIOTHERAPY

SEMESTER	PAPER NO	SUBJECT	NO OF HOURS	
			Theory	Practical
I	I	Management & Education	75	25
	II	Research Methods and Biostatistics	75	25
	III	Exercise Physiology, Health & Nutrition.	75	25
		Clinical Affiliation	200	
		Seminar-Evidence Based Practice	50	
TOTAL NO OF HOURS			550	
II	IV	Applied Biomechanics	100	50
	V	Diagnostics in Neurological Physiotherapy	100	50
		Clinical Affiliation	200	
		Seminar-Topical Therapeutic Techniques	50	
TOTAL NO OF HOURS			550	
III	VI	Physiotherapy in Neurological Conditions I	125	75

	VII	Advance Therapeutics in Neurological Physiotherapy	50	50
		Clinical Affiliation	200	
		Topical Seminar	50	
TOTAL NO OF HOURS			550	
IV	VIII	Physiotherapy in Neurological Conditions II	125	75
		Clinical Affiliation	300	
		Topical Seminar	50	
TOTAL NO OF HOURS			550	
GRAND TOTAL			2200	

17. Detailed syllabus

Master of Physiotherapy (Musculoskeletal Physiotherapy)

FIRST SEMESTER MANAGEMENT & EDUCATION

SECTION I: PROFESSIONAL ETHICS IN PHYSIOTHERAPY

1. Code of ethics:
 - (i) Responsibilities to the client.
 - (ii) Responsibilities to society.
 - (iii) Responsibilities to the profession.
2. Concept of Morality and its implications.
3. Physiotherapy and law:
 - (i) Medico legal aspects of Physiotherapy.
 - (ii) Liability.
 - (iii) Negligence.
 - (iv) Malpractice.
 - (v) Licensure.

- (vi) Workman's compensation.
- 4. Law of disability & discrimination.
- 5. Need of Council Act for regulation of Professional Practice and self regulatory role of professional association.
- 6. Professional associations: Rules, Regulations, Framework, Aims and Objectives.
- 7. Consumer protection law, Health law, MCI, DCP.
- 8. Role of World Health Organization (WHO) and World Confederation of Physiotherapists (WCPT) and their various branches and special interest groups.
- 9. Standards of practice for Physiotherapists.

SECTION II: ADMINISTRATION MANAGEMENT & PROFESSIONAL

PRACTICE

- 1. Administration & Management
 - i) Concept of Administration & Management, Objectives, Branches of Management, Various levels of Management
 - ii) Concept of theories of management
 - (a) Classical theory, Systems approach and contingency approach.
 - (b) Application to physiotherapy practices with quality assurance at various levels of health delivery system, Teaching institutions & Self employment.
- 2. Management Process
 - (i) Functions of Management: POSDCORB (Planning, Organization, Staffing, Directing, Coordinating, Reporting, Budgeting), Control, Decision Making, Time Management.
- 3. Introduction to Human Resource Management (HRM)
 - (i) Concept of HRM, Human Resources Planning, Recruitment,

Selection, Placement, Career Planning & Development, Salary & Wages Administration, Disciplines, Collective Bargaining, Performance Appraisal, Job Design & Job Analysis.

4. Administration & Marketing
 - (i) Concept of Marketing, Marketing Communication
 - (ii) Personal Policies: Communication & Contract
 - (iii) Administration principles based on goal & function at large hospital/ domiciliary set up/ private clinic/ academic institution.
5. Methods of maintaining records:
 - (i) Concept of Budget Planning, Budget Planning at large hospital/ private clinic/ academic Institution
6. Financial Management
 - (i) Meaning, Objectives, Scope, Importance
7. Performance Analysis:
 - (i) Physical Structure, Reporting System, Quality & Quantity of Services, Turnover –Cost benefits, Contribution.

SECTION III: EDUCATION METHODOLOGY

1. Education:
 - (i) Introduction.
 - (ii) Educational Philosophy- Idealism Naturalism, Pragmatism.
 - (iii) Aims of education.
 - (iv) Functions of education.
 - (v) Formal, Informal and non formal education.
 - (vi) Agencies of education.
 - (vii) Current issues and trends in higher education & issue of quality in higher education.
 - (viii) Autonomy and accountability & Privatization of education.
2. Concepts of teaching and learning:
 - (i) Theories of teaching.

- (ii) Relationship between teaching and learning.
 - (iii) Psychology of education.
 - (iv) Motivational process of learning, Perception, Individual differences, Intelligence, Personality.
3. Principles and methods of teaching:
- (i) Strategies of teaching.
 - (ii) Planning of teaching.
 - (iii) Organization.
 - (iv) Concept of Microteaching- Teaching skills.
 - (v) Writing lesson plans.
 - (vi) Teaching methods.
4. Methods and techniques of teaching:
- (i) Lecture.
 - (ii) Demonstration.
 - (iii) Discussion.
 - (iv) Seminar.
 - (v) Assignment.
 - (vi) Project.
 - (vii) Case Study.
5. Teaching aids:
- (i) Types of teaching aids.
 - (ii) Principles of selection.
 - (iii) Preparation and use of audio-visual aids.
6. Curriculum:
- (i) Meaning and concept of curriculum.
 - (ii) Basis of curriculum formulation.
 - (iii) Framing objectives for curriculum.
 - (iv) Process of curriculum development and factors involved.
 - (v) Evaluation of curriculum.
7. Measurement and evaluation:
- (i) Nature of educational measurement: Meaning, Process, Types of tests.

- (ii) Construction of an achievement test and its analysis.
 - (iii) Standardized test.
 - (iv) Introduction of some standardized tools & important tests of intelligence.
 - (v) Aptitude and personality.
 - (vi) Continuous and comprehensive evaluation.
8. Guidance and counselling:
 - (i) Meaning & concepts of guidance and counselling.
 - (ii) Principles of guidance and counselling.
 9. Skill development: Clinical skills, Communication skills, counselling skills.
 10. Continuing medical education.

***SECTION-I ONLY INTERNAL ASSESSMENT**

PRACTICAL

1. To have a basic knowledge of utility of multimedia.
2. Microteaching using audio visual aides in designated topics. Set up objectives, content, presentation, assessment and evaluation of theory and practical.
3. Setting up of an individual Physiotherapy clinic/ Physiotherapy department in a hospital. Managing resources and budget planning.

Recommended Books:

1. American physical therapy association. Guide to physical therapy practice. 2nd edition,
2. Basavanthappa B T. Nursing research. 2nd edition New Delhi, Jaypee Brothers, 1998. USA, SLACK Incorporated, 2000-2003.
3. Hlckok Robert J. Public Therapy administration & Management. 2nd Edition, American Physical Therapy Association, Williams & Wilkins, 1982

4. Higgs Joy, Mark A Jones, Loftus Stephen, Christensen Nicole. Clinical reasoning in health professions. 3rd Edition, Elsevier Health Sciences, 2008
5. Katherine F. Shepard , Gail M. Jensen. Hand book for teaching for physical therapist. 2nd Edition University of Michigan, Butterworth-Heinemann, 2002
6. **Komblau Barbara, Starling Shirley. Ethics In Rehabilitation: A Clinical Perspective.**
7. Nosse Lorry J. Management Principles for physiotherapists
8. Prasad LM. Principles and Practice of Management. S.Chand & Sons, 2006.
9. Swisher Laura Lee and Catherine GPage. Professionalism in physical therapy: History, Practice and Development, Philadelphia, Elsevier Saunders, 2005
10. Wilenski, Hale & Iremonger. Public power & Administration. Royal Australian Institute of Public Administration, 1998.

RESEARCH METHODOLOGY AND BIOSTATISTICS

SECTION I: RESEARCH METHODOLOGY

1. Introduction: Concept of research, Evidence based practice, Role of theory, Ethical issues.
2. Concepts of Measurement: Principles, Reliability and Validity of measurement.
3. Research Question
4. Sampling
5. Experimental Control
6. Experimental design
7. Single-case study design
8. Descriptive Research
9. Surveys

SECTION II: APPLIED BIOSTATISTICS

1. Descriptive Statistics and measurement variability
2. Statistical inference
3. Comparison of group means: T-test
4. Analysis of variance
5. Multiple comparison tests
6. Non parametric tests
7. Correlations
8. Regression
9. Analysis of frequencies: Chi square
10. Statistical measure of reliability
11. Power analysis – Determining sample size
12. Overview of available statistical softwares used in research.

SECTION III: SCIENTIFIC WRITING

1. Definition and types of scientific documents – Research paper, Review paper, Book , Reviews, Thesis, Conference and project reports (for the scientific community and for funding agencies).

2. Publication – Role of author, Guide, Co-authors.
3. Structure, Style and contents; Style manuals (APA, MLA, Vancouver); Citation styles: Footnotes, References; Evaluation of research
4. Significance of Report writing: Different steps in Report writing- Mechanics and precautions of writing research reports, Oral and Poster presentation of research papers in conferences/symposia; Preparation of abstracts.
5. Structure of Thesis and Content – Preparing Abstracts.

PRACTICAL

1. Planning a Survey and Preparing Questionnaire/Interview.
2. Preparing research proposal.
3. Performing data analysis.
4. Critical review of article.
5. Poster presentation.
6. Platform presentation.
7. Planning and executing a Case study.

Recommended books:

1. Basavanthappa BT. Nursing research. New Delhi, Jaypee Brothers, 1998.
2. Batavia and Mitchell. Clinical research for health professionals. Delhi, Butterworth.Heinemann, 2001.
3. Bechhofer, Frank , Paterson and Lindsay. Principle of research design in the social sciences. London, Routledgefalmer, 2000.
4. Bell and Judith. Doing your research project: Guide for first-time researchers in educational and social science. 3rd Edition Buckingham, Open university press, 1987.
5. Borg and Walter R. Educational research: An Introduction. 3rd Edition New York, Longman publishing group, 1978.

6. Creswell and John W. Research design: Qualitative, quantitative, and mixed methods approaches. New Delhi, Sage publication, 2003.
7. Gillham and Bill. Research interview: Research methods. London, Continuum, 2005.
8. Glesne Corrine and Peshkin Alan. Becoming Qualitative Researchers : An Introduction. New York, Longman publishing group, 1992.
9. Gorard and Stephen. Quantitative methods in educational research: Role of numbers made easy. London, Continuum, 2001.
10. Hicks, Carolyn M. Research Methods for clinical therapists : Applied project design analysis. 3rd edition London, Churchill Livingstone, 1999.
11. Kothari CR. Research methodology: Methods and techniques. 2nd Edition New Delhi, New age international (p) Ltd. pub., 2004.
12. Koul, Lokesh. Methodology of educational research. 2nd Edition Delhi, Vikas Publishing House, 1984.
13. Mahajan, BK. Methods in Biostatistics: Medical students and research workers. New Delhi, Jaypee Brothers, 1997.
14. Pratt Brian and Loizos Peter. Choosing Research methods: Data collection for development workers. London, Oxfam Publication, 1992.
15. Raina, M K. Creativity research: International perspective. New Delhi, National council of Educational Research and Training, 1980.
16. Raman and Malaviya. Research methods: An Insight. Delhi, Rainbow Communication, 2004.
17. Seale, Jane, Barnard, Sue. Therapy research: Processes and practicalities. Butterworth Heinemann, 1998.
18. Sprinthall, Richard C and Schmutte, Gregory T. Understanding education an research. Prentice Hall, 1991.
19. Swet and Van Jacqueline. Postgraduate programmes as platform: Research-led approach. Taipei, Sense Publishers, 2007.

20. Teitelbaum. Harry. How to write a thesis : A guide to the research paper. Delhi, Macmillan Publication, 1989.
21. Vohara and Vandana. Research methodology. New Delhi, Omega publication, 2007.

EXERCISE PHYSIOLOGY, HEALTH & NUTRITION

SECTION I

1. Introduction and review of:

- (i) Muscle Physiology.
- (ii) Blood & Circulation.
- (iii) Respiration.

2. Physical Performance:

- (i) Aerobic processes: Intensity & duration of exercise, Prolonged exercise, Muscular stress involved in exercise.
- (ii) Anaerobic Processes: Power & capacity of high energy breakdown.
- (iii) Lactate Production - Distribution & disappearance, effect of metabolism on tissue & blood PH, Anaerobic threshold, Maximal aerobic power, Maximal anaerobic power.

SECTION II

1. Physical Performance Tests:

- (i) Test of maximal aerobic power - Measurement of oxygen uptake, Treadmill tests, Bicycle ergo meter test, Step-test, Maximal oxygen uptake in various sports.
- (ii) Evaluation of anaerobic power.
- (iii) Exercise electrocardiogram.

2. Applied work physiology:

- (i) Factors affecting sustained physical work, Assessment of

work load in relation to work capacity, Assessment of maximal aerobic power measurement of oxygen uptake in a typical work situation, Assessment of load exerted on specific muscles.

- (ii) Classification of work, Daily rates of energy expenditure, Energy expenditure during specific activities like sleeping, Sedentary work, House work, Light industry, Manual labour.

3. Fatigue & Reconditioning:

- (i) General Physical fatigue, Local muscular fatigue, Reconditioning.

SECTION III

1. Nutrition & Physical Performance:

- (i) The basis for human performance:
 - § Carbohydrates.
 - § Proteins.
 - § Vitamins.
 - § Minerals.
 - § Lipids and water.
- (ii) Optimal nutrition for exercise, Energy for physical activities, Energy value of food.
- (iii) Introduction to energy transfer, Energy transfer in the body phosphate bond energy, Energy released from food, Energy transfer in exercise.
- (iv) Nutrition in general digestion, Energy metabolism & factors governing the selection of fuel for muscular exercises, Food for the athletes.
- (v) Energy balance, Regulation of food intake, Ideal body weight, Obesity, Slimming diets, Optional supply of nutrients.

SECTION IV

1. Body composition assessment, Physique, Performance and physical activity, Over weight and weight control.
2. Exercise successful ageing and disease prevention:
 - (i) Physical activity in the population.
 - (ii) Ageing and Physiologic function.
 - (iii) Physical activity, Health and Longevity.
3. Exercise in prevention and management of the following common conditions:
 - (i) Coronary Heart Disease.
 - (ii) Diabetes Mellitus.
 - (iii) Hypertension.
 - (iv) Hyperlipidimia.
 - (v) Thyroid diseases.
 - (vi) Cancer.

PRACTICAL

1. To assess and practice aerobic power and anaerobic power.
2. To assess and practice body composition analysis.
3. Exercise ECG testing and monitoring.
4. Exercise prescription for health and fitness with special emphasis to Cardiovascular disease, Obesity, Diabetes, Hypertension.
5. Analysis of physical activity in geriatrics population. Exercise prescription for health and fitness of geriatrics.
- ⑥ Fatigue assessment and scientific organisation of work-rest regimes to control fatigue.

Recommended Books:

1. Hall John Edward, Guyton Arthur C. Textbook of work physiology. 12th Edition Philadelphia, Saunders, 2011.
2. Katch & Katch, Mc Ardle. Exercise Physiology. 6th Edition Philadelphia, Lippincott Williams and Wilkins, 2000.

3. Robert A. Roberts and Scott O Roberts. Exercise Physiology: Exercise, Performance, and Clinical Applications. 2nd Edition St. Louis, Mosby, 1997.
4. Scott O. Roberts, Peter Hanson. Clinical Exercise Testing and Prescription Theory and Applications. C RC Press, 1997
5. Wright Samson and Joels Normal. Samson Wright's work physiology. 13th Edition London, Oxford University Press, 1982.

SECOND SEMESTER

APPLIED BIOMECHANICS

SECTION I

REVIEW OF BASIC BIOMECHANICS

1. Fundamental Biomechanics:
 - (i) Forces, Force of gravity & COG, Stability, Reaction forces, Friction, Moments, Newton's laws.
 - (ii) Equilibrium: Static and dynamics.
 - (iii) Simple machines: Levers, Pulleys and wheel and axle.
 - (iv) Work, Power and energy, Density and mass, Segmental dimensions, Poisson's effect, Stress and strain, Modulus of rigidity and modulus of elasticity, Strain energy, Static and cyclic load behaviors, Load: load shearing and load transfer.
2. Kinetics – Forces, Force vectors, Naming of forces, Force of gravity and COG, Stability, reaction forces, Equilibrium, Linear force systems, Friction and its various parameters, Parallel force system, Concurrent force system, Force components, Equilibrium of force.
3. Kinematics–Motion: Types, Location, Magnitude and direction, Angular motion and its various parameters, Linear motion and its various parameters and projectile motions.

SECTION II

1. Review of Joint biomechanics:
 - (i) Joint design, Joint categories, Joint functions: Arthrokinematics, Osteokinematics and kinematic chains, Joint forces, joint lubrication.
 - (ii) Equilibrium and distribution of these forces.
 - (iii) Degenerative changes in weight bearing joints and compensatory actions.
 - (iv) Joint stability and its mechanisms, Clinical applications.

2. Review of Muscle mechanics:

- (i) Structure and components of muscle, Fiber length and Cross-Sectional area, Mechanical properties.
- 9 (ii) EMG changes during fatigue and contraction, Changes in mechanical properties because of aging, Exercises, Injury and Immobilization.

3. Review of Tendon and ligament mechanics:

- 9 (i) Structure, Composition and mechanical properties, Cross – sectional area measurement, Muscle tendon properties, Temperature sensitivity.
- (ii) Changes in the mechanical properties of aging, Exercises and Immobilization, Mechanoreceptors and clinical application.

4. Review of Peripheral nerve mechanics:

- 5 (i) Neural tissue mobility, Factors influencing mobility, Effects of head and spine movement on neural tension.
- (ii) Effects of compression and distraction forces on neural tissues.

BIOMECHANICAL BASIS AND PATHO-MECHANICS OF THE FOLLOWING REGIONS

SECTION III

1. Upper extremity:

- 5 (i) Review of the normal biomechanics of upper extremity.
- (ii) Pathomechanics of the following regions – Shoulder joint, Elbow complex, Wrist and hand complex. J P k

2. Lower extremity:

- (i) Review of the normal biomechanics of lower extremity.
- 5 (ii) Pathomechanics of the following regions – Hip complex, Knee joint, Ankle and foot complex. P J

3. Vertebral column:

- (i) Review of the normal biomechanics of spine and pelvis.
- (ii) Pathomechanics of the various conditions of spine and pelvis.

4. Thorax and chest wall.

- (i) Review of the normal biomechanics of Thorax and Chest wall.
- (ii) Pathomechanics of the various conditions of Thorax and Chest wall.

5. Temporo-mandibular joint.

- (i) Review of the normal biomechanics of Temporo-mandibular joint.
- (ii) Pathomechanics of the various conditions of Temporo-mandibular joint.

BIOMECHANICS OF INTEGRATED FUNCTIONS

SECTION IV

1. Posture—Normal posture, postural deviations, Biomechanics of erect Posture in the presence of muscle weakness.

2. Biomechanics of gait:

- (i) Review of the normal gait parameters.
- (ii) Analysis of pathological gait.
- (iii) Running and stair gait.
- (iv) Pathological gait following various surgeries and Diseases.

3. Prosthesis and Orthosis:

- (i) Orthosis of spine, Upper and lower extremity.
- (ii) Prosthesis prescriptions, Checkouts and proper fittings, Aids in management of mobility.

SECTION V

1. Ergonomics:

- (i) Introduction, Physiological and bio-mechanical risk factors.
- (ii) Job analysis, Developing and implementing work site programs, Ergonomics of home, Child care and leisure activities.

2. Biomechanical analysis of various functional movements including supine-to-sit, sit-to stand and lifting biomechanics.

INSTRUMENTATION

SECTION VI

1. Goniometry, Accelerometers, Photo- Optical devices, Pressure transducers and force plates.
2. GAIT mat.
3. Isokinetic dynamometers.
3. EMG (Electrophysiology of muscle contraction, Recording, Processing), Relationship between EMG and biomechanical variables.
4. NCV.
5. Functional Electrical stimulator (FES).
6. Computerized Posturography.

PRACTICAL

1. To assess and evaluate normal posture and abnormal posture in anterior, posterior and lateral views.
2. Analysis of normal and abnormal gait and measurements of spatio temporal features.
3. To analyse Activities of Daily Living (like sitting to standing, throwing, lifting etc.). Explain and demonstrate the movement occurring at the joints, the muscles involved, the movements or muscle action produced, and mention the axis and plane through which the movement occur.
4. To observe various EMG, NCV procedures.
5. To practice functional electrical stimulation.

Recommended books

1. Craik Rebecca and Oatis Carol A. Gait Analysis: Theory and Application. University of Michigan, Mosby, 1995.

2. Frankel Victor Hirsch, Nordin Margareta. Basic Biomechanics of the musculoskeletal system. 3rd Edition, Lippincott Williams and Wilkins, 2001.
3. Gowitzke. Scientific basis of human movement. 3rd edition Baltimore, Willams and Wilkins, 1988.
4. Hamill Joseph and Knutzen Kathleen M. Biomechanical basic of human movement. 2nd Edition, Lippincott Williams and Wilkins, 1995.
5. Norkin Cynthia. Joint structure and function. 4th Edition, F.A. Davis Co., 2005.
6. Oatis Carol A. Kinesiology. 1st Edition London, Lippincott Williams and Wilkins, 2003.
7. Panjabi Manohar M. and White Augustus A. Biomechanics in the musculoskeletal system. 1st Edition University of Michigan, Churchill Livingstone, 2000.
8. Perry Jacquelin, Burnfield Judith M. Gait analysis. 2nd Edition New Jersey, Slack Incorporated, 2010.
9. Scott M Gladys. Kinesiology Of human motion. F.S. Crofts & Co., 1947.
10. Shaw and Dhananjay. Biomechanics and kinesiology of human motion. Khel Sahitya Kendra, 1998.
11. Smith Laura K, Elizabeth Lawrence Weiss, Lehmkuhl L. Don. Brunnstrom's clinical kinesiology. 5th Edition, F.A. Davis, 1996.
12. Soderberg Gary L. Kinesiology: Application to pathological motion. 2nd Edition University of Michigan, Williams & Wilkins, 1997.
13. Steindler Arthur. Kinesiology of the Human Body: Under Normal and pathological condition. 5th edition University of California, Charles C Thomas, 1955.
14. Wells Katharine F., Luttgens Kathryn. Kinesiology. 6th Edition, Saunders, 1976.

DIAGNOSTICS IN MUSCULOSKELETAL PHYSIOTHERAPY

SECTION I

1. Importance of assessment and evaluation in musculoskeletal conditions:
 - (i) Methods of evaluation.
 - (ii) Clinical evaluation.
 - (a) Subjective assessment: - Demographic data evaluation, History taking for Musculoskeletal conditions.
 - (b) Objective assessment: - Observation, Palpation, Motor assessment, Sensory testing, Joint play, Hand function evaluation, balance, coordination, Posture, Gait.
 - (iii) Functional Assessment.
 - (a) Conceptual framework.
 - (b) Functional scales (condition wise), Scoring, Interpretation.
 - (c) Multidimensional functional assessment instruments- Reliability, Specificity, Validity, Acceptability, Specificity and Practicality.
 - (d) Screening of other relevant systems.
2. Evaluation of Physical fitness.
3. Pre-participation evaluation and return to competition.
4. Ergonomic evaluation.
5. Clinical decision making.
6. Guideline for Physiotherapy Documentation.
7. Outcome measures of evaluation:
 - (i) Shoulder-ASES, DASH, Quick DASH, Neer Shoulder Score, Oxford instability score, Oxford shoulder score, Rockwood score for SC joint, UCLA, WOOS, UEFI, Rotator Cuff-QoL, Shoulder Function Assessment, SPADI.

- (ii) Elbow- ASES, PREE, PRTEE, Upper extremity function scale.
- (iii) Wrist/hand- ABILHAND manual ability measure, sequential occupational dexterity, patient rated wrist evaluation.
- (iv) Spine- Oswestry low back disability, Roland morris questionnaire, back pain functional scale.
- (v) Pelvis-low back pelvic score, Orlando pelvic outcome score.
- (vi) Hip-low back hip score, McMaster Toronto arthritis questionnaire, non arthritic hip score, oxford hip score, Patient Specific Index hip rating scale, Rheumatoid Arthritis Outcome Score, WOMAC osteoarthritis index, total hip arthroplasty outcome evaluation.
- (vii) Knee- American academy of orthopaedic surgeon hip and knee score, ACL evaluation format, ACL-QoL, Lysholm knee function scoring scale, OA knee hip QoL, Fulkerson-Shea Patellofemoral joint evaluation score, Lowa knee evaluation, Patellofemoral severity scale, Cincinnati knee rating system, knee outcome survey activities of daily living scale.
- (viii) Ankle- Achilles tendon total rupture score, American academy of orthopaedic surgeon foot and ankle scale, foot and ankle disability index. lowa ankle score.
- (ix) Quality of life- European QoL, Nottingham Health Profile, SF 36, SF 12, Sickness Impact Profile.
- (vii) Scales used for specific conditions including Rheumatoid arthritis, Osteoarthritis, Ankylosing spondylosis, Fibromyalgia.

SECTION III

1. Laboratory testing- Screening for:
 - (i) Infections and Inflammations.
 - (ii) Autoimmune disorders.
 - (iii) Malignancy.

- (iv) Deficiency diseases.
- (v) Diseases like Diabetes, Hyperlipidemia and Thyroid.

2. Bone biopsy.

SECTION IV

1. Radiology:

- (i) Review of Basics of radiology including Ultrasound, CT, MRI and Discography.
- (ii) Imaging of head, Neck and Spine.
- (iii) Imaging of Pelvis, Hip and thigh, Knee, Ankle and Foot joint.
- (iv) Imaging of upper limb.
- (v) Radioactive scan and Isotope scan.
- (vi) Arthroscopy.
- (vii) BMD- Bone densitometry (Ultrasound densitometry, DEXA).

Section V

1. Electro-Diagnosis:

- M (i) Electrophysiology.
- T (ii) EMG- Normal & abnormal potentials. single fibre & macro EMG, Reporting results, Clinical implication of EMG tests, Kinesiological EMG
- (iii) NCV- MNCV, SNCV, H reflex, F wave, Clinical implication in various musculoskeletal conditions.
- M (iv) Basics of ECG waves- Normal & abnormal interpretation.

PRACTICAL

- 1. Case presentation.
- 2. To study and practice Clinical examination of radial pulse, blood pressure, examination of CVS, respiratory system, sensory system, motor system, reflexes.
- M 3. To study and practice Clinical electrophysiological testing.
- X 4. To perform anthropometric measurements.

- ✓ 5. To assess physical fitness for various age groups.
- ✓ 6. To study and practice evaluation methods, special test and scales used in musculoskeletal disorders.
- ✓ 7. Physical disability evaluation.
8. To study and practice normal and abnormal potentials in Electromyography.
- ✓ 9. To study and practice Nerve conduction velocity of motor and sensory nerves and its clinical implication in various musculoskeletal conditions.
- m 10. To study and observe ECG waves.

Recommended Books:

1. American physical therapy association: Guide to physical therapy practice. 2nd Edition, 2001.
2. Aminoff Michael J. Electromyography in clinical practice. 3rd edition New York, Churchill Livingstone, 1997.
3. Conrad Peter. The ABC of EMG: A practical introduction to Kinesiological electromyography. USA, Noraxon Inc. 2005.
4. Craik Rebecca and Oatis Carol A. Gait Analysis : Theory And Application. University of Michigan, Mosby, 1995.
5. Dutton Mark. Orthopedics examination evaluation and intervention. 1st Edition, McGraw-Hill Medical, 2004.
6. Erickson Mia, Utzman Ralph. Physical therapy Documentation: From examination to outcome. Slack incorporated, 2008.
7. Evans Ronald C. Illustrated Orthopedic Physical Assessment. 3rd Edition, Mosby, 2001.
8. Goodman Catherine C, and Snyder Teresa Kelly. Differential Diagnosis for Physical Therapists: Screening for Referral. 4th Edition, Saunders, 2006.

9. Hecox Bernadette and Sanko John. Integrating physical agents in rehabilitation. 2nd Edition, Pearson Prentice Hall, 2006.
10. Herbert Rob, Jamtvedt Gro, Mead Judy, Hagen Kare Briger. Practical Evidence-Based Physiotherapy. 1st Edition, Oxford UK , Elsevier Butter worth Heinemann, 2005.
11. Jewell Dianne V. Guide to Evidence-Based Physical Therapy Practice. 1st Edition Virginia Commonwealth University, Jones and Bartlett Publishers, 2007.
12. Kettenbach Ginge. Writing SOAP Notes with Patient / Client management Formats. 3rd Edition Philadelphia, F.A. Davis Company, 2004.
13. Kimura Jun. Electro diagnosis in diseases of nerve and muscle: Principles and practice. 3rd Edition, Oxford university press, 2001.
14. Norris Christopher N. Sports injuries diagnosis and management. 3rd Edition, Butterworth-Heinemann, 1998.
15. Reese Nancy Berryman. Joint Range of Motion and Muscle length testing. 2nd Edition, Saunders, 2009.
16. Shamus Eric and Debra. Effective Documentation for Physical Therapy Professionals. 2nd Edition, McGraw Hill Medical, 2003.
17. Swisher Laura Lee and G.Page Catherine. Professionalism in physical therapy: History, Practice and Development. 1st Edition, Elsevier publication, 2005.

THIRD SEMESTER

PHYSIOTHERAPY IN MUSCULOSKELETAL CONDITIONS I SECTION-I

1. Physiotherapy assessment & Physiotherapy management after conservative & surgical treatment for common fractures and dislocations of upper limb, Lower limb, Spine.
2. Physiotherapy assessment & management of soft tissue injuries – Upper limb, Lower limb, Spine.
3. Physiotherapy assessment & pre and post operative Physiotherapy management for:
 - (i) Arthrodesis.
 - (ii) Osteotomy.
 - (iii) Arthroplasty.
 - (iv) Arthroscopy.
 - (v) Bone grafting.
 - (vi) Internal and external fixations.
 - (vii) Distraction and limb reconstruction.
 - (viii) Tendon transfers.
 - (ix) Nerve suturing and grafting.
 - (x) Wound debridement.
 - (xi) Orthopaedic implants.
4. Physiotherapy assessment & management of rheumatic and autoimmune disorders affecting the musculoskeletal system.
5. Physiotherapy assessment & management of degenerative joint diseases.
6. Physiotherapy assessment & management in Gerontology.

Theories of ageing, Changes related to ageing, Musculoskeletal disorder related to ageing.

SECTION II

1. Basic Sports emergencies management – On-field emergencies, Sports first aid.
2. Basic Medical concerns in sports – Diabetes, Hypertension, Women specific condition, Exercise induced Asthma

Recommended Books:

1. Brill Patricia A. Functional Fitness for Older Adults. 1st Edition, Human Kinetics, 2004.
2. Bulstrode Christopher and Buckwalter Joseph. Oxford Textbook of Orthopaedic & Trauma. 1st Edition, Oxford University Press, 2005.
3. Canale S. Terry and Beaty James H. Campbell's operative orthopedics. 11th Edition, Mosby, 2007.
4. Charles McGary. Physical therapy of the cancer patient. New York, Churchill Livingstone, 1989.
5. Ebenezer John. Essentials of Orthopedics. 1st Edition New Delhi, Jaypee Publication, 2003.
6. Gatterman Meridel I. Foundations of Chiropractic. 2nd Edition University of Michigan, Mosby, 2005.
7. Guyton. Text book of work physiotherapy. 8th Edition Bangalore, Prim Books, 1991.
8. Hewetson Thomas John. An Illustrated Guide to Taping Techniques – Principles & Practice. 2nd Edition, Mosby, 2009.
9. Hotchkin Green. Green's operative hand surgery. 6th Edition University of Michigan, Churchill Livingstone, 1998.
10. Jackson Osa. Physical Therapy of the geriatric patient. 2nd Edition New York, Churchill Livingstone, 1983.
11. Jones Watson. Fractures & joint injuries. 5th Edition University of Michigan, Churchill Livingstone, 1976.
12. Jonson Rob. Sports medicine in primary care. University of Michigan, Saunders, 2000.

13. Lewis Carole B and Bottomley Jennifer. Geriatric Physical Therapy: A Clinical Approach. University of Michigan, Appleton & Lange, 1993.
14. Molnar Gabriella E. Pediatric Rehabilitation. 3rd Edition Philadelphia, Hanly & Belfus, 1999.
15. Moorthy Vasantha L & Stanley. Hoppenfield Treatment and rehabilitation fractures. 1st Edition, Lippincott Williams & Wilkins, 2000.
16. Peterson Lass. Sports injuries prevention and their treatment. 1st Edition, 2001.
17. Sherry Eugene. Sports medicine problem and practical management. 1st Edition, Greenwich Medical Media, 1997.
18. Smith Paul. Lister's the hand. 4th Edition University of Michigan, Churchill Livingston, 2002.
19. Tecklin Jan Stephen. Pediatric Physical Therapy. 4th Edition, Lippincott Williams & Wilkins, 1999.

ADVANCED THERAPEUTICS IN MUSCULOSKELETAL PHYSIOTHERAPY

SECTION I

1. Foundational concepts in Manual therapy:
 - (i) Biomechanical principles in manual therapy.
 - (ii) Clinical reasoning.
2. Joints Mobilization Techniques:
 - (i) Maitland's Technique.
 - (ii) Mulligan's Technique.
 - (iii) McKenzie's Technique.
 - (iv) Kaltenborn Technique.
3. Soft Tissue Techniques and Recent Advances in Manual Therapy:

Related anatomy & physiology, Terminology, Principles, Indications, Contra indications, Assessment and treatment procedure of the following techniques at spinal & peripheral regions.

 - (i) Myofascial release techniques.
 - (ii) Trigger point release.
 - (iii) Lymphatic manipulations.
 - (iv) Cyriax Concept
 - (v) Sports massage.
 - (vi) Positional release techniques.
 - (vii) Muscle energy techniques.
 - (viii) Neural tissue mobilization.
4. Taping and preventive measures in musculoskeletal conditions:
 - (i) Tapes, Wraps, Braces and pads- types, objectives and recommendations.
 - (ii) Taping and wrapping techniques for conditions of upper limb, Lower limb, Thorax and spine.
 - (iii) Protective equipment and padding.

SECTION II

1. Role of PNF in musculoskeletal conditions:
 - (i) Conceptual framework, Principle.
 - (ii) Techniques.
 - (iii) Patterns of facilitation.
 - (iv) Indications, Precautions.
 - (v) Therapeutic effect.
2. Core stabilization:
 - (i) Guidelines – Exercise selection, Exercise program, Program variation, Training Scientific rationale for core stabilization training.
3. Advance Fitness program:
Principles, Guidelines, Precautions, Design and training parameters / clinical consideration of:
 - (i) Plyometrics.
 - (ii) Pilates.
 - (iii) Isokinetics.
 - (iv) Other special training programs used in musculoskeletal Rehabilitation
4. Role of Hydrotherapy and Balenotherapy in musculoskeletal Conditions:
 - (i) Basic principles, Properties of water.
 - (ii) Types and technique of application, Different materials used.
 - (iii) Effects, Indication, Contraindications, Precautions.
5. Use of Yoga in Musculoskeletal Physiotherapy

SECTION III

1. Advanced electrotherapy: Production, indications, Contraindications, Dangers, Precautions, Effects, Technique of application of:
 - (i) Long wave diathermy.

- (ii) Russian and sinusoidal currents.
- (iii) HVPGS
- (iv) Shockwave therapy.
- (v) Laser.

2. Biofeedback:

- (i) Introduction, principles of biofeedback, Method of biofeedback, Applied fields, Clinical implication in various musculoskeletal problems, Use of biofeedback in other fields.

SECTION IV

1. Pain:

- (i) Models of pain & disability.
- (ii) Basic molecular biology of pain.
- (iii) Integration of neurobiology into pathobiological mechanisms.
- (iv) Peripheral & central pain mechanisms, Theories of modulation of pain.
- (v) Identification of risk factors for chronicity.
- (vi) Pain measurement tools & physiotherapy management strategies.
- (vii) Merging bio-psychosocial approaches into physiotherapy management.
- (viii) Multidisciplinary pain management strategies.
- (ix) Diagnostic dilemmas & common pain states.
- (x) Drug therapy, Cultural & age influences on pain, Placebo, Nocebo.

Practical

- 1. To practice joint mobilization and special emphasis on Maitland, Mulligan, Kaltenborn, McKenzie Technique, MET, myofascial and trigger point release, Positional release technique, neural mobilisation
- 2. To practice taping-region wise for musculoskeletal condition.
- 3. To practice advanced fitness program.
- 4. To practice PNF techniques in various musculoskeletal conditions.

5. To practice core stability assessment and core stability training
6. To practice various types of application of long wave diathermy, LASER therapy, Russian and Sinusoidal currents.
7. To practice biofeedback application in various musculoskeletal conditions.

Recommended Books:

1. Barral Jean-Pierre, Croibier Alain, Osteopathe. Manual Therapy for the Peripheral Nerves. 1st Edition, Churchill Livingstone, 2007.
2. Cameron Michelle H. Physicals agents in rehabilitation: from research to practical. 3rd Edition, Saunders and Elsevier, 2003.
3. Edmond Susan L. Joint Mobilization / Manipulation: Extremity and Spinal Techniques. 2nd Edition, Mosby, 2006.
4. Hecox Bernadette and Sanko John. Integrating physical agents in rehabilitation. 2nd Edition New Jersey, Pearson prentice hall 2006.
5. Huber Francis E, Wells Christly. Therapeutic Exercise: Treatment Planning for Progression. 2nd Edition, W.B. Saunders Company, 2006.
6. Kaltenborn Freddy. Manual Mobilization of the Joints – The Kaltenborn Method Volume I, II. 5th Edition Cambridge University Press, Norli, 2003.
7. Kerb D. Bio – feedback- A practitioners guide. Guiford press
8. Knot M. and Voss, Harper and Row. Proprioception, neuro muscular facilitation techniques. 2nd Edition New York, Medical Department Harper & Row, 1968.
9. Mckenzie Robin. Cervical and Thoracic spine : Mechanical Diagnosis & Therapy Vol I & II. 2nd Edition New Zealand, **Spinal Publications New Zealand limited, 2006.**

10. Mckenzie Robin. The Human Extremities: Mechanical Diagnosis & Therapy. 1st Edition New Zealand, **Spinal Publications New Zealand limited, 2000.**
11. Mckenzie Robin. The Lumbar Spine: Mechanical Diagnosis & Therapy Vol I & II. 2nd Edition New Zealand, **Spinal Publications New Zealand limited, 2003.**
12. Mckenzie Robin. Treat your own Back. 7th Edition New Zealand, **Spinal Publications New Zealand limited, 1997.**
13. Mckenzie Robin. Treat your own Neck. 3rd Edition New Zealand, **Spinal Publications New Zealand limited, 1983.**
14. Mulligan Brain R. Manual Therapy.
15. Prentice William E and Underwood Frank. Therapeutic Modalities for Allied Health Professionals. 96th Edition University of Michigan, McGraw-Hill, 1998.

FOURTH SEMESTER
PHYSIOTHERAPY IN MUSCULOSKELETAL
CONDITIONS II

SECTION I

1. Physiotherapy management of Pediatric orthopedic conditions: Acquired and congenital conditions.
2. Physiotherapy management of Bone infections.
3. Physiotherapy management of Metabolic bone diseases.
4. Physiotherapy management in Orthopedic oncology.
5. Physiotherapy management in Amputations.
6. Physiotherapy management in Burns and Vascular diseases.

SECTION II

1. Physiotherapy management of common regional conditions: Spine, Upper and lower extremities.

SECTION III

1. Basic briefing of Sports Psychology:
2. Basic briefing of Sports Pharmacology.
3. Basic briefing of Sports rehabilitation for the person with disability.
4. Basic briefing of Sports Nutrition.

Recommended Books:

1. Brill Patricia A. Functional Fitness for Older Adults. 1st Edition, Human Kinetics, 2004.
2. Bulstrode Christopher and Joseph Buckwalter. Oxford Textbook of Orthopaedic & Trauma. 1st Edition, Oxford University Press, 2005.
3. Canale S. Terry and Beaty James H. Campbell's operative orthopedics. 11th Edition, Mosby, 2007.

4. Charles McGaryex. Physical therapy of the cancer patient. New York, Churchill Livingstone, 1989.
5. Ebenezer John. Essentials of Orthopedics. 1st Edition New Delhi, Jaypee Publication, 2003
6. Eugene Sherry. Sports medicine problem and practical management. 1st Edition, Greenwich Medical Media, 1997.
7. Gatterman Meridel I. Foundations of Chiropractic. 2nd Edition University of Michigan, Mosby, 2005.
8. Guyton. Text book of work physiotherapy. 8th Edition Bangalore, Prim Books, 1991.
9. Hewetson Thomas John. An Illustrated Guide to Taping Techniques – Principles & Practice. 2nd Edition, Mosby, 2009.
10. Hotchkin Green. Greens operative hand surgery. 6th Edition University of Michigan, Churchill Livingstone, 1998.
11. Jones Watson. Fractures & joint injuries. 5th Edition University of Michigan, Churchill Livingstone, 1976.
12. Jonson Rob. Sports medicine in primary care. University of Michigan, Saunders, 2000.
13. Lewis Carole B and Bottomley Jennifer. Geriatric Physical Therapy: A Clinical Approach. University of Michigan, Appleton & Lange, 1993.
14. Molnar Gabriella E. Pediatric Rehabilitation. 3rd Edition Philadelphia, Hanly & Belfus, 1999.
15. Moorthy Vasantha L & Stanley. Hoppenfield Treatment and rehabilitation fractures. 1st Edition, Lippincott Williams & Wilkins, 2000.
16. Osa Jackson. Physical Therapy of the geriatric patient. 2nd Edition New York, Churchill Livingstone, 1983.

17. Paul Smith. Lister's the hand. 4th Edition University of Michigan, Churchill Livingston, 2002.
18. Peterson Lass. Sports injuries prevention and their treatment. 1st Edition, 2001.
19. Tecklin Jan Stephen. Pediatric Physical Therapy. 4th Edition, Lippincott Williams & Wilkins, 1999.

18. Detailed syllabus

Master of Physiotherapy (Neurological Physiotherapy)

FIRST SEMESTER

MANAGEMENT & EDUCATION

SECTION I: PROFESSIONAL ETHICS IN PHYSIOTHERAPY *

1. Code of ethics:
 - (i) Responsibilities to the client.
 - (ii) Responsibilities to society.
 - (iii) Responsibilities to the profession.
2. Concept of Morality and its implications.
3. Physiotherapy and law:
 - (i) Medico legal aspects of Physiotherapy.
 - (ii) Liability.
 - (iii) Negligence.
 - (iv) Malpractice.
 - (v) Licensure.
 - (vi) Workman's compensation.
4. Law of disability & discrimination.
5. Need of Council Act for regulation of Professional Practice and self-regulatory role of professional association.
6. Professional associations: Rules, Regulations, Framework, Aims and Objectives.
7. Consumer protection law, Health law, MCI, DCP.
8. Role of World Health Organization (WHO) and World Confederation of Physiotherapists (WCPT) and their various branches and special interest groups.
9. Standards of practice for Physiotherapists.

SECTION II: ADMINISTRATION MANAGEMENT & PROFESSIONAL PRACTICE

1. Administration & Management
 - i) Concept of Administration & Management, Objectives, Branches of Management, Various levels of Management
 - ii) Concept of theories of management
 - (a) Classical theory, Systems approach and contingency approach.
 - (b) Application to physiotherapy practices with quality assurance at various levels of health delivery system, Teaching institutions & Self employment.
2. Management Process
 - (i) Functions of Management: POSDCORB (Planning, Organization, Staffing, Directing, Coordinating, Reporting, Budgeting), Control, Decision Making, Time Management.
3. Introduction to Human Resource Management (HRM)
 - (i) Concept of HRM, Human Resources Planning, Recruitment, Selection, Placement, Career Planning & Development, Salary & Wages Administration, Disciplines, Collective Bargaining, Performance Appraisal, Job Design & Job Analysis.
4. Administration & Marketing
 - (i) Concept of Marketing, Marketing Communication
 - (ii) Personal Policies: Communication & Contract
 - (iii) Administration principles based on goal & function at large hospital/ domiciliary set up / private clinic/ academic institution.
5. Methods of maintaining records:
 - (i) Concept of Budget Planning, Budget Planning at large hospital/ private clinic/ academic Institution

6. Financial Management
 - (i) Meaning, Objectives, Scope, Importance
7. Performance Analysis:
 - (i) Physical Structure, Reporting System, Quality & Quantity of Services, Turnover –Cost benefits, Contribution.

SECTION III: EDUCATION METHODOLOGY

1. Education:
 - (i) Introduction.
 - (ii) Educational Philosophy- Idealism Naturalism, Pragmatism.
 - (iii) Aims of education.
 - (iv) Functions of education.
 - (v) Formal, Informal and non formal education.
 - (vi) Agencies of education.
 - (vii) Current issues and trends in higher education & issue of quality in higher education.
 - (viii) Autonomy and accountability & Privatization of education.
2. Concepts of teaching and learning:
 - (i) Theories of teaching.
 - (ii) Relationship between teaching and learning.
 - (iii) Psychology of education.
 - (iv) Motivational process of learning, Perception, Individual differences, Intelligence, Personality.
3. Principles and methods of teaching:
 - (i) Strategies of teaching.
 - (ii) Planning of teaching.
 - (iii) Organization.
 - (iv) Concept of Microteaching- Teaching skills.
 - (v) Writing lesson plans.
 - (vi) Teaching methods.

4. Methods and techniques of teaching:
 - (i) Lecture.
 - (ii) Demonstration.
 - (iii) Discussion.
 - (iv) Seminar.
 - (v) Assignment.
 - (vi) Project.
 - (vii) Case Study.
5. Teaching aids:
 - (i) Types of teaching aids.
 - (ii) Principles of selection.
 - (iii) Preparation and use of audio-visual aids.
6. Curriculum:
 - (i) Meaning and concept of curriculum.
 - (ii) Basis of curriculum formulation.
 - (iii) Framing objectives for curriculum.
 - (iv) Process of curriculum development and factors involved.
 - (v) Evaluation of curriculum.
7. Measurement and evaluation:
 - (i) Nature of educational measurement: Meaning, Process, Types of tests.
 - (ii) Construction of an achievement test and its analysis.
 - (iii) Standardized test.
 - (iv) Introduction of some standardized tools & important tests of intelligence.
 - (v) Aptitude and personality.
 - (vi) Continuous and comprehensive evaluation.
8. Guidance and counselling:
 - (i) Meaning & concepts of guidance and counselling.
 - (ii) Principles of guidance and counselling.
9. Skill development: Clinical skills, Communication skills, counselling skills.

10. Continuing medical education.

***SECTION-I ONLY INTERNAL ASSESSMENT**

PRACTICAL

1. To have a basic knowledge of utility of multimedia.
2. Microteaching using audio visual aides in designated topics. Set up objectives, content, presentation, assessment and evaluation of theory and practical.
3. Setting up of an individual Physiotherapy clinic/ Physiotherapy department in a hospital. Managing resources and budget planning.

Recommended Books:

1. American physical therapy association. Guide to physical therapy practice. 2nd edition,
2. Basavanthappa B T. Nursing research. 2nd edition New Delhi, Jaypee Brothers, 1998.
USA, SLACK Incorporated, 2000-2003.
3. Hickok Robert J. Public Therapy administration & Management. 2nd Edition, American Physical Therapy Association, Williams & Wilkins, 1982
4. Higgs Joy, Mark A Jones, Loftus Stephen, Christensen Nicole. Clinical reasoning in health professions. 3rd Edition, Elsevier Health Sciences, 2008
5. Katherine F. Shepard , Gail M. Jensen. Hand book for teaching for physical therapist.
2nd Edition University of Michigan, Butterworth-Heinemann, 2002
6. Komblau Barbara, Starling Shirley. Ethics In Rehabilitation: A Clinical Perspective.

7. Nosse Lorry J. Management Principles for physiotherapists
8. Prasad LM. Principles and Practice of Management. S.Chand & Sons, 2006.
9. Swisher Laura Lee and Catherine G.Page. Professionalism in physical therapy: History, Practice and Development, Philadelphia, Elsevier Saunders, 2005
10. Wilenski, Hale & Iremonger. Public power & Administration. Royal Australian Institute of Public Administration, 1998.

RESEARCH METHODOLOGY AND BIOSTATISTICS

SECTION I: RESEARCH METHODOLOGY

1. Introduction: Concept of research, Evidence based practice, Role of theory, Ethical issues.
2. Concepts of Measurement: Principles, Reliability and Validity of measurement.
3. Research Question
4. Sampling
5. Experimental Control
6. Experimental design
7. Single-case study design
8. Descriptive Research
9. Surveys

SECTION II: APPLIED BIOSTATISTICS

1. Descriptive Statistics and measurement variability
2. Statistical inference
3. Comparison of group means: T-test
4. Analysis of variance
5. Multiple comparison tests
6. Non parametric tests
7. Correlations
8. Regression
9. Analysis of frequencies: Chi square
10. Statistical measure of reliability
11. Power analysis – Determining sample size
12. Overview of available statistical softwares used in research.

SECTION III: SCIENTIFIC WRITING

1. Definition and types of scientific documents – Research paper, Review paper, Book , Reviews, Thesis, Conference and project reports (for the scientific community and for funding agencies).
2. Publication – Role of author, Guide, Co-authors.

3. Structure, Style and contents; Style manuals (APA, MLA, Vancouver); Citation styles: Footnotes, References; Evaluation of research
4. Significance of Report writing: Different steps in Report writing- Mechanics and precautions of writing research reports, Oral and Poster presentation of research papers in conferences/symposia; Preparation of abstracts.
5. Structure of Thesis and Content – Preparing Abstracts.

PRACTICAL

1. Planning a Survey and Preparing Questionnaire/Interview.
2. Preparing research proposal.
3. Performing data analysis.
4. Critical review of article.
5. Poster presentation.
6. Platform presentation.
7. Planning and executing a Case study.

Recommended books:

1. Basavanthappa BT. Nursing research. New Delhi, Jaypee Brothers, 1998.
2. Batavia and Mitchell. Clinical research for health professionals. Delhi, Butterworth.Heinemann, 2001.
3. Bechhofer, Frank , Paterson and Lindsay. Principle of research design in the social sciences. London, Routledgefalmer, 2000.
4. Bell and Judith. Doing your research project: Guide for first-time researchers in educational and social science. 3rd Edition Buckingham, Open university press, 1987.
5. Borg and Walter R. Educational research: An Introduction. 3rd Edition New York, Longman publishing group, 1978.

6. Creswell and John W. Research design: Qualitative, quantitative, and mixed methods approaches. New Delhi, Sage publication, 2003.
7. Gillham and Bill. Research interview: Research methods. London, Continuum, 2005.
8. Glesne Corrine and Peshkin Alan. Becoming Qualitative Researchers : An Introduction. New York, Longman publishing group, 1992.
9. Gorard and Stephen. Quantitative methods in educational research: Role of numbers made easy. London, Continuum, 2001.
10. Hicks, Carolyn M. Research Methods for clinical therapists : Applied project design analysis. 3rd edition London, Churchill Livingstone, 1999.
11. Kothari CR. Research methodology: Methods and techniques. 2nd Edition New Delhi, New age international (p) Ltd. pub., 2004.
12. Koul, Lokesh. Methodology of educational research. 2nd Edition Delhi, Vikas Publishing House, 1984.
13. Mahajan, BK. Methods in Biostatistics: Medical students and research workers. New Delhi, Jaypee Brothers, 1997.
14. Pratt Brian and Loizos Peter. Choosing Research methods: Data collection for development workers. London, Oxfam Publication, 1992.
15. Raina, M K. Creativity research: International perspective. New Delhi, National council of Educational Research and Training, 1980.
16. Raman and Malaviya. Research methods: An Insight. Delhi, Rainbow Communication, 2004.
17. Seale, Jane, Barnard, Sue. Therapy research: Processes and practicalities. Butterworth Heinemann , 1998.

18. Sprinthall, Richard C and Schmutte, Gregory T. Understanding education an research. Prentice Hall, 1991.
19. Swet and Van Jacqueline. Postgraduate programmes as platform: Research-led approach. Taipei, Sense Publishers, 2007.
20. Teitelbaum. Harry. How to write a thesis : A guide to the research paper. Delhi, Macmillan Publication, 1989.
21. Vohara and Vandana. Research methodology. New Delhi, Omega publication, 2007.

EXERCISE PHYSIOLOGY, HEALTH & NUTRITION

SECTION I

1. Introduction and review of:
 - (i) Muscle Physiology.
 - (ii) Blood & Circulation.
 - (iii) Respiration.
2. Physical Performance:
 - (i) Aerobic processes: Intensity & duration of exercise, Prolonged exercise, Muscular stress involved in exercise.
 - (ii) Anaerobic Processes: Power & capacity of high energy breakdown.
 - (iii) Lactate Production - Distribution & disappearance, effect of metabolism on tissue & blood PH, Anaerobic threshold, Maximal aerobic power, Maximal anaerobic power.

SECTION II

1. Physical Performance Tests:
 - (i) Test of maximal aerobic power - Measurement of oxygen uptake, Treadmill tests, Bicycle ergo meter test, Step-test, Maximal oxygen uptake in various sports.
 - (ii) Evaluation of anaerobic power.
 - (iii) Exercise electrocardiogram.
2. Applied work physiology:
 - (i) Factors affecting sustained physical work, Assessment of work load in relation to work capacity, Assessment of maximal aerobic power measurement of oxygen uptake in a typical work situation, Assessment of load exerted on specific muscles.
 - (ii) Classification of work, Daily rates of energy expenditure, Energy expenditure during specific activities like sleeping, Sedentary work, House work, Light industry, Manual labour.

3. Fatigue & Reconditioning:

- (i) General Physical fatigue, Local muscular fatigue, Reconditioning.

SECTION III

1. Nutrition & Physical Performance:

- (i) The basis for human performance:

- Carbohydrates.
- Proteins.
- Vitamins.
- Minerals.
- Lipids and water.

- (ii) Optimal nutrition for exercise, Energy for physical activities, Energy value of food.
- (iii) Introduction to energy transfer, Energy transfer in the body phosphate bond energy, Energy released from food, Energy transfer in exercise.
- (iv) Nutrition in general digestion, Energy metabolism & factors governing the selection of fuel for muscular exercises, Food for the athletes.
- (v) Energy balance, Regulation of food intake, Ideal body weight, Obesity, Slimming diets, Optional supply of nutrients.

SECTION IV

- 1. Body composition assessment, Physique, Performance and physical activity, Over weight and weight control.
- 2. Exercise successful ageing and disease prevention:
 - (i) Physical activity in the population.
 - (ii) Ageing and Physiologic function.
 - (iii) Physical activity, Health and Longevity.

3. Exercise in prevention and management of the following common conditions:
 - (i) Coronary Heart Disease.
 - (ii) Diabetes Mellitus.
 - (iii) Hypertension.
 - (iv) Hyperlipidimia.
 - (v) Thyroid diseases.
 - (vi) Cancer.

PRACTICAL

1. To assess and practice aerobic power and anaerobic power.
2. To assess and practice body composition analysis.
3. Exercise ECG testing and monitoring.
4. Exercise prescription for health and fitness with special emphasis to Cardiovascular disease, Obesity, Diabetes, Hypertension.
5. Analysis of physical activity in geriatrics population. Exercise prescription for health and fitness of geriatrics.
6. Fatigue assessment and scientific organisation of work-rest regimes to control fatigue.

Recommended Books:

1. Hall John Edward, Guyton Arthur C. Textbook of work physiology. 12th Edition Philadelphia, Saunders, 2011.
2. Katch & Katch, Mc Ardle. Exercise Physiology. 6th Edition Philadelphia, Lippincott Williams and Wilkins, 2000.
3. Robert A. Roberts and Scott O Roberts. Exercise Physiology: Exercise, Performance, and Clinical Applications. 2nd Edition St. Louis, Mosby, 1997.
4. Scott O. Roberts, Peter Hanson. Clinical Exercise Testing and Prescription Theory and Applications. C RC Press, 1997
5. Wright Samson and Joels Normal. Samson Wright's work physiology. 13th Edition London, Oxford University Press, 1982.

SECOND SEMESTER

APPLIED BIOMECHANICS

SECTION I

REVIEW OF BASIC BIOMECHANICS

1. Fundamental Biomechanics:
 - (i) Forces, Force of gravity & COG, Stability, Reaction forces, Friction, Moments, Newton's laws.
 - (ii) Equilibrium: Static and dynamics.
 - (iii) Simple machines: Levers, Pulleys and wheel and axle.
 - (iv) Work, Power and energy, Density and mass, Segmental dimensions, Poisson's effect, Stress and strain, Modulus of rigidity and modulus of elasticity, Strain energy, Static and cyclic load behaviors, Load: load shearing and load transfer.
2. Kinetics – Forces, Force vectors, Naming of forces, Force of gravity and COG, Stability, reaction forces, Equilibrium, Linear force systems, Friction and its various parameters, Parallel force system, Concurrent force system, Force components, Equilibrium of force.
3. Kinematics–Motion: Types, Location, Magnitude and direction, Angular motion and its various parameters, Linear motion and its various parameters and projectile motions.

SECTION II

1. Review of Joint biomechanics:
 - (i) Joint design, Joint categories, Joint functions: Arthrokinematics, Osteokinematics and kinematic chains, Joint forces, joint lubrication.
 - (ii) Equilibrium and distribution of these forces.
 - (iii) Degenerative changes in weight bearing joints and compensatory actions.
 - (iv) Joint stability and its mechanisms, Clinical applications.

2. Review of Muscle mechanics:
 - (i) Structure and components of muscle, Fiber length and Cross-Sectional area, Mechanical properties.
 - (ii) EMG changes during fatigue and contraction, Changes in mechanical properties because of aging, Exercises, Injury and Immobilization.
3. Review of Tendon and ligament mechanics:
 - (i) Structure, Composition and mechanical properties, Cross – sectional area measurement, Muscle tendon properties, Temperature sensitivity.
 - (ii) Changes in the mechanical properties of aging, Exercises and Immobilization, Mechanoreceptors and clinical application.
4. Review of Peripheral nerve mechanics:
 - (i) Neural tissue mobility, Factors influencing mobility, Effects of head and spine movement on neural tension.
 - (ii) Effects of compression and distraction forces on neural tissues.

BIOMECHANICAL BASIS AND PATHO-MECHANICS OF THE FOLLOWING REGIONS

SECTION III

1. Upper extremity:
 - (i) Review of the normal biomechanics of upper extremity.
 - (ii) Pathomechanics of the following regions – Shoulder joint, Elbow complex, Wrist and hand complex.
2. Lower extremity:
 - (i) Review of the normal biomechanics of lower extremity.
 - (ii) Pathomechanics of the following regions – Hip complex, Knee joint, Ankle and foot complex.
3. Vertebral column:
 - (i) Review of the normal biomechanics of spine and pelvis.
 - (ii) Pathomechanics of the various conditions of spine and pelvis.
4. Thorax and chest wall.
 - (i) Review of the normal biomechanics of Thorax and Chest wall.
 - (ii) Pathomechanics of the various conditions of Thorax and Chest wall.
5. Temporo-mandibular joint.
 - (i) Review of the normal biomechanics of Temporo-mandibular joint.
 - (ii) Pathomechanics of the various conditions of Temporo-mandibular joint.

BIOMECHANICS OF INTEGRATED FUNCTIONS

SECTION IV

1. Posture—Normal posture, postural deviations, Biomechanics of erect Posture in the presence of muscle weakness.

2. Biomechanics of gait:
 - (i) Review of the normal gait parameters.
 - (ii) Analysis of pathological gait.
 - (iii) Running and stair gait.
 - (iv) Pathological gait following various surgeries and Diseases.
3. Prosthesis and Orthosis:
 - (i) Orthosis of spine, Upper and lower extremity.
 - (ii) Prosthesis prescriptions, Checkouts and proper fittings, Aids in management of mobility.

SECTION V

1. Ergonomics:
 - (i) Introduction, Physiological and bio-mechanical risk factors.
 - (ii) Job analysis, Developing and implementing work site programs, Ergonomics of home, Child care and leisure activities.
2. Biomechanical analysis of various functional movements including supine -to-sit, sit-to stand and lifting biomechanics.

INSTRUMENTATION

SECTION VI

1. Goniometry, Accelerometers, Photo- Optical devices, Pressure transducers and force plates.
2. GAIT mat.
3. Isokinetic dynamometers.
3. EMG (Electrophysiology of muscle contraction, Recording, Processing), Relationship between EMG and biomechanical variables.
4. NCV.
5. Functional Electrical stimulator (FES).
6. Computerized Posturography.

PRACTICAL

1. To assess and evaluate normal posture and abnormal posture in anterior, posterior and lateral views.
2. Analysis of normal and abnormal gait and measurements of spatio temporal features.
3. To analyse Activities of Daily Living (like sitting to standing, throwing, lifting etc.). Explain and demonstrate the movement occurring at the joints, the muscles involved, the movements or muscle action produced, and mention the axis and plane through which the movement occur.
4. To observe various EMG, NCV procedures.
5. To practice functional electrical stimulation.

Recommended books

1. Craik Rebecca and Oatis Carol A. Gait Analysis: Theory and Application. University of Michigan, Mosby, 1995.
2. Frankel Victor Hirsch, Nordin Margareta. Basic Biomechanics of the musculoskeletal system. 3rd Edition, Lippincott Williams and Wilkins, 2001.
3. Gowitzke. Scientific basis of human movement. 3rd edition Baltimore, Willams and Wilkins, 1988.
4. Hamill Joseph and Knutzen Kathleen M. Biomechanical basic of human movement. 2nd Edition, Lippincott Williams and Wilkins, 1995.
5. Norkin Cynthia. Joint structure and function. 4th Edition, F.A. Davis Co., 2005.
6. Oatis Carol A. Kinesiology. 1st Edition London, Lippincott Williams and Wilkins, 2003.

7. Panjabi Manohar M. and White Augustus A. Biomechanics in the musculoskeletal system. 1st Edition University of Michigan, Churchill Livingstone, 2000.
8. Perry Jacquelin, Burnfield Judith M. Gait analysis. 2nd Edition New Jersey, Slack Incorporated, 2010.
9. Scott M Gladys. Kinesiology Of human motion. F.S. Crofts & Co., 1947.
10. Shaw and Dhananjoy. Biomechanics and kinesiology of human motion. Khel Sahitya Kendra, 1998.
11. Smith Laura K, Elizabeth Lawrence Weiss, Lehmkuhl L. Don. Brunnstrom's clinical kinesiology. 5th Edition, F.A. Davis, 1996.
12. Soderberg Gary L. Kinesiology: Application to pathological motion. 2nd Edition University of Michigan, Williams & Wilkins, 1997.
13. Steindler Arthur. Kinesiology of the Human Body: Under Normal and pathological condition. 5th edition University of California, Charles C Thomas, 1955.
14. Wells Katharine F., Luttgens Kathryn. Kinesiology. 6th Edition, Saunders, 1976.

DIAGNOSTICS IN NEUROLOGICAL PHYSIOTHERAPY

SECTION I

1. Importance of assessment and evaluation.
2. Assessment of a comatose patient.
3. Clinical evaluation:
 - (i) Subjective assessment: - Demographic data evaluation, History taking for neurological conditions.
 - (ii) Objective assessment: - Observation, Higher motor function, Motor assessment, Sensory testing, pain assessment, Autonomic function, Coordination, Balance.
4. Functional assessment:
 - (i) Conceptual framework.
 - (ii) Functional scales (condition wise), Scoring, Interpretation.
 - (iii) Multidimensional functional assessment instruments- Reliability, Specificity, Validity, Acceptability, Specificity and Practicality.
 - (iii) Screening of other relevant systems.
5. Clinical decision making.
6. Guidelines for physiotherapy documentation.
7. Outcome measures of evaluation:
 - (i) Measures of cognitive impairment and disability - Glasgow coma scales, Children's coma scales, Edinburgh-2 coma scale, Blessed dementia rating scales, information Concentration - Memory test, Dementia scale.
 - (ii) Measure of motor impairment - Motor club assessment, Rivermead motor assessment, Motricity index, Trunk control test, Motor assessment scale, Modified ashworth scale for spaticity, Isometric and isokinetic dynamometer testing, Limb length measurement, Flexibility and Endurance testing.

- (iii) Autonomic testing and neuropsychological testing.
- (iv) Measures of focal disability - Standing balance, Functional ambulation categories, Hauser ambulation index, Timed walking test, Rivermead mobility index, Nine hole peg test, Action research arm test, Franchay arm test
- (v) Activities of daily living and extended ADL tests - Barthel ADL index, Katz ADL index, Nottingham ten point ADL index, Rivermaid ADL scale, Northwick park index of independence in ADL, Kenny self care evaluation, Nottingham extended ADL index, Frenchay activity index.
- (vi) Global measures of disability, OPCS disability scale Severity categories, Functional independence measure, PULSES profile, Measures of handicap and quality of life - WHO handicap scale, Rankin scale, Glasgow outcome scale, Quality of life a measure.
- (vii) Somatic growth in children - Height, weight, head and skull symmetry and circumference, Assessing motor development in children – GMFM, Gessell Development Schedules, Bayley Scales of infant development, Neonatal behavioral assessment scales.
- (viii) Scales used for specific conditions including multiple sclerosis, Stroke, SCI, Parkinsonism.

SECTION II

1. Laboratory Investigations:
 - (i) Infections and inflammations.
 - (ii) Malignancies.
 - (iii) Deficiency diseases.
 - (iv) Autoimmune diseases.
 - (v) Congenital malformations and genetic disorders.
 - (vi) Diseases like Diabetes, Hyperlipidemia and Thyroid.
2. Radiology:
 - (i) Basics of radiology including Ultrasonography, CT and MRI, functional MRI (fMRI).

14. Robinson Andrew J, Snyder-Mackler Lynn. Clinical electrophysiology. 3rd Edition London, Lippincott Williams and Wilkins, 2008.
15. Russell Dianne J, Rosenbaum Peter L. Gross motor function measure (GMFM - 66 and GMFM - 88) user's manual. U K, Blackwell publishers, 2002.
16. Scherzer Alfred L. Early diagnosis and therapy in Cerebral Palsy. 2nd Edition University of Michigan, M. Dekker, 1982.
17. Valk J. Computed tomography and cerebral infarctions. Raven press, 1980.
18. Wilhelm. Physical therapy Assessment in Early Infancy. 1st Edition New York, Churchill Livingston, 1993.

THIRD SEMESTER

PHYSIOTHERAPY IN NEUROLOGICAL CONDITIONS I

SECTION I

1. Physiotherapy management of disorders of cerebral circulation & CSF.
2. Physiotherapy management for head injury including headache, stupor and coma.
3. Physiotherapy management of disorders of spine, spinal cord & cauda equine.
4. Physiotherapy management of disorders of the peripheral nerves and cranial nerves.
5. Physiotherapy management of disorders of muscles.
6. Physiotherapy management of congenital & hereditary disorders.
7. Physiotherapy management of autoimmune disorders and psychiatric disorders.

SECTION II

1. Pediatric neurology:
 - (i) Normal development of child –Weight, Height, Circumference measurement related to age in child, Developmental milestones, Neonatal reflexes and Factors influencing growth & development, Types of body build, Physical examination of the child, growth patterns.
 - (ii) Early intervention program including school education for children with special needs.
2. Understanding motor performances in children and Pediatric Neurophysiotherapy.

SECTION III

1. Special settings and community considerations - The environment of intervention, Early intervention program, Education environment, Assistive technology, Burn and plastic surgery unit, Special care nursery.

SECTION IV

Assessment and PT management of the following neuro-surgical conditions:

1. General procedures in neurosurgery.
2. Disorders of CSF fluid, Circulation and Cerebral malformation.
3. Various procedures for Spasticity management.
4. Surgical repair of peripheral nerves.
5. Muscle lengthening/ release.
6. Management of an unconscious patient & ICU management of a neurologically ill patient.

Recommended books:

1. Adams, Raymond D, Victor, Maurice and Ropper, Allan H. Principles of neurology. 6th Edition, New York, Mcgraw—Hill Book Company, 1997.
2. Anderson E.M. and Spain B. Child with Spina Bifida. CUP Archive, 1977.
3. Bobath Berta. Adult hemiplegia: Evaluation and Treatment. 3rd Edition, Elsevier, 2002.
4. Bromley Ida. Tetraplegia & Paraplegia: a guide for the physiotherapist. 6th Edition, Churchill Livingstone, 2006.
5. Cambell William W. DeJong's the neurologic examination. Lippincott, Williams and Wilkins, 2005.
6. Chusid. Joseph G. Correlative neuroanatomy and functional neurology. 12th Edition California, Long Medical publishers, 1964.

7. Cohen Helen. Neuroscience for rehabilitation. 2nd Edition, Lippincott, Williams and Wilkins, 1999.
8. Davis Patricia M. Starting Again: early rehabilitation after traumatic brain injury or other severe brain lesion. Springer-Verlag, 1994.
9. Delisa Joel A and Kirshblum Steven. Spinal cord medicine. 1st Edition Philadelphia, Lippincott Williams & Wilkins, 2002.
10. Downie Patricia A. Cash's textbook of neurology for physiotherapist. Lippincott, 1986.
11. Edward Susan. Neurological Physiotherapy: A problem solving Approach. Churchill Livingstone, 1996.
12. Frontera Walter R. DeLisa's Physical Medicine and Rehabilitation: Principles and Practice. 5th edition Lippincott, Williams & Wilkins, 2010.
13. Greenfield Joseph Godwin. Greenfield's Neuropathology. 8th Edition. Hodder Arnold Publishers, 1984.
14. Greenwood R.J. Handbook of neurological rehabilitation. New York, John Wiley & Sons, 2001.
15. Harrison Marilyn A. Physiotherapy in Stroke management. Churchill Livingstone, 1995.
16. May Bella J. Amputation and prosthetics: A Case Study Approach. 2nd Edition, F.A. Davis Co., 2002.
17. Nixon Vickie. Spinal cord injury. William Heinemann Medical Books, 1985.
18. O' Young and Stiens Steven A. Physical medicine and rehabilitation secrets. 3rd Edition, Mosby Elsevier, 2008.
19. Pillane John S & Bickerstaff Edwin R. Bickerstaff's Neurological Examination in Clinical Practice. 6th Edition, Blackwell Science, 1996.

20. Porter Stuart. Tidy's Physiotherapy. 13th Edition, Butterworth-Heinemann, 2003.
21. Rose Jessica and Gamble James Gibson. Human Walking. Lippincott, Williams & Wilkins, 2006.
22. Stokes Maria. Neurological Physiotherapy. 2nd Edition, Churchill Livingstone, 1998.
23. Sullivan Susan B.O & Smith Thomas J. Physical rehabilitation. 5th Edition, F.A.Davis, 2007.
24. Taly and Nair. Neuro – Rehabilitation: Principles and practice. NIMHANS, 1998.
25. Tinsley R. Harrison. Harrison's principles of internal medicine. 16th Edition New York, Mcgraw—Hill Book Company, 2005.
26. Tyerman Andy and King Nigel S. Psychological approaches to rehabilitation after Traumatic Head Injury. Blackwell publication, 2008.
27. Umphred Darcy Ann. Neurological Rehabilitation. W.B. Saunders, 2007.
28. Vernon and Diana. Spinal Cord Medicine: Principles and Practice. New York, 2003.
29. Walton Brain and John. Brain Diseases of the nervous system. 9th Edition USA, Oxford University Press, 2000.
30. Zasler Nathan D. Brain injury Medicine: Principles and Practice. New York, 2007.

ADVANCED THERAPEUTICS IN NEUROLOGICAL PHYSIOTHERAPY

ADVANCED TREATMENT APPROACHES:

Basic principles and therapeutic application in various neurological conditions.

SECTION I

1. Bobath and NDT:
 - (i) Introduction to NDT philosophy, Principles of treatment, NDT handling techniques, Facilitatory and inhibitory techniques and their neurological basis.
 - (ii) NDT/ Bobath evaluation, treatment planning for the stages of recovery in stroke, Treatment techniques, Relationship to functional performance, Barriers to effectiveness.
2. Brunnstrom – Assumptions and principles of Brunnstrom movement therapy, Evaluation, Treatment planning in different stages of recovery of voluntary movement (Brunnstrom's stages).
3. Rood's approach – Introduction, Common facilitatory and inhibitory techniques and their neurological basis.
4. Proprioceptive Neuromuscular Facilitation:
 - (i) Introduction, Basic procedure and principles of PNF, Techniques of PNF, Indications, Contraindications and Description.
 - (ii) PNF patterns of facilitation – Scapula and pelvis, Upper extremity, Lower extremity, Neck and trunk.
 - (iii) PNF format activities, Breathing and other vital functioning, PNF for gait training.
5. Motor Relearning Programme:
 - (i) Background to the development of MRP, Creating an environment for recovery and for learning.

- (ii) Introduction, Upper limb function, Oro-facial function, Sitting up over the side of the bed, Balanced sitting, Standing up and sitting down, Balanced standing and walking.
 - (iii) Mechanism of recovery, Elimination of unnecessary muscle activity, Feedback, adjustment to gravity.
6. Vojta Therapy.
 7. Sensory Integration.
 8. Myofascial Release – Introduction, Physiology of fascial system, Techniques of application, Myofascial release intervention.

SECTION II

1. Pain management – Anatomy of pain, Evaluation and clinical management, Common pain syndromes.
2. Balance and coordination training.
3. Vestibular Rehabilitation- Specialized testing and specific exercises for BPPV.
- ④ Recent trends in prescribing, Designing and checkout of prosthesis, Orthosis, Splints and other assistive devices including wheelchair.
5. Transfer training- Independent transfers (Plinth, Floor, Bathtub, Toilet seat and chair to crutch) and transfer by the therapist.

SECTION III

1. Patient and family education.
2. Physiotherapy in home setting.
3. Group exercises - Music, Rhythm and exercises, Home introduction.
4. Relaxation technique - Basic principles, Types of relaxation, Techniques of general and local relaxation.
5. Early intervention program – Interdisciplinary team work, Role of special educator, Consideration of special needs of disabled child.

6. Oromotor rehabilitation – Introduction and diagnosis of various oromotor difficulties, Various treatment strategies including swallowing maneuvers.

SECTION IV

1. Positional Release Techniques - Principles, Indications, Contraindications and techniques of applications.
2. Neural Mobilization Techniques – Clinical neuro-biomechanics and clinical consequences of injury to the nervous system, Tension testing and principles of mobilization.
3. Muscle Energy Technique – Principles, Indications, Contraindications and techniques of applications.
4. Combined Movement Therapy.
5. Yoga techniques – Yoga and physiotherapy, Physical aspects of yoga, Prevention and Physiotherapeutic effects of yoga, Rationale of yoga, Yoga as applied to Physiotherapy.
6. Biofeedback — Introduction, Principles of biofeedback, Method of biofeedback, Applied fields, Neurologic basis of EMG biofeedback, Biofeedback in other conditions.
7. Hydrotherapy –Physiological effects of hydrotherapy, Indications, Contraindications, Application procedures, Precautions, Water exercises for neurological conditions.

SECTION V: RECENT DEVELOPMENTS

1. Multiple conceptual models, Normal development arc.
2. Theories of motor control, Theories of motor learning.
3. Neuroplasticity: Assessment of movement and techniques, Use of fMRI for analyzing cortical changes.
4. Functional Training using Partial body weight support systems with treadmill training and functional electrical stimulation (FES).

PRACTICAL

1. To practice various treatment approaches- Bobath, NDT, Brunstorm, Rood's approach, PNF, MRP, Vojta, Sensory integration and Myofascial release.
2. To study and practice Balance and Co-ordination training.
3. To study and practice Positional release technique, Neural Mobilisation technique, MET.
4. To practice functional training using partial body support systems with treadmill training and functional electrical stimulation.
5. To practice local and general relaxation technique.
6. To practice vestibular rehabilitation- habituation exercises, management of post traumatic vertigo and bilateral vestibular disorder.
7. To practice dysphagia management.
8. To practice Yoga in physiotherapy.
9. To practice biofeedback for various Neurological conditions.

Recommended books:

1. Adler Susan. PNF in practice: An illustrated guide. 2nd Edition, Springer, 2000.
2. Batavia Mitch. Wheelchair evaluation a practical guide. Butterworth Heinemann, 1998.
3. Butler David S. Mobilization of the nervous system. Churchill Livingstone, 1996.
4. Carr Janet and Shepherd R. A Motor Relearning Programme for Stroke. Butterworth and Heinemann Ltd, Oxford Publication.
5. Carr Janet and Shepherd R. Neurological Rehabilitation - Optimizing motor performance. Butterworth and Heinemann Ltd, 2004.

6. Chaitow Leon. Muscle energy techniques. Churchill Livingstone, 1997.
7. Gregory Payne V. Human motor development: A lifespan approach. 5th edition McGraw-Hill, 2001.
8. Herdman Susan J. Vestibular rehabilitation. 2nd edition, F.A. Davis Company, 2000.
9. Howle Janet M. Neuro developmental treatment approach: theoretical foundations and principles of clinical practice. NDTA, 2002.
10. Hughes Richard and Liberati Alessandro. Evidence based neurology: Management of Neurological Disorders. Blackwell Publications, 2007.
11. Knot M. and Voss. Proprioception neuromuscular facilitation techniques. 2nd Edition New York, 1972.
12. Lane. Shelly J., Muralidharan Rajalakshmi and Bundy Anita. C. Sensory integration. 2nd Edition, F.A. Davis Company, 2002.
13. Margaret Red Champion. Hydrotherapy in Pediatrics. William Heinmann Medical Books Ltd, 1995.
14. Ruskin Sarah A. Neuroplasticity and rehabilitation. New York, Guilford Publications, 2011.
15. Ryerson Susan and Levitt Kathryn. Functional Movement Reeducation – A contemporary model for stroke Rehabilitation. Churchill Livingston, Elsevier, 1997.
16. Sawner Kathryn A and Jeanne M. La Vigne. Brunnstrom's movement therapy in hemiplegia: A neurophysiological approach. 2nd Edition, Lippincott, 1992.
17. Shaw Christopher and Mceachern Jill C. Towards a theory of Neuroplasticity. Philadelphia, Psychology Press, 2001.

18. Shumway – Cook Anne and Woollacott Marjorie. Motor control: Translating research into clinical practice. 3rd Edition, Lippincott, Williams and Wilkins.
19. Stein Joel and Harvey Richard L. Stroke recovery and rehabilitation. New York, Demos Medical Publication, 2008.
20. Thein Lori and Richley Paula. Aquatic Exercise for rehabilitation and training. Geigle Editors, 2009.

FOURTH SEMESTER

PHYSIOTHERAPY IN NEUROLOGICAL CONDITIONS II

SECTION I

- S 1. Physiotherapy management of Extra-pyramidal disorders.
- 2✓ N Physiotherapy management of Neurocutaneous disorders & degenerative diseases of the spinal cord & cerebellum:
 - (i) Neurocutaneous, Inherited, Degenerated, Developmental, Cerebellar & spinocerebellar diseases.
 - (ii) Early & late onset inherited ataxia, MND & SMA.
- N 3. Physiotherapy management of demyelinating disorders.
- S 4. Physiotherapy management of Infectious disorders of the nervous system.
- S 5. Physiotherapy management of deficiency, Nutritional and metabolic disorders, normal nutritional requirements of a child, Infant feeding, Prevention of nutritional disorders, Immunization.
- N 6. Physiotherapy management of disorders of vestibular system- Specialized testing and specific exercises for BPPV.
- S 7. Physiotherapy management of disorders of the ANS & hypothalamus.
- S 8. Physiotherapy management of disorders of nervous system due to drug and chemical agents, Tumors, Seizures, Epilepsy & other episodic disorders.
- N 9. Physiotherapy management of disorders of higher cerebral cortical function.
- S 10. Physiotherapy management of diseases of bones of skull – Tumors of skull, Craniostenosis, Cleidocranial dysostosis, Hypertelorism and other cranial anomalies.
- N 11. Behavior neurology – Neurological basis of behavior and its relation with various diseases.

SECTION II

1. Mobility function:

- (i) Control of normal mobility.
- (ii) A life span perspective of mobility.
- (iii) Abnormal mobility.
- (iv) Clinical management of a patient with mobility disorder.

2. Reach, Grasp, Manipulation:

- (i) Normal reach, Grasp and, Manipulation.
- (ii) Changes across the life span.
- (iii) Abnormal reach.
- (iv) Grasp and Manipulation.
- (v) Clinical management of a patient with abnormal reach.
- (vi) Grasp and manipulation disorder.

SECTION III

1. Disability evaluation, Functional analysis indices, Relevant provision of prevalent law.
2. Energy conservation, Vocational fitness program, Job analysis based on the ergonomic Principles.
3. Psychological aspects and adjustment during rehabilitation of disabled and CBR.
4. Geriatric Rehabilitation:
 - (i) Normal aging physiology, The environment of older persons with disability, Psychological and social issues in aging, Trajectories of functional decline.
 - (ii) Principles of assessment and management of older adults with disability.
 - (iii) The future – Role of geriatric rehabilitation setting.

SECTION IV

Prevision

Assessment and PT management of the following neuro-surgical conditions:

- ✓ 1. Intracranial abscess.
- ✓ 2. Malformation of spine & spinal cord.
- ✓ 3. Surgeries for disc disorders.
- ✓ 4. Decompression surgeries for tumors – Tumors of cranial bones, Meningiomas, Tumors in spinal cord, Intra-cranial tumors & other space occupying lesions.
5. Stereotactic surgery.
6. Image guided frameless stereotaxy.
7. Robotic surgery.
8. Psychosurgery.

Recommended books:

1. Adams, Raymond D , Victor, Maurice and Ropper, Allan H. Principles of neurology. 6th Edition, New York, Mcgraw—Hill Book Company, 1997.
2. Behrman Richard E, Kliegman Robert M, Hal B. Jenson Jenson. Nelson Textbook of pediatrics. 18th Edition, W.B Saunders Company, 2004.
3. Braddom Randall L. Hand book of Physical and rehabilitation. Saunders, 2006.
4. Burns and Mcdonald. Physiotherapy and the growing child. W.B. Saunders, 1996.
5. Campbell Sazann K and Maggie. Physical therapy for children. Saunders, 1994
6. Cheltenham. Rehabilitation of the older person. 3rd Edition, Nalson thornes Ltd, 2002.

7. Cogher Lesley, Savage Elizabeth. Cerebral palsy. Melbourne, Chapman & hall medical, 1992.
8. Delisa Joel A. Physical Medicine and Rehabilitation. 4th Editon, Lippincott Williams & Wilkins, 2005.
9. Eagle. Disorders of voluntary muscle. Edingburg, Churchill Livingstone, 1988.
10. Fan Stanley. Principles and practice of movement disorders. Churchill Livingstone, Elsevier, 2007.
11. Goblet Charles and Franchignoni Franco. Vocational rehabilitation. France, Springer Verlag, 2006.
12. Hanson Marci J. Early intervention: implementing child and family services for infants and toddlers who are at risk or disabled. 2nd Edition, Pro-Ed publishers, 1995.
13. Levitt Sophie. Textbook of Cerebral palsy and Motor Delay. Blackwell Scientific Publications, 1977.
14. Levitt Sophie. Treatment of cerebral palsy and motor delay. 4th Edition, Blackwell publishers, 2001.
15. Lewis Carole B. Geriatric physical therapy: A clinical approach. Appleton & Lange, 1994.
16. Lindsay. Neurology and neurosurgery illustrated. 4th Edition U.K., Churchill Livingstone, 2004.
17. Lusardi Michele M and Nielsen Cariline C. Prosthetic and Orthotics in Rehabilitation. Saunders Elsevier, 2007.
18. Mital Anil and Kumar Sharwan. Ergonomics guidelines and problem solving. Elsevier ergonomic book series, 2000.
19. Scherzer Alfred L. Early diagnosis and therapy in Cerebral Palsy. 1990.

20. Shummway Anne Cook. Motor control: Translating research into clinical practice. Lippincott, Williams and Wilkins, 2006.
21. Snell Richard S. Clinical neuroanatomy. 7th Edition London, Lippincott Williams and Wilkins, 2009.
22. Tecklin Jan Stephen. Pediatric physical therapy. 4th Edition Lippincott, Williams and Wilkins, 2008.
23. Tinsley R. Harrison. Harrison's principles of internal medicine. 16th Edition New York, Mcgraw—Hill Book Company, 2005.
24. Walton Brain and John. Brain Diseases of the nervous system. 9th Edition USA, Oxford University Press, 2000.