CURRICULUM

for

Certificate
in

Physiotherapy

Council for Technical Education and Vocational Training
Curriculum Development Division
Sanothimi, Bhaktapur
2010

1. Background:

Physiotherapy is an emerging field in the health service sector. Many people in the developed countries, developing countries and under developed countries have been given emphasis for the broader application of physiotherapy in treatment and rehabilitation of various health conditions. This field has been helping the societies and communities for their fitness, treatment and rehabilitation and it has been creating job opportunities both in public and private sectors as well as creating self employment opportunities immensely.

2. Introduction:

The purpose of this curriculum is to produce middle level human resources equipped with knowledge and skills related to the field of physiotherapy so as to meet the demand of such workforce in the country and to contribute in the national streamline of poverty reduction of Nepal.

3. Course title:

Certificate in Physiotherapy

4. Program goal and objectives:

Goal:

To prepare students for physiotherapy practice within clinical and community settings and with diverse population, including vulnerable groups in the country and elsewhere.

Objectives:

The graduates of the program will be able:

1. To apply the knowledge and skills of physiotherapy (therapeutic exercise, electrotherapy, hydrotherapy and therapeutic massage) in different human health conditions.
2. To practice the values and ethics of the physiotherapy profession.
3. To demonstrate the professional competence, self- awareness, integrity, respect of individual, and ethical and social responsibilities.
4. To assist physiotherapists/seniors in treatment /rehabilitation procedures.
5. To apply the knowledge and skills of rehabilitation in community and clinical settings.
6. To apply knowledge and skills of hygiene, sanitation and first aid to the needy.
7. To state organizational structure, function and utilization of their knowledge in various health settings.

5. Course description:

This course is based on the tasks required to be performed by a physiotherapy assistant in variety of clinical and community settings. Therefore, this curriculum is designed to provide knowledge and skills focusing on physiotherapy.

Program extends over three years. The first year course includes basic science; the second year course focuses on basic disciplinary subjects of physiotherapy. Similarly, the third year comprises of the disciplinary subjects and application of learned skills and knowledge in clinical and community setting. Certificate in Physiotherapy program is residential in nature.

6. Duration:

The total duration of this curricular program is three years.

7. Target group:

The target group for this program will be all the interested individuals who have passed SLC or equivalent.

8. Group size:

The group size will be maximum of 40 (Forty) in a batch.

9. Target location:

The target location will be all over Nepal.

10. Entry qualification:

The applicant for entry qualification for Certificate in Physiotherapy program will be SLC pass or equivalent or Technical SLC (TSLC) in related subject.

11. Entry criteria:

- Should submit certificate of SLC pass with English, Math and Science.
- Should pass entrance examination as administered by CTEVT
- Applicants fulfilling the minimum requirements will be selected for admission on the basis of merit
- Individuals of lower economic status preferred

12. Selection:

Applicants fulfilling the entry criteria will be selected for admission on the basis of merit.

13. Medium of instruction:

The medium of instruction will be in English and/or Nepali.

14. Pattern of attendance:

Minimum of 90% attendance in each subject is required to appear in the respective final examination

15. Teacher and student ratio:

- For theory: As per the nature of the course.
- For practical / demonstration: 1:10.
- 50% of the teaching faculty must be full timer.

16. Physical Facilities

- General Hospital with Neuro, Ortho and physiotherapy departments including: exercise therapy, electrotherapy and rehabilitation units.

OR

- Physiotherapy and Rehabilitation Hospital with Neuro, Ortho and physiotherapy departments including exercise therapy, electrotherapy and rehabilitation units

17. Teaching Faculty:

- Program Coordinator must be MPT or BPT with 3 years of experience.
- The tutor/instructor must be a Bachelor's degree holder in the related area.
- The demonstrator should be Certificate level with two years experiences in training activities or Bachelor's degree holder in the related area.

18. Instructional media and materials:

The following instructional media and materials are suggested for the effective instruction and demonstration.

- **Printed Media Materials** (Assignment sheets, Case studies, Handouts, Information sheets, Individual training packets, Procedure sheets, Performance Check lists, Textbooks etc.).
- **Non-projected Media Materials** (Display, Models, Flip chart, Poster, Writing board etc.).
- **Projected Media Materials** (Opaque projections, Overhead transparencies, Slides etc.).
- **Audio-Visual Materials** (Audiotapes, Films, Slide-tape programs, Videodiscs, Videotapes etc.).
- **Computer-Based Instructional Materials** (Computer-based training, Interactive video etc.).

19. Teaching learning methodologies:

The methods of teachings for this curricular program will be a combination of several approaches. Such as Illustrated Lecture, Tutorial, Group Discussion, Demonstration, Simulation, Guided practice, Practical experiences, Fieldwork, Report writing, Term paper presentation, Case analysis, Role-playing, Heuristic and Other Independent learning.

- Theory: Lecture, Discussion, Seminar, Interaction, Assignment, Group work.
- Practical: Demonstration, Observation, Guided practice, Self-practice Project work, Hospital practice

20. Mode of education:

There will be inductive and deductive mode of education

1. Internal assessment
   - There shall be a transparent evaluation system for each subject both in theory and practical
   - Internal assessment every 4 month with feedback to the student
   - Clinical assessment with formative evaluation system
   - Internal assessment carries 20% of the total marks

2. Final Examination: Written exam, Practical exam and Viva voce
   - Weightage of theory and practical marks will be according to the course structure
   - Final exam carries 80% of the total marks

- Must pass internal assessment exams (both theory and practical) to appear in the final examination
- Provision of re-examination as per CTEVT policy.
- Provision for administering practical examination by qualified Physiotherapist.
- One examiner in one setting can evaluate not more than 20 students per day for final practical examination
- Practical examination should be administered in actual situation on relevant subject with provision of at least one independent external examiner from the concerned recognized teaching institute.

21. Provision of back paper:

There will be the provision of back paper but a student must pass all the subjects of all three years within six years from the enrolment.

22. Disciplinary and ethical requirements:

- Intoxication, insubordination or rudeness to peers will result in immediate suspension followed by review by the disciplinary review committee of the Polytechnic.
- Dishonesty in academic or practice activities will result in immediate suspension followed by administrative review, with possible expulsion.
- Illicit drug use, bearing arms on Polytechnic, threats or assaults to peers, faculty or staff will result in immediate suspension, followed by administrative review with possible expulsion.

23. Pass marks:

The students must secure minimum of 40% marks both in theory and practical. Moreover, the students must secure minimum of 40% marks in the internal assessment and 40% in the year final examination of each subject to pass the subject

24. Grading system:

The overall achievement of each student will be measured by a final aggregate percentage of all final year examinations and graded as follow:
Marks division:

- Distinction : > or =80 %
- First division : 65 % to < 80 %
- Second division : 50 % to 65 %
- Pass : 40 % to < 50 %

25. Certification and degree awards:

- Students who have passed all the components of all the subjects of all years are considered to have successfully completed the course.
- Students who have successfully completed the course will be awarded by a degree of proficiency Certificate in Medical Science (Physiotherapy).

26. Career path:

The graduates will be eligible for the position equivalent to Non-gazetted 1st class (technical) as physiotherapy professionals or as prescribed by the Public Service Commission of Nepal. The graduate will be eligible for registration with the related licensing organization of the country (if any).

Course Structure on Certificate in Physiotherapy

First Year

S. N	Subjects	Mode		Weekly Hours	Distribution of Marks						Total Marks
					Theory			Practical			
		T	P		Internal	Final	Time (Hrs)	Internal	Final	Time (Hrs)	
1	English	3	-	3	20	80	3	-	-	-	100
2	Nepali	3	-	3	20	80	3	-	-	-	100
3	Social Studies	3	-	3	10	40	3	-	-	-	50
4	Anatomy & Physiology	3	2	5	16	64	3	8	12	3	100
5	Physics	3	1	4	16	64	3	8	12	3	100
6	Chemistry	3	2	5	16	64	3	8	12	3	100
7	Zoology	3	2	5	16	64	3	8	12	3	100
8	Botany	3	1	4	16	64	3	8	12	3	100
9	Mathematics, Statistics & Computer Application	3	2	5	16	64	3	8	12	3	100
Total		**27**	**10**	**37**							**850**

Second Year

S.N	Subjects	Mode		Weekly Hours	Distribution of Marks						Total Marks
					Theory			Practical			
		T	P		Internal	Final	Time (Hrs)	Internal	Final	Time (Hrs)	
1	Applied Anatomy & Physiology	4	1	5	16	64	3	12	8	3 hrs	100
2	Bio-mechanics	2	1	3	10	40	1.5	30	20	3 hrs	50
3	Therapeutic Exercise	3	4	7	10	40	1.5	60	40	3 hrs	150
4	Electrotherapy	4	2	6	16	64	3	30	20	3 hrs	150
5	Medicine & Surgery	5	2	7	14	64	3	30	20	3 hrs	150
6	Psychology	2	-	2	10	40	1.5	30	20	3 hrs	50
7	Pathology & Pharmacology	4	-	4	20	80	3				100
8	Community Rehabilitation	4	1	5	16	64	3	12	8	3 hrs	100
Total		**28**	**11**	**39**							**850**

Third year

S.N	Subjects	Mode		Weekly Hours	Distribution of Marks						Total Marks
					Theory			Practical			
		T	P		Internal	Final	Time (Hrs)	Internal	Final	Time (Hrs)	
1	Physiotherapy in Clinical Conditions – I (Cardio respiratory and Medical and Surgical)	4	2	6	16	64	3	30	20	3 hrs	150
2	Physiotherapy in Clinical Conditions – II (Orthopedics & Neurology)	4	2	6	16	64	3	30	20		150
3	Rehabilitation Medicine	3	1	4	16	64	3	12	8	3 hrs	100
4	Health Care Management	2	-	2	10	40					50
5	Clinical Practices		20	20				200	200	3 hrs	400
Total		**13**	**25**	**38**							**850**

Second Year

Offered Subjects

1. Applied Anatomy and Physiology
2. Biomechanics
3. Therapeutic Exercises
4. Electrotherapy
5. Medicine and Surgery
6. Psychology
7. Pathology and Pharmacology
8. Community Rehabilitation and First Aid

Applied Anatomy and Physiology

Total: 5 hrs/w
Theory: 4 hrs/w
Practical: 1 hr/w

Course description
This course provides knowledge of the normal structure and function of the systems of the human body. The students require an understanding of the normal structure and function of the human body in order to be able to differentiate between the normal and abnormal pattern of movement which is essential in the assessment and treatment of patient

Course objectives
After the completion of this course the student will be able to:

1. Identify the classifications of the systems of the human body.
2. Locate and describe the structure and function of the components of each body system.
3. Explain the interrelationship of the body systems.
4. Transfer knowledge of anatomy and physiology of the body to medical and surgical circumstances.
5. Explain the mechanisms of body repair and resistance to disease.
6. Describe the physical changes that occur during normal growth and development, from conception to senescence.

Course contents

THEORY

Part -1: Applied Anatomy

Unit 1 General introduction of anatomy 5 hrs

1. Define anatomy, sub disciplines of anatomy, level of body organization.
2. Define various important anatomical terminologies (anterior, posterior, superior, inferior, proximal, distal, extension, flexion, abduction, adduction, saggittal, coronal, palmar, dorsal, ventral)
3. List the name of various systems of human body.

Unit 2 Skeletal system (Osteology) 20 hrs

1. Describe the structure and histology of bone.
2. Classify, describe types of bone and division of skeletal system.
3. Describe structure and function of bones of skull, spine, thoracic cage, pelvic bones, and upper and lower limbs bones.
4. Define, classify and describe the structure and components of joints.
5. Define and describe the synovial joint and its functional characteristics.
6. Describe anatomical component of shoulder joint, elbow joint, proximal and distal radio ulnar joint, joints of hand and finger, hip joint, knee joint, ankle joint, joints of foot and toes.

Unit 3 Muscular System **20 hrs**

1. Classify and describe structure and functions of muscle.
2. Classify and describe the connective tissue of the body.
3. Explain the attachments, nerve supply and action of the following muscles
    - Major Muscles of face and neck
    - Major Muscle of thoracic cage
    - Major Muscle of spine
    - Major Muscle of abdominal wall
    - Major Muscles of pelvic floor
    - Major Muscle of upper limb
    - Major Muscle of lower limb

Unit 4 Integument System **5 hrs**

1. Describe the characteristics of layer of the epidermis, dermis, subcutaneous tissue and epidermal appendages.
2. Define gland, classify gland and describe sweat gland, sebaceous gland, hair and nail.

Unit 5 Nervous system **20 hrs**

1. Classify nervous system and Describe the organization of Central Nervous system, Peripheral Nervous system and Autonomic Nervous system,
2. Describe the structure and functions of the Brain
    - Cerebrum
    - Cerebellum
    - Pons
    - Thalamus
    - Hypothalamus
    - Medulla oblongata
    - Spinal cord

3. Describe formation, course and distribution of the following;
    - Facial nerve
    - Brachial plexus
        - Ulnar nerve
        - Radial nerve
        - Median nerve
        - Musculo-cutaneous nerve
        - Axillary nerve
    - Lumbo-sacral plexus
        - Sciatic nerve
        - Femoral nerve
        - Obturator nerve

4. Describe the automatic nervous system

- Automatic sensory
- Motor pathways.

Part -2: Physiology

Unit 6 General introduction of physiology **5 hrs**

1. Define physiology
2. Review the functions of following systems of human body
    - skeletal system
    - muscular system
    - nervous system
    - cardiovascular system
    - lymphatic system
    - immune system
    - respiratory system
    - digestive system
    - urinary system
    - Reproductive system

Unit 7 Circulatory systems **10 hrs**

1. Review the Physiology of blood
    - Composition and functions of blood
    - plasma and their formation
    - Structure and formation and functions of RBC, WBC and platelets, Hemoglobin
    - Coagulation
    - bleeding time, clotting time and their defects
    - ABO Blood groups and their significance
2. Describe the structure and function of heart, arteries, veins, arterioles, venules, and capillaries.
3. Briefly describe the blood supply and nerve supply of heart.

Unit 8 Neuro muscular physiology **15 hrs**

1. Describe muscle-structure and function. Describe the Mechanism of muscle contraction.
2. Describe the neuron its properties and function, neural conduction,
3. Describe membrane potential, action potential, and its propagation; describe neuromuscular transmission, degeneration and regeneration of nerve fibers.
4. Describe the conduction velocity in nerve fibers
5. Define receptors, synapse, its characteristics, and describe events at the chemical synapse.
6. Describe the function of the principle sensory and motor tracts of the spinal cord.
7. Describe the functional components of the reflex arc.

Unit 9 Respiratory system **15 hrs**

1. Review the organization of respiratory system
2. Describe the mechanism of respiration
3. Describe pulmonary volume and capacities
4. Describe transport of respiratory gases
5. Describe nervous and chemical control of respiration

Unit 10 Exercise physiologies **8 hrs**

1. Describe the importance of exercise physiology.
2. Describe the effect of exercise on oxygen transport, muscle strength/ power & endurance

Unit 11 Endocrine systems **8 hrs**

1. Describe the functions of endocrine glands. (pituitary, thyroid, parathyroid, and adrenal, islets of langerhans, and testis)
2. Name the hormones secreted by these glands.
3. State the role of hypothalamus on regulating endocrine glands.
4. Describe the uses of hormones in our body.

Unit 12 Digestive system **10 hrs**

1. Review the structures and functions of alimentary canal, with diagram.
2. Review the mechanisms of mastication, deglutition, digestion, absorption, and defecation, and vomiting.
3. Identify the locations and functions of different digestive glands.

Unit 13 Reproductory system **5 hrs**

1. Review the structure and function of male and female reproductive organs.
2. Describe the mechanism of menstruation, fertilization.
3. Describe the structure and function of breast.

Unit 14 Urinary system **5 hrs**

1. Review the structure and functions of urinary systems. (kidney, ureter, bladder, and urethra)
2. Explain formation of urine, mechanism of water balance, electrolyte balance.
3. Explain micturation and incontinence.

Unit 15 Lymphatic systems **5 hrs**

1. Describe the gross structures, functions of lymphatic system.
2. Explain functions of lymph nodes. (tonsils, wall of the vermiform appendix, payers patches)

PRACTICAL

Unit 1 Musculoskeletal **30 hrs**

1. List major muscles of the head, neck, thorax, spine and extremities.
2. List the bones of human body.
3. Demonstrate movements of synovial joints.
4. Palpate and inspect the body prominences of head, neck, thorax, spine and extremities.

Unit 2 Organs **9 hrs**

1. Practice surface marking of organs in thorax and abdomen in models.
2. Practice Surface marking of the lungs, fissure and lobes, heart, liver, spleen, kidney, spinal nerves and blood vessels.
3. Practice surface marking of head neck and spinal cord.

Textbooks

Ross & Wilson, Anatomy and Physiology. Churchill Livingstone, London.
Textbook of Physiology, Chatterzee.

Reference Texts

Shier, D., Butler, J. & Lewis, R., Hole's Human Anatomy and Physiology. Wm. C. Brown Publishers, London. 1996.
Chauarasia, Handbook of Human Anatomy. CBS Publication.
Gytons' Text book of physiology.
Textbook of Physiology, Shembugam.

Biomechanics

Total: 3 hrs/w
Theory: 2 hrs/w
Practical: 1 hr/w

Course description
This course will enable the student to understand the biomechanics and their application in physiotherapy in restoration of the physical function.

Course objectives
After the completion of this course the student will be able to:

a. Explain mechanics and mechanical principles in relation to human body
b. Explain mechanical principles of equipments seen in the physiotherapy gymnasium
c. Explain the range of motion of different joints and muscle action
d. Able to use different tools like goniometry, walking aids and crutches
e. Explain gait and its parameter

Course contents:

THEORY

Unit 1 Introduction **2 hrs**

1. Describe Biomechanics
2. Describe Kinesiology

Unit 2 Mechanics and mechanical principles: **15 hrs**

1. Define mechanics, forces, classification of forces, forces acting on human body.
2. Define and Describe
    - Momentum
    - Friction
    - Pivot
    - Angle of pull
    - Gravity
    - Line of gravity
    - Centre of gravity
    - Equilibrium
    - Use of equilibrium board
    - Energy
    - Work
    - Power
    - Lever
    - Pulleys

- Muscle contraction
- Action of muscles

Unit 3 Mechanics and mechanical principles applied in physiotherapy 30 hrs.

1. Explain Mechanical principles applied in physiotherapy like force, momentum, torque
2. Explain Mechanics of position, gravity, line of gravity and centre of gravity in human body
3. Explain Mechanics of movement areas and plane
4. Explain Lever, Pulleys in human body
5. Analyze Movement in ADL and other various movements
6. Describe Elasticity
7. Explain Parallel bars, Static cycle, CPM, Shoulder wheel, Shoulder ladder

Unit 4 Goniometry 8 hrs

8. Define and describe Goniometry
9. State principles and limitation of Goniometry
10. Explain range of motion of joints.

Unit 5 Posture and Gait 13 hrs

1. Explain posture and
2. Explain types of posture
   Fundamental postures, derived postures
   Good and bad postures
3. Describe Normal, abnormal Gait and its parameters,

Unit 6 Walking aids and Crutches 10 hrs

1. Define walking Aids and Crutches
2. Describe function, structure, indication, contraindication and uses of walking aids- Walker, Crutches, Sticks, Wheel chairs.

PRACTICAL

Unit 1 Goniometry 5 hrs

1. Measure the range of motion of joints of upper and lower extremities

Unit 2 Mechanical Exercise Tools 10 hrs

1. Handle shoulder wheel
2. Handle shoulder ladder
3. Handle bicycle ergo meter
4. Handle equilibrium board
5. Handle CPM
6. Handle tilt bed

Unit 3 Posture and Gaits analysis 24 hrs

1. Measure the various crutches

2. Apply Walking aids; auxiliary crutch, elbow crutch, gutter crutch, stick (tripod, quadripode) and wheel chair.
3. Analyze ADL
4. Analyze posture

Reference / text books:

- Clinical Kinesiology for physical therapist assistant, JP bros medical publishers
- Cinthia C. Norkin, Biomechanics of Human motion
- Tidy's Physiotherapy

Therapeutic Exercises

Total: 7 hrs/w
Theory: 3 hrs /w
Practical: 4 hrs/w

Course description
This course provides both the theoretical knowledge and practical skills to carry out therapeutic exercises programs. The course is designed to give the student knowledge and skills necessary to carry out comprehensive regional assessments along with the introduction of a variety of exercise techniques and exercise equipments.

Course objectives
After the completion of this course the student will be able to:

1. Carry out the comprehensive regional assessment, analyze and record these findings, develop a problem lists, short and long term goals and a treatment plan.
2. Describe and demonstrate a wide variety of exercise techniques and their effects including modifications and progressions based on the patient's response to the techniques.
3. Prepare Plan for therapeutic exercise program for commonly encountered clinical conditions, including modifications, progression, home exercise programs and discharge planning.

Course contents:

THEORY

Unit 1 Evaluation / Assessment methods: 8 hrs

1. Explain Principles, techniques, merits, demerits of:
    - Manual muscle testing (MMT) – group muscles
    - Range of motion – Goniometry and soft tissue tightness
    - Limb girth and length measurement
    - Posture
    - Chest expansion
    - Hand function
    - Deformities

Unit 2 Soft tissue manipulation technique / massage 8 hrs

1. Describe principles and types of massage
2. Describe technique, physiological and therapeutic effects of massage.
3. Describe indication and contraindication

Unit 3 Relaxation 8 hrs

1. Describe Concepts and principles Indications, Techniques (Hold relax and contract relax) of relaxation.

Unit 4 Locomotion 8 hrs

1. Define Gait: normal gait, gait analysis, pathological gait, gait training
2. Explain Patient transfer technique
3. Walking aids: types and uses
4. Identify crutches, describe Crutch walking, Explain crutch measurement, crutch gait types and gait training.

Unit 5 Activity of daily living (ADL): 14 hrs

1. Describe Posture
    - Describe physiological deviations
    - Explain Corrective exercises: ideal sitting, standing, strengthening and stretching.
    - Describe preventive measures.

2. Mat exercises
    - Describe Transfer activities
    - Describe Equilibrium, Principles and techniques. Balancing exercises.

Unit 6 Hydrotherapy 4 hrs

1. Define Hydrotherapy
2. Explain effects, merits and demerits

Unit 7 Exercise for hand function 6 hrs

1. Explain exercise for muscle strength / flexibility imbalance.

Unit 8 PNF 6 hrs

1. Describe Proprioceptive, Neuro-muscular facilitation (PNF) techniques

Unit 9 Coordination exercises 8 hrs

1. Explain: Coordination exercises (Frenkel's Exercises)

Unit 10 Suspension Therapy 6 hrs

1. Define suspension therapy
2. State principle of suspension therapy
3. Describe types, uses, merits and demerits of suspension therapy

Unit 11 Joint movement: 3 hrs

1. Define joint movement
2. Explain mobilization techniques and its indication and contraindication

Unit 12 Stretching: 8 hrs

1. Define stretching, state principles and types of stretching
2. Explain contractures and tightness and their types
3. Describe, indication, goals precautions and contraindications
4. Describe active and passive stretching techniques

Unit 13 Therapeutic Exercises 8 hrs

1. Describe therapeutic exercise for strength
2. Describe therapeutic exercise for mobility

3. Describe therapeutic exercise for flexibility
4. Describe therapeutic exercise for power
5. Describe therapeutic exercise for endurance
6. Describe therapeutic exercise for group exercises
7. Describe therapeutic exercise for home exercise program

Unit 14 Gymnasium **5 hrs**

1. Explain gymnasium, setting up, equipments and its uses

Unit 15 Breathing exercises **5 hrs**

2. Describe: Principle, types, techniques, effects, merits and demerits of breathing exercises

Unit 16 Starting positions **5 hrs**

1. Describe: Various positions in Lying, Sitting, Standing, and Hanging

Unit 17 Chest physiotherapy 7 **hrs**

1. Describe Coughing
2. Describe Huffing
3. Describe Postural drainage
4. Describe Chest manipulation techniques
5. Explain Home programs

PRACTICAL

Unit 1 Case assessment 15 **hrs**

1. Assess range of motion
2. Assess muscle strength
3. Sssess tone
4. Assess power
5. Assess reflexes
6. Assess sensation
7. Assess limb length
8. Assess limb girth
9. Assess muscle bulk
10. Assess gait

Unit 2 Movement **10 hrs**

1. Perform movements of upper limbs
2. Perform movements of lower limbs
3. Perform movements of spine. (Active and Passive movements)

Unit 3 Therapeutic massage **15 hrs**

1. Perform techniques of therapeutic massage/soft tissue manipulation for Neck, Back, Face and Limbs.

Unit 4 Mobilization and Stretching **24 hrs**

1. Perform soft tissue stretching techniques for following muscles: Sternocleidomastoid, Trapezius, Pectoralis, Biceps brachi, Triceps, Long flexors of wrist and fingers, Ileopsoas, Gluteus maximus, Hamstring, Quadriceps, Ileotibial band, Piriformis, Tendoachilis tendon,

Peroneal muscles.

2. Perform mobilization of joints. Shoulder, wrist/ intercarpal, interphalangeal, sacroiliac, hip, knee, ankle and intermetatarsal joints.

Unit 5 Strengthening and balance/coordination exercises

22 hrs

1. Perform muscle strengthening exercises. (Neck, Spine, Abdomen and Limb muscles).
2. Perform coordination exercises (Frenkel's exercises)
3. Perform balance exercises (for vertigo and postural imbalances)
4. Perform Mat exercises.

Unit 6 Breathing exercise and Postural drainage **10 hrs**

1. Perform breathing exercises and postural drainage.

Unit 7 Walking Aids and ADL **30 hrs**

1. Perform measurement of limb length and girth.
2. Perform measurement and use of crutches (crutch gait).
3. Perform ADL
4. Perform functional re-education techniques.

Unit 8 MMT and Goniometry **6 hrs**

1. Perform MMT
2. Perform Goniometry

Unit 9 PNF, Relaxation and gymnasium **24 hrs**

1. Perform PNF
2. Perform Relaxation exercises.
3. Perform gymnasium.

Text Book

- Therapeutic exercises by Carolyn Kisner and Lynn Aller Colby
- The principles of therapeutic exercises by Dena Gardener

Reference Books:

- Practical exercise therapy by Margaret Hollis.
- Joint structure and function by Pamela K. Levangies and Cynthia C. Norkin
- Manual muscle testing by Kendel and Kendel.
- Massage therapy by Margaret Hollis.
- Goniometry by Cynthia C. Norkin.

Electrotherapy

Total: **6 hrs/w**
Theory: **3 hrs/w**
Practical: **2 hrs/w**

Course description
This course provides knowledge and skills of electrotherapy. This course designed to develop basic but comprehensive knowledge of various types of electrical modalities and to develop skills of procedure adopted in electrotherapy.

Course objectives
After the completion of this course the student will be able to:

1. Explain historical background of various electrical modalities
2. Classify the different modes of current
3. Can use given electrical modalities independently in their level

Course contents:

THEORY

Unit 1 Introduction **2 hrs**

1. Define electrotherapy and describe modalities used in electrotherapy

Unit 2 Physics **20 hrs**

1. Define Ions, Explain: Ionization, production of current, Direct current and Alternative current, Conduction and induction of current.
2. Identify and describe the uses of Power sockets, switches and plugs.
3. Explain definition, classification and management of electric shock), explain therapeutic current.

Unit 3 High frequency current **36 hrs**

1. Describe therapeutic uses of high frequency
2. Describe production, indication, contraindication, effects and uses and techniques of application of Short wave diathermy.
3. Describe production, indication, contraindication, effects and uses and techniques of application of microwave diathermy.
4. Describe types, indication, contraindication, effects and techniques of application of Infra red radiation.
5. Describe production, indication, contraindication, effects and uses and techniques of application of Ultrasound)

Unit 4 Low frequency current **24 hrs**

1. Describe, type indication, contraindication, Effects and uses and techniques of application of faradic current.
2. Describe, types, indication, contraindication, Effects and uses and techniques of application of galvanic current.

Unit 5 Motor points **10 hrs**

1. Define and describe of motor points and techniques of application of faradic current at motor points.

Unit 6 Faradic foot bath **4 hrs**

1. Explain Faradic foot bath, indication and application.

Unit 7 Faradism under pressure **4 hrs**

1. Explain Faradism under pressure indication and application

Unit 8 Transcutaneous Electric Nerve Stimulation (TENS) **6 hrs**

1. Define, classify TENS
2. Explain indication, contraindication and application of TENS.

Unit 9 Interferential Therapy **6 hrs**

1. Define and classify IFT
2. Explain indication, contraindication and application of IFT.

Unit 10 Electrodiagnosis **10 hrs**

1. Explain Faradic Galvanic test, Strength Duration curve, Nerve Conduction test Electromyography.

Unit 11 Iontophoresis **2 hrs**

1. Explain iontophoresis and therapeutic uses

Unit 12 Paraffin Wax Bath **6 hrs**

1. Define Paraffin Wax Bath
2. Explain indication, contraindication and application of wax bath.

Unit 13 Hot packs **6 hrs**

1. Define hot packs, classify types of hot packs.
2. Explain indication, contraindication and application of hot packs.

Unit 14 Hydrotherapy **6 hrs**

1. Define and classify hydrotherapy
2. Explain indication, contraindication and application of hydrotherapy.

Unit 15 Cryotherapy **6 hrs**

1. Define cryotherapy, classify types of cryotherapy.
2. Explain indication, contraindication and application of cryotherapy.

Unit 16 Traction **8 hrs**

1. Define Traction, classify types of Traction.
2. Explain indication, contraindication and application of Traction.
3. Explain uses of pelvic and cervical traction.

PRACTICAL

Unit 1 Heating Modalities **20 hrs**

1. Apply SWD, MWD, IRR, UST

Unit 2 Electrical stimulation **18hrs**

1. Stimulate the denervated and innervated muscles with Faradic and Galvanic current.
2. Apply TENS.
3. Apply faradic foot bath and faradism under pressure.

Unit 3 Paraffin and Hot packs **20 hrs**

1. Apply Paraffin wax bath and hot packs.

Unit 4 Hydrotherapy and Cryotherapy **20 hrs**

1. Perform reeducation and strengthening of muscle using water.
2. Apply ice in different forms.

Text Books:

- Claytons Electrotherapy
- Textbook of Electrotherapy, Jagmohan

Reference

- Electrotherapy Explained, Low and Ann Reed
- Clinical Electrophysiotherapy; Robinson

Medicine and Surgery

Total: **7 hrs/w**
Theory: **5 hrs/w**
Practical: **2 hrs/w**

Course description
The course content of the medicine and surgery includes the study of different conditions of various medical disciplines which are important in fundamental physiotherapy practice. The course includes introduction of the conditions, causes and management related to orthopedic, neurological, and cardiopulmonary, general medical and surgical conditions.

Course objectives
After the completion of this course the student will be able to:

1. Define different conditions.
2. Describe the etiology, signs &symptoms and management of the conditions.

Course Contents:

THEORY

Unit 1 Orthopedic conditions: **75 hrs**

1. Describe aetiology, signs & symptoms and complications of the following conditions:
    - Congenital anomalies
        - CTEV
        - CDH
        - Torticolis
        - Spina bifida
        - Cervical ribs.
    - Bone infections
        - Osteomyelitis
        - Bone and joints TB
    - Arthritis
        - Osteoarthritis
        - Rheumatoid arthritis
        - Juvenile rheumatoid arthritis
        - Ankylosing spondylitis
        - Hemophilia
        - Infective arthritis.
    - Bone and joints deformities:
        - Kyphosis
        - Lordosis

- Scoliosis
- Spondylolysthesis
- Coxa vara
- Genu varum
- Genu valgum
- Genu recurvatum
- Flat foot

- Bone, muscle and joints disorders:
  - Rickets
  - Osteomalacia
  - Planter fasciitis
  - Cervical
  - Lumber spondylitis
  - Inter-vertebral disc prolapsed
  - Spinal stenosis
  - Frozen shoulder
  - common tendonitis
- Fractures

- Definition and types of fracture
- Clinical sign of fracture
- Facture healing
- Fracture complications (cross-union, non-union, delayed-union, mal-union, fibrous-union)
- Fracture management
- Common fracture of upper limb and lower limbs
- Clavicle neck
- Shaft & condylar fracture of humerus
- Olecronan process and shaft of the Ulna
- Head and shaft of radius
- Colle's fracture
- Carpals, metacarpals and phalanges fracture
- Lower limbs
- Neck
- Shaft and condylar fracture of femur
- Patella fracture
- Condylar and shaft fracture tibia
- Shaft of fibula fracture
- Fracture malleolus (right and left)
- Tarsals fracture

- Metatarsals and phalanges fracture
    - Amputations
        - Types of amputations
        - Common sites of amputation in upper limb and lower limb
        - Stump management
        - Orthosis fitting and training.
    - Soft tissue injuries
        - Sprain and strain
        - Contusion, muscle and ligament rupture
        - Inflammations
        - Bursitis
        - Tendinitis
        - Teno-synovitis
        - Fibrositis.

Unit 2 Neurological conditions (20 Hours)

1. Describe aetiology, signs & symptoms, complications of the neurological conditions.
    - Cardio vascular accident (CVA);
    - Brain injury
    - Spinal cord injury
    - Poliomyelitis
    - Encephalitis
    - Parkinsonism
    - Peripheral nerve injury; brachial plexus injury
    - Facial palsy, bells palsy

Unit 3 Cardiopulmonary conditions (40 Hours)

1. Describe aetiology, signs & symptoms, complications of the cardio pulmonary conditions.
    - Chronic obstructive pulmonary disease (COPD
    - Asthma
    - Chronic bronchitis,
    - Pneumonia,
    - Lung abscess
    - Empyema,
    - Broncheactisis
    - Plural effusion,
    - Emphysema
    - Pneumothorax
    - Pulmonary Tuberculosis

- Rheumatic Heart Disease,
- Ischemic heart disease;
- Coronary artery disease
- Myocardial infraction
- Hypertension and hypotension
- Deep vein thrombosis,
- Pneumonectomy, types of pulmonary surgery, and demonstrate management

Unit 4 General medical and surgical conditions (60 Hours)

- Define inflammation. types of inflammation and management of inflammation
- Explain the process, stages of Wound healing
- Mention different types of agent causing Burn and first aid. Describe severity of burns and management.
- Describe Edema with causes, types and management.
- Explain embolism, types, complications and management
- Define Atherosclerosis, clinical feature, complications
- Explain Diabetes, risk factors, pathogenesis and management
- Define Neoplasm and types of neoplasm
- Explain STD, mention different types , prevention and management of STD
- Explain HIV, AIDS, route of transmission, chemical manifestation, Anti Retroviral Therapy.
- Define Hepatitis, types, pathogenesis , management of Hepatitis
- Explain features during different trimester of pregnancy. Describe stages of labor
- Define Plastic surgery, mention different types of grafts and medical and rehab management after surgery.
- Define Epilepsy, explain pathogenesis, management of Epilepsy
- Define Leprosy; explain types, clinical features and medical and rehabilitation management of Leprosy.
- Define Diarrhea and explain Diarrhea management
- Define dysentery and dysentery management
- Explain otitis media, causes, types and management
- Explain Conjunctivitis and management
- Explain Myopia , hypermeteropia, sterognosis and management
- Explain Vertigo

PRACTICAL

Unit 1 First aid (40 hrs)

Handle a patient

Perform Wound dressing
Perform Bandaging and Taping
Perform Splinting

Unit 2 Vital signs:
Measure Blood Pressure,
Measure Respiration Rate,
Measure Pulse Rate,
Measure Temperature, and
Measure Heart Rate.

Unit 3 Clinical posting: Observation, study presentation (23 hrs)
Handle stethoscope, sphygmomanometer, and thermometer.
Perform Cardiopulmonary Auscultation.
Perform Anthropometric measurement-Limb Length, Limb girth, Height, Weight, Chest expansion

Unit 4 X rays (15 hrs)
Observe activities on radiology department.
Observe Routine x-ray plates of AP view/lateral view/ PA view/oblique.
Interpret X-ray film of various conditions.-Fractures, deformity, cardiopulmonary images.

Textbook

- General medicine and surgery - Bruner and Siddhartha
- Textbook of Medicine, U. N. Pathak
- Textbook of Surgery, A.L. Sen.
- Principle of Surgery, Prof. A.K. Sharma.

Reference Books:

- Essential of Orthopedic - Maheshawari
- Text book for Orthopedic and Traumatology - N. Natarajan
- Gynecology and Obstetric - Ac Dutta
- Davidson's Medicine

Psychology

Total: 7 hrs/w
Theory: 5hrs/w
Practical: 0 hrs/w

Course description
This course is designed for the students of proficiency certificate level (PCL) in physiotherapy. The major course contents are motivation, learning styles, emotion, reactions to stress and mental illness which help the physiotherapy practitioners.

Course objectives
After the completion of this course the student will be able to:

1. Define and explain the common terms used in psychology
2. Relate their knowledge of motive when working with patients
3. Describe commonly used intelligence tests and carry out basic intelligence assessments.
4. Describe factors affecting learning and how it may impact their own and their patients' ability to learn
5. Describe the normal emotional and personality development of a child
6. Explain how emotional deprivation may affect health
7. Explain methods of assessing personality
8. List the components of assessing mental health
9. Describe causes of conflict
10. List methods of stress reduction
11. Explain and teach different relaxation methods
12. Relate the knowledge of defense mechanisms
13. Describe the causes, signs & symptoms and physiotherapy management of common mental illnesses

Course Contents:

THEORY

Unit 1 Introduction to Psychology **2 hrs**

1. Define psychology
2. Explain Educational, Social, Developmental, Occupational and child psychology

Unit 2 Motive **5 hrs**

1. Define and classify motive
2. Explain Psychological drives, Social motives, Personal motives, Unconscious motive
3. Describe use of knowledge of motive for patients care

Unit 3 Intelligence **8 hrs**

1. Define intelligence
2. List characteristics of intelligence
3. List factors affecting intelligence

- Intelligence tests
  - Describe Wechsler Adult and children Intelligence scales
  - Describe Bhatia Intelligence Test Battery
  - Describe IQ Test
  - Categorize people (patient) on the basis of IQ
- Mental retardation
- Define and describe mental retardation

Unit 4 Learning **11 hrs**

1. Define learning
2. Explain significance of learning
3. List factors of effective learning
4. State Laws of learning -Readiness, exercise, effect
5. State theories of learning – Pavlov, Skinner and Thorndike (Trial and error, conditioning)

Unit 5 Emotion **8 hrs**

1. Define emotion
2. Describe external and internal changes of the individual
3. Describe emotional development in Infant and toddler, Pre-school and school age child
4. Describe importance of children's emotion and emotional deprivation
5. Describe emotional effects on health

Unit 6 Personality **8 hrs**

1. Define personality
2. Classy personality types
3. List and describe factors affecting personality -physiological, social, psychological
4. List personality development pattern in infancy, early childhood, late childhood

Unit 7 Mental health **10 hrs**

1. Define mental health and mental hygiene
2. List characteristics of mental health
3. Assess the mental health
   - Appearance
   - Posture
   - Facial expression
   - Mood
   - Speech
4. Assess the behavior
   - Orient to time, place and person
   - Able to concentrate and level of consciousness
5. Assess intellectual function
   - Memory
   - Basic knowledge
   - Judgment
6. Explain factors affecting mental health

Unit 8 Frustration and Mental conflict **8 hrs**

1. Define frustration
2. Define mental conflict
3. Classify and list types and causes of conflict
4. Describe methods of stress reduction: relaxation, recreation
5. List the effects of meditation, diversion and exercise on frustration and mental conflict

Unit 9 Defiance and adjustment mechanisms **10 hrs**

1. Define defense mechanism
2. Define adjustment mechanism
3. Classify adjustment mechanisms including:
    - Compensation
    - Rationalization
    - Projection
    - Identification
4. Define substitution, sublimation, repression, regression,
5. Define sympathism, withdrawal, day dreaming
6. Explain positive and negative aspects of defiance mechanisms

Unit 10 Mental Illness **8 hrs**

1. Define mental health
2. Define mental illness
3. Define and classify mental and Personality disorders: psychosis, hysteria, neurosis, drug abuse, alcoholism
4. Explain Physiotherapy treatment for the mentally ill patient

Text Book

Textbook of Psychology, Barron's.

Pathology and Pharmacology

Total: **4 hrs/w**
Theory: **4 hrs/w**
Practical: **0 hrs/w**

Course description:

The course is comprised of two parts. The first part intends to provide knowledge on the common pathology of medical and surgical conditions. Similarly, the second part is designed to provide knowledge on the common groups of drugs used in medical and surgical conditions.

Course objectives:
After the completion of this course the student will be able to:

1. Describe pathological condition of various medical and surgical conditions.
2. Describe micro organisms and their structure.
3. Describe mode of infection and prevention of medically important intestinal parasites
4. Explain defense mechanism of body.
5. Describe formation and function of blood.
6. Describe actions of each group of drugs commonly used in Nepal.
7. Name the common therapeutic drugs used in each groups.
8. Describe the actions, effects, side effects and contraindications of drugs.
9. Describe the possible implications for physiotherapy treatment of certain drugs.
10. Describe the principles of treatment of poisoning with commonly used household chemicals.

Course Contents:

THEORY

Part 1: Pathology

Unit 1 Medical Microbiology: **20 hrs**

1. Describe microorganisms in relation to their structure (Morphological classification) - Bacteria, Parasites, Viruses and Fungi.
2. Identify/ describe microorganisms causing diseases in man.
3. Explain the methods of basic bacteriological investigations (Gram's stain, AFB stain, culture media, cultivation techniques, identification techniques and sensitivity testing methods).
4. Explain bacterial growth and factors influencing it.
5. Define sterilization and explain various methods of sterilization (physical, chemical).

Unit 2 Medical parasitology **15 hrs**

1. Describe modes of infection, pathogenicity, laboratory diagnosis and prevention of medically important intestinal parasites prevalent in Nepal (Ascais, Hookworm, Trichuris, Enterbious Taenia Echinococcus, Hymenolepis, Entamoeba, Giardia and Trichomonas).
2. Describe modes of infection, pathogenicity, laboratory diagnosis and prevention of medically, important blood and tissue parasites found in Nepal (Plasmodium, Leishmania, Wuchereria).
3. Explain defense mechanism of body (non-specific and specific), Antigent, Antibody, complement and antigen-antibody reaction.

Unit 3 Haematology **12 hrs**

1. Describe the formation and composition of blood and function of its different components e.g. RBC, WBC, Platelets, Plasma.
2. Describe the structure, functions and estimation of hemoglobin.
3. Describe methods of blood collection and use of anticoagulants.
4. Describe test methods and normal values of WBC total count, WBC different count and erythrocyte sedimentation rate.

Unit 4 Basic Pathology **25 hrs**

1. Inflammation
    - Define Inflammation
    - Describe mechanism of inflammatory process including physical, chemical and biological causes.
2. Infection
    - Define infection
    - Describe mechanism of infection
    - Explain the source of infection
    - Explain differences between infection and inflammation
3. Wound
    - Define wound
    - Describe the mechanism of wound
    - Describe stages of wound healing
4. Ulcers
    - Define ulcers
    - Describe the mechanism of ulcer
    - Describe stages of ulcer healing
5. Gangrene
    - Define and classify Gangrene
    - Describe the mechanism of Gangrene formation
6. Neoplasm
    - Define and classify Neoplasm
    - State Histological changes in neoplasmic tissue
7. Burn
    - Define burn

- List the cause of burn
- Explain the types of burn
- Explain rule of nine

8. Shock

- Define shock
- List the cause of shock
- Explain the types of shock
- Describe the mechanism of shock

Text Book:

- Text book of Pathology by Harsh Mohan

Reference Book:

- Robins textbook of Pathology

Part 2: Pharmacology

Unit 5 Terminology and definition **10 hrs**

1. Define Pharmacology, Pharmacy, Drug, Pharmacodynamics, Pharmacokinetics
2. Discuss Adverse reactions, Dose, Indication, Contraindication, Preparation and Dispensing, Expiry date and self-life
3. Enumerate the routes of drug administration and identify the factors effecting drug action.
4. Explain with examples the importance of expiry date and self-life of drug.

Unit 6 Analgesic, antipyretic and anti-inflammatory drugs.

6 hrs

1. Define analgesic, and anti inflammatory.
2. Describe the mode of use, dose, common side effects and contraindications of Aspirin, Paracetamol, Ibuprofen, Indomethacih and Naproxen.

Unit 7 Drugs used in common respiratory problems **8 hrs**

1. Define cough sedative cough expectorant, bronchodilator, antihistamine and mucolytics.
2. Describe the doses and common side effects of Ephedrine, Aminophylline, Salbutamol, Chlorpheniramine, Pheniramine, Volatile Oils and Vasaka.

Unit 8 Drugs used for treatment of infections and infestations **16 hrs**

1. Define antibiotic, chemotherapeutic agent, antitubercular, antileprotic, anthelmintic, antiamoebic, antifilarial, and antimalarial agents.

2. Describe uses and side effects of peniciline, tetracyclines, cephalosporins, erythromycin, sulphadimidine, sulphaguanidine, co-trimoxazole, chloramphenicol, streptomycin, lsoniazid, thiacetazone, PAS, ethambutol, Ethionamide, pyrizinamide rifampicin, dapsone, clofazimine, bephenium, piperazine, mebendazole, niclosamide, di-iodohydroxyquinoline, diloxanide, metronidazole, tinidazole, chloroquin, primaquine, and diethylcarbamazine.

Unit 9 Drugs used locally **10 hrs**

1. Define local anesthetic, soothing agent, antifungal, antiseptic, disinfectant, and vasoconstrictor.
2. Explain uses, and side effects of lignosine, zinc sulphate, zinc oxide, calamine, salicylic acid, benzoic acid, methyl salicylate, gentian violet, mercurochrome, iodine, benzoin, acriflavine, cercrimide, potassium permanganate, chlorhexdine, benzylbenzoate, adrenaline and sulphar, gamma benzene hexachloride.

Unit 10 Vaccines and antisera **10 hrs**

1. Define active and passive immunizations, vaccine, toxoid, and antisera.
2. Explain the various uses, enumerate the doses and identify untoward effects of BCG, DPT, Cholera vaccine, Polio vaccine, TEB vaccine, Anti Rabies vaccine, Tetanus toxoid, Measles vaccine, Tetanus antitoxin, Diphtheria antitoxin and Anti-snake venom serum.

Unit 11 Drugs used in common C.V. problems **6 hrs**

1. Define antihypertensives and diuretics.
2. Explain the uses and side effects of digoxin, reserpine, thiazides and frusemide.

Unit 12 Drugs used in common nervous system problems **8 hrs**

1. Define sedative, hypnotic, tranquilliser, anticonvulsant, antiepileptic and drug dependence with examples of drugs causing dependence.
2. Explain uses and common side effects of phenobarbitone, paraldehyde, diazepam, morphine, pethidine and codeine.

Unit 13 Nutritional supplements. **6 hrs**

1. Define vitamin, minerals deficiency and supplement.
2. Describe the sources, uses and side effects of vitamins A, B, C, D, E, K Iron and calcium.

Unit 14 Drug dependency and drug addiction **4 hrs**

1. Definition - drug dependency and drug abuse.
2. Commonly abused drugs.

Text Book:

- Pharmacology for Physiotherapy, Shetty Uday Kumar

Reference Book:

- Text book of Pharmancology by Satoshkar
- Essentials of Pharmacology by K. D. Triphathi

Community Rehabilitation and First Aid

Total: 5 hrs/w
Theory: 4 hrs/w
Practical: 1 hr/w

Course description
This course is designed to impart knowledge and skills on rehabilitation, from a facility based physiotherapy approach (largely based on the medical model) to a more holistic, community-based approach (largely based on the social/community model). It also deals with the existing community based rehabilitation (CBR) programmes in Nepal, their role, their locations and the links between physiotherapy and CBR. The existing and potential role of community physiotherapy will also be explored. This course also provides knowledge and skills on first aid. This course deals on various common emergency situation, which need first aid.

Course objectives:
After the completion of this course the student will be able to:

1. Describe the current situation of disability in Nepal.
2. Examine their own and others attitudes, assumptions and underlying belief system regarding impairment, disability and handicap.
3. Identify the social, political, economic, culture and religious factors, which impact attitudes towards and belief systems surrounding disability and handicap.
4. Understand the background from which many hospital patients come and to which they will return.
5. Conduct a community meeting in a participatory fashion to promote disability awareness and to teach health promotion and disability prevention.
6. List government policies relating to disability and understand how these impact attitudes towards persons with disabilities, and the lives of the disabled persons themselves.
7. Describe in detail the disability related the disability related resources available in Nepal, and be aware how to access these resources appropriately.
8. Provide emergency first aid to the needy.
9. Identify the national health policy and strategy, health care delivery, elements of primary health care, indicator of improvement in the health care and the role of health worker in primary health care.
10. Provide basic maternal, childcare and family planning guidance to the needy.

Course Contents:

THEORY

Unit 1 Community Rehabilitation **40 hrs**

1. Definitions of impairment, disability, handicap according to the new WHO conceptualizations.
2. Describe Health promotion, disability prevention in the community
3. Explain community, government, INGO and NGO role in disability prevention
4. Explain creating change processes at the local, national and international levels.
5. Explain role of
    - poverty
    - malnutrition
    - inadequate health and rehabilitation services
    - poor educational facilities

Unit 2 Community Disability **40 hrs**

1. Explain disability Disability rights, including issues of access, inclusion, as well as social, legal and social issues
2. Describe disability materials and resources
3. Describe poor community and transportation infrastructures in contributing to disability
4. List Local, national and international organizations working in the disability sector

5. Describe government policy and legislation relating to disability
6. Disability awareness training in the community, and monitoring and evaluation of its impact
7. Explain role of Physiotherapy in the community

Unit 3 Community based rehabilitation **28 hrs**

1. Describe Community based rehabilitation
2. Explain Community approaches to handicap in development
3. Explain model of community based rehabilitation
4. Explain Locally made aids and adaptations

Unit 4 First Aid (48 Hrs.)

1. Introduce first aid, manage on the site and make decision for referal and management during transfer.
2. Define shock, list the causes of shock, and identify first aid measures to the patient in shock.
3. Identify first aid measures in cases of poisoning (insecticides, rodenticides, drugs and alcohol)
4. Conceptualize ABC (Airway, Breathing, Circulation) and describe the procedure of cardio-pulmonary resuscitation.
5. Identify foreign body in ear, nose, throat and eye and provide first aid treatment.
6. Classify type of injuries and identify measures to provide first aid.
7. Classify types of haemorrhage and identify measures to provide first aid to arrest external bleeding.
8. Classify burns, calculate its percentage and state the first aid measures to thermal and chemical burns.
9. Identify measures to management of a case of frostbite.
10. Identify heat stroke and its first aid.
11. Identify measures to provide first aid measures in case of acute mountain sickness.
12. Identify the broken bones and dislocation and its first aid measures.
13. List the dangers of rabid animal bite and identify first aid measures.
14. Identify the measures to be taken in case of snakebite and insect bite.

PRACTICAL

Unit 1 Community Rehabilitation **31 Hrs**

1. Enlist potential cases to be rehabilitated in the community.
2. Plan physiotherapy and rehabilitation program for the enlisted cases.
3. Develop tools and materials to educate and counsel the patients and his/her environment.
4. Simulate the implementation of plan developed.
5. Make/modify assistive devices using local resources as required.
6. Simulate to apply referral procedures.
7. Develop community based rehabilitation awareness program for school children.

Unit 2 First Aid **8 Hrs**

1. Measure temperature, pulse, respiration and blood pressure.
2. Apply dressing, bandages and splint.
3. Perform cardio-pulmonary resuscitation.
4. Put patient in different positions and transfer patient from one place to other.

Text Book

Text book of preventive and community medicine, Park and Park.
Text book of rehabilitation, Sunder and Sunder
Atlas of Orthosis and assistive devices, B. Goldbery, MD; John D. HSv, MD

Reference book

1. First Aid - St. John Ambulance
2. First Aid -ICRC
3. First Aid and Emergency Nursing - N. N. Yalayyaswamy
4. Emergency first AID safety oriented - Harvinder popli, Nirmal

Third Year

Offered Subjects

1. Physiotherapy in Clinical Condition – I
2. Physiotherapy in Clinical Conditions – II
3. Rehabilitation Medicine
4. Health Care Management
5. Clinical Practices II (In hospital and clinical settings)

Physiotherapy in Clinical Condition – I

Total:	**6 hrs/w**
Theory:	**3 hrs/w**
Practical:	**3 hrs/w**

Course description:

The course is comprised of two parts. The first part intends to provide knowledge and skill on the specific conditions and physiotherapy management of cardiopulmonary condition. Similarly the second part is designed to provide knowledge and skills on specific conditions and physiotherapy management of general medical and surgical condition. This course also provides knowledge and skills on specific conditions in Obstetric and pediatric, gynecology.

Course objectives

After the completion of the course, the student will be able to:

1. Assess and examine the conditions
2. Explain the treatment process
3. Treat the patients using physiotherapy modalities
4. Ergonomics and environment modification
5. Make follow up

Course Contents:

THEORY

Part – I: Cardiopulmonary Condition

1 Cardiopulmonary Condition **78 hrs**

1. Explain the types of pulmonary surgery (Pneumonectomy) and physiotherapy management.
2. Describe the procedure of Coronary artery bypass surgery, and role of physiotherapy.
3. Explain the types of Peripheral vascular diseases, (Atherosclerosis, Burgers diseases): importance and physiotherapy management
4. Explain and perform Chest physiotherapy.
5. Explain importance of Ventilation and Nebulization.
6. Demonstrate the Coughing and Huffing techniques and explain its use (indications)
7. Explain clinical features congenital deformity of chest (Pectus carinatum, Pectus excavatum,) and its managements.
8. Explain and demonstrate the Postural drainage techniques and its indication for use.

Part – II: Medical & Surgical conditions

2 Medical & Surgical conditions **78 hrs**

1. Explain different causative factor of burn, classification based on the severity of the burn, first aid, medical and physiotherapy management.
2. Define Inflammation, classification of different stages of inflammation, management of inflammation.
3. Explain Leprosy. Describe types, causes, clinical features, pathogenesis and management of leprosy
4. Describe mastectomy and physiotherapy management after mastectomy.
5. Mention different types of abdominal surgery and incisions and role of physiotherapy.
6. Describe, differentiate Necrosis and gangrene and its management
7. Explain what Atrophy is and what measures to preventive atrophy are.
8. Explain and demonstrate Cardiopulmonary resuscitation process and importance.
9. Describe pressure sore and its medical and physiotherapy management.
10. Define Edema, explain types and management
11. Explain what is pre-natal and post natal exercises and its importance.

PRACTICAL

Unit 1 Cardiopulmonary unit
Perform:

Breathing exercises	5 Hours
Postural drainage	**(10 Hours)**
Nebulization	**(3 Hours)**
General assessment,	**(8 Hours)**
Cardio pulmonary resuscitation	**(5 Hours)**
Exercise and management in Thoracotomy	**(7 Hours)**

Unit 2 General –Abdominal and lower limb
Perform:

Pelvic floor exercises	**(8 Hours)**
Exercises after Abdominal surgery	**(8 Hours)**
Antenatal and post natal exercises	**(9 Hours)**
Edema management	**(8 Hours)**
Relaxation	**(7 Hours)**

Text Books:

Cash's text book of neurology for physiotherapists- Patricia A Downie
Cash's text books of medicine and surgey for physiotherapist
Tidy's physiotherapy

Reference Book
Physical Rehabilitation; SusanO' Suluvan Schmitz
Physiotherapy in Thoracic Condition; 4th Edition; Moyna J. Parker

Physiotherapy in Clinical Conditions – II

Total: **6 hrs/w**
Theory: **4 hrs/w**
Practical: **2 hrs/w**

Course description:
The course is comprised of two parts. The first part intends to provide knowledge and skill common traumatic and orthopedic conditions which cause disability. Similarly the second part is designed to provide knowledge on the normal functioning of the nervous system. Neurology helps to build up basic foundation for the treatment of more common neurological conditions and supports for the development of effective treatment skills for the neurological patients.

Course objectives:
After the completion of this course the student will be able to:

a. Describe the aetiology, signs & symptoms, general pathology, complications & prognosis of the musculo-skeletal conditions.
b. Describe the medical, surgical and physiotherapy management of these conditions.
c. Provide appropriate advice and instructions on preventive healthcare related to musculo-skeletal conditions.
d. Prescribe the appropriate orthotics and prosthetics wherever needed.
a. Describe the aetiology, signs & symptoms and physiotherapeutic interventions of the commonly encountered neurological conditions.
b. Demonstrate effective clinical treatment skills emphasizing for the movement pattern of various neurological conditions.
c. Develop ability to tacle with movement disorders and appropriate treatment of cerebro vascular accident (CVA).
d. Describe the cause s and acute care management of the spinal cord injured patient including emergency trauma care.
e. Provide effective advice and counseling for the home care

Course Contents:

THEORY

Part 1: Orthopedics

Unit 1 Traumatology **35 hrs**

1..Define fracture. Explain types, clinical features of fracture, fracture healing, complication of fractures(cross-union, non-union, delayed-union, mal-union, fibrous-union)
and fracture management.
2..Explain management of following fractures:

- Clavicle neck
- Shaft & condylar fracture of humerus

- Olecronan process and shaft of the Ulna
- Head and shaft of radius
- Colle's fracture
- Carpals, metacarpals and phalanges fracture
- Neck, Shaft and condylar fracture of femur
- Patella fracture
- Condylar and shaft fracture tibia
- Shaft of fibula fracture
- Fracture malleolus (right and left)
- Tarsals fracture
- Metatarsals and phalanges fracture

b. Dislocation and subluxation

Explain clinical features and management of Dislocation and sub luxation of following joints:

- Shoulder
- Elbow
- Wrist
- Hip
- Knee
- Ankle

c. Soft tissue injuries

Explain clinical features and management of following soft tissue injuries and inflammatory conditions:

i. Injuries:

- Sprain
- Strain
- Contusion
- Ruptures

ii. Inflammatory conditions

- Synovitis
- Bursitis
- Capsulitis
- Tenosynovitis
- Tenovaginitis
- Fibrositis

d. Amputation

- Identify Level of amputation of upper and lower extremity
- Identify prosthesis(emphasis for lower limb)
- Describe Training for an amputee.
- Explain Complications of amputations

Unit 2 Arthritis **20 hrs**

Define and explain the causes, clinical features and management of the following conditions:

- Osteoarthritis
- Rheumatoid arthritis
- Juvenile rheumatoid arthritis
- Tubercular arthritis
- Ankylosing spondylitis
- Gouty arthritis
- Infective arthritis

Unit 3 Deformities **15 hrs**

i. Congenital

Define and explain the causes, clinical features and management of following conditions:

- Torticollis
- Cervical ribs
- Congenital dislocated hip(CDH)
- Pes cavus
- Pes planus
- Talipes equino varus

ii. Acquired

Define and explain the clinical features and management of following conditions:

- Genu valgum
- Genu varum
- Genu recurvatum
- Dupuytren's contracture
- Mallet finger
- Trigger finger
- Swan neck deformity
- Boutonnniere deformity

Unit 4 Regional conditions of spine **10 hrs**

Define and explain the causes, clinical features and management of following conditions:

- Cervical and lumbar spondylosis
- Prolapsed intervertebral disc (PIVD)
- Osteoporosis

Unit 5 Peripheral Nerve Injuries **20 hrs**

Define and explain the causes, clinical features and management of following conditions:

- Brachial plexus injuries
- Leprosy
- Carpel tunnel syndrome
- Polio

Unit 6 Miscellaneous **5 hrs**

Define and explain the use of different types of traction

Text Books:

Text bok of Orthopaedics and applied physiotherapy- Jayant Joshi and Prakash Kotwal
Text book of Orthopaedics- Mahesahwori

Reference Books:

Cash's text book of orthopaedics and rheumatology for physiotherapists- Patricia a. downie
Atlas of Orthosis and assistive devices, Bertram Goldbery, MD; John D. Hsv, MD
Physical Examination of Spine and Extremities, Stanley Hoppenfield, MD

Part 2: Neurology

Unit 7 Basic neurophysiology **10 hrs**

Explain neurophysiology of:
a. Motor (Pyramidal, Extra pyramidal & Cerebellar)
b. Sensory
c. Reflexes, Bladder & Bowel control.

Unit 8 Neurological disorders: **40 hrs**

Describe the aetiology, signs & symptoms, management and physiotherapeutic interventions following conditions.
a.Cerebral palsy
b. Cerebro vascular accident, stroke, hemiplegia, monoplegia
c. Neuro-Infections
.Meningitis
.Encephalitis
.Poliomyelitis
.Neurosyphilis
d. Movement disorders (Parkinsonism, chorea, tremors and writer's cramps)
e. Diseases of the spinal cord:

- Compressive (spondylotic, tumors)
- Non-compressive, paraplegia, quadriplegia

f. Peripheral neuropathies:

- Gullian barre syndrome
- Diabetic neuropathy
- Entrapment neuropathy

g. Neurogenic bladder

PRACTICAL

Unit 1 Orthopedics (48 hrs)

Identify and apply physiotherapeutic skills for the management of following cases:

Fractures
Soft tissue injuries
Deformities
Degenerative and
Inflammatory conditions

Unit 2 Neurology (30 hrs)

Assess and perform physiotherapy management for the following conditions:

- Peripheral Nerve injuries
- Cerebral palsy
- Cerebrovascular accident
- Spinal cord injury
- Brain injuries
- Neurogenic bladder

Text books:

Cash textbook of neurology

Reference Book:

Neurology and Neurosurgery Illustrated, Kenneth W. Lindsay; Ian Bone; Robin Callander
Tidy's Physiotherapy

Rehabilitation Medicine

Total: **4 hrs/w**
Theory: **3 hrs/w**
Practical: **1 hr /w**

Course description
This course is designed to equip the students with knowledge and skills deals with locomotors handicap as well as holistic rehabilitation medicines. Rehabilitation medicine is a fast emerging specialty today and there is a need to increase awareness about it

Course objectives
After the completion of this course the student will be able to:

1. Understand the concept of rehabilitation medicine
2. Be familiar with different mobility aids and their accessibility.
3. Describe application of therapeutic and transfer techniques
4. Understand holistic management of various conditions on both IBR and CBR center
5. Conduct vocational, psychological training for a disabled person

Course contents:

THEORY

Unit 1 General rehabilitation medicine. **12 hrs**

1. Define rehabilitation medicine
2. Explain levels of prevention
3. Distinguish impairment, disability and handicap
4. Describe function of rehabilitation team

Unit 2: Therapeutic Techniques **12 hrs**

1. Describe mat exercise
2. Describe balance and coordination exercises
3. Describe relaxation techniques/exercises
4. Describe handling and positioning of CP child

Unit 3 Transfer Techniques **9 hrs**

1. Describe transfer techniques
2. Describe importance of transfer techniques
3. State principle of transfer techniques

Unit 4 Mobility Aids **9 hrs**

1. Classify of various aids.
2. Explain measurement of crutches and cane
3. Describe gait training aids

Unit 5 Orthosis and prosthesis. **9 hrs**

1. Define and classify Orthosis and prosthesis
2. State general principles of orthosis and prosthetics
3. List functions and uses of Orthosis and prosthesis

Unit 6 Architectural Barriers **15 hrs**

1. Define architectural barriers
2. Classify types of architectural barriers
3. Describe architectural design features and their accessibility
4. Explain wheel chair assistive houses in community
5. Explain special rooms relating to various disabilities

Unit 7 Rehabilitation of stroke **9 hrs**

1. Describe acute stage rehabilitation
2. Describe sub- acute stage rehabilitation
3. Describe recovery stage rehabilitation

Unit 8 Rehabilitation of polio **9 hrs**

1. Describe acute stage rehabilitation
2. Describe post-polio residual paralysis rehabilitation
3. Describe deformities and their management in polio

Unit 9 Rehabilitation of cerebral palsy **10 hrs**

1. Describe primary level of CP.
2. Describe ADL training of CP
3. Explain Occupational therapy for CP children

Unit 10 Rehabilitation of burn **6 hrs**

1. Describe burns and its complication
2. Describe rehabilitation of the burn

Unit 11 Vocational rehabilitation. **12 hrs**

1. Define vocational rehabilitation
2. Describe the importance of vocational rehabilitation
3. Explain the role of vocational rehabilitation team
4. Explain the training for various disabilities according to their functional capacity

Unit 12 Counseling **5hrs**

1. Define counseling
2. Describe the importance of counseling
3. Explain the methods of counseling

PRACTICAL

Unit 1 Devices **20 hrs**

1. Apply Orthoses and prosthesis

2. Perform gait training
3. Demonstrate/perform walking aids

Unit 2 Exercise **19 hrs**

1. Perform mat exercises
2. Perform Frenkle's exercise
3. Perform equilibrium and non-equilibrium exercises

Text Book:
Text Book of Rehabilitation, Sunder
Physical Rehabilitauion, Susan O' Suluvan Schmitz

Reference Book:
Atlas of Amputation and limb defficiencies, DouglasG. Smith; John W. Michael; John H. Bowker
Atlas of Orthoses and assistive devices, Bertram Goldbery, MD; John D. Hsv, MD
Therapeutic exercises by Carolyn Kisner and Lynn Aller Colby
The principles of therapeutic exercises by Dena Gardener
Practical exercise therapy by Margaret Hollis.

Health Care Management

Total:	**2 hrs/w**
Theory:	**2 hrs/w**
Practical:	**0 hrs/w**

Course description
This course is designed to provide knowledge and skills on health care management system. This course focuses on to the principles of physiotherapy and rehabilitation management, leadership skills, personnel management, quality control and health care delivery system. This course also provides knowledge on professional ethics (national/international).

Course objectives
After the completion of this course the student will be able to:

1. State management principles and their application to the practice of physiotherapy
2. Describe issues of professional development and autonomy relevant to physiotherapy
3. Enumerate types of solid wastes and methods of its disposal.
4. Identify food borne infections and food poisoning.
5. Describe the effects of poor housing and ways for improved housing.
6. Familiarize with health care system.
7. Supervise quality control.
8. Understand professional ethics of physiotherapy discipline.

Course Contents:

THEORY

1 Management **12 Hrs**

1. State organizational management principle
2. Explain methods and importance of record keeping
3. Explain health care policies and organizational structure of health care system of Nepal.
4. Describe job descriptions, roles and responsibilities.
5. Describe Performance evaluations
6. Describe processes of interactions within physiotherapy department and between departments.

Unit 2 Waste Disposal (8 Hours)
1. Identify the human wastes.
2. State the effects of unhygienic practice of open-air defecation.
3. State the benefits of sanitary latrine.
4. State the methods of excreta disposal.
5. List different types of solid wastes and their management including hospital originated wastes.
6. State the methods of waste disposal.

7. State existing typical disposal of refuse at public places.
8. Describe the health hazards from unhygienic disposal of refuse.
9. Describe the hospital born infections (Patients and Staffs)

Unit 3 Food Hygiene (8 Hours)

1. Describe different types of food poisoning (bacterial, chemical and plants).
2. Describe the sources of food contamination (human factor, environmental factors)
3. State the methods of food preservation (pickling, smoking, carrying, cooking, drying, adding chemicals)
4. Identify food borne infections and food poisoning.
5. State milk and meat hygiene.

Unit 4 Water (8 Hours)

1. State the sources of water.
2. State water borne diseases.
3. Describe sources of contamination of water.
4. State methods of purification of water.

Unit 5 Sanitary Housing (7 Hours)

1. Describe the basic principles of housing (site selection, material used, space, light, ventilation, waste disposal management, etc.).
2. State the effects of poor housing.
3. State governmental plans and policies regarding housing.

Unit 6 Health care delivery system (6 Hours)

1. Describe health care delivery system in Nepal.
2. Explain healthcare management models.
3. Describe patient care system in physiotherapy department.

Unit 7 Ethics **10 hours**

1. Explain process of quality assurance & clinical audit.
2. Explain Legal & Ethical aspects of Healthcare.
3. Explain ethics and professionalism, including physiotherapy code of ethics of Nepal Health Professions Council.
4. Explain standards of practice and competency at different level of physiotherapy professionals.
5. Describe Role of Nepal Health Professions Council.
6. Describe duties and responsibilities of a physiotherapy professional at different level of health care delivery system.
7. Describe importance of continuing medical education and lifelong learning.
8. State existing professional organizations and associations of Nepal related to health.

PRACTICAL

Unit 1 Health Management **18 Hrs**

1. Perform record keeping.
2. Prepare organizational structure of health care system of MoHP.
3. List job descriptions, roles and responsibilities.
4. Carry out performance evaluations of staffs.
5. Organize/facilitate interactions within physiotherapy department and between departments.

Unit 2 Hygiene and Sanitation **30 Hrs**

1. Identify the existing waste disposal systems.
2. Identify/List the needs of the community regarding personal hygiene and environmental sanitation.
3. Conduct awareness programs in the community on "safe hygienic practices and maintenance of sanitary latrine".
4. Facilitate to cooperate with other team members in sanitary activities in the community.

Unit 3 Food Hygiene (8 Hours)

1. Identify food borne infections and food poisoning.
2. List sources of food contamination (human factor, environmental factors).
3. State milk and its product.
4. State meat and its product.

Unit 4 Water (8 Hours)

1. Enlist the sources of water.
2. Enlist water borne diseases.
3. Observe/Identify sources of contamination of water.
4. Observe/Identify methods of purification of water.

Textbooks

1. On Being In Charge, A guide to Management in Primary Health Care - Macmohan, R. et al. WHO. Current edition.
2. The Quest for Health - Dixit, H. Educational Enterprise, (P) Ltd., Kathmandu. 1999.
3. Health Management -Pradhananga, Y. Council for Technical Education and Vocational Training, Bhaktapur, Nepal. 2055B.S.
4. Leadership and Management for Nurses -Kamala, T. & Bishnu, R. Health Learning Materials Centre, Tribuvan University, Kathmandu. 1990.

Reference books:

1. Basic Principles of Management - Shrestha, B.M.. Akshyulak Publication, Nepal. 2039B.S.
2. Modern Management Methods and the Organization of Health Services, Public Health Papers #55. WHO. 1974.

3. Inventory Control and Basic Logistics Procedure Manual on Store Management for PHC/HP and SHP Personnel. HMG/JSI. 2054B.S.
5. Textbook of Preventive and Social Medicine - Park, K. Bhandrasidas Bhanot, Jabalpur, India. 2000.
6. Health Logistics Procedure Manual. - NHTC/LMD/USAID JSI, Nepal 2057.
7. Health Statistics and EPI Cold Chain Management Procedure Manual. - NHTC/LMD/USAID JSI, Nepal 2057.
8. A Handbook of Hygiene and Public Health - Y.P. Bedi.
9. Jorcan's Tropical Hygiene and Sanitation - W. Wilinte *et.al.*
10. W.H.O. Excreta disposal
11. Environmental Health and Sanitation - Shatrughna Ojha..
12. Annual Report of Department of Health Services, Ministry of Health
13. WHO Publications (related issues) - WHO, Geneva
14. Laboratory Bio-safety Manual - WHO Publication, Geneva

Clinical Practices II (In hospital and clinical settings)

Total: 20 hrs/w
Theory: 0 hrs/w
Practical: 20 hrs/w

Course description
This comprehensive clinical practice program is designed to help students apply the comprehensive learned knowledge and skills on actual situation. This course consists of clinical practice in hospitals and/or other suitable settings. The program is offered after completing third year. The students will be supervised primarily by an instructor/lecturer. It is the instructor/lecturer's responsibility to organize the clinical experience for each individual student, to provide theoretical and practical support in their specialty.

Course objectives
1. Relate to and adapt to varying work situations
2. Demonstrate confidence in dealing with clinical problems
3. Assess patients
4. Plan patient treatments
5. Demonstrate effective patient treatments using the practical skills.
6. Demonstrate the analytical skills to evaluate the effect of treatment methods.
7. Progress or modify treatments in response to evaluation, and to discharge patients when appropriate.
8. Demonstrate the ability to keep accurate comprehensive patient record..
9. Communicate effectively with multidisciplinary team, patients and their families
10. Give effective health care advice and prevention

Duration: 780 hrs
Course contents

Placements in hospitals and/or other suitable facilities, comprising a total of 780 hrs of clinical practice including

- Clinical assessment
- Therapeutic exercises
- Electrotherapy
- Hydrotherapy
- Musculoskeletal conditions
- Neurological conditions
- Cardiopulmonary conditions

Placement schedule
The whole class of students will be divided into five groups and placed for the following sections of the pathology department

S. No.	Subject Area/Sections	Duration (in hrs)	No. of Cases to be performed
1	Clinical assessment	150	Neuro Ortho Cardiothoracic
2	Therapeutic exercises	350	Neuro Ortho- cardiopulmonary
3	Electrotherapy	155	Apply each modality for minimum 5 cases
4	Hydrotherapy	50	5 cases
5	Community Rehabilitation	75	
	Total	**780**	

Students should be present in the departments at least 90% of the allotted days to be eligible to sit in the final examination. Students will have to perform all tests under the supervision of departmental staffs and may be allowed to perform tests independently if the supervisor finds them perfect.
Students should keep their practical record (logbook) signed periodically by their supervisor/instructor at the end of the posting in each subject.

Evaluation Scheme
Under this scheme students will have to perform a prescribed number of tests in each department. At the end of the term the teacher or supervisor closely evaluates their performance for accuracy and precision according to the evaluation sheet proposed. At the end of the course there will be a final practical and examination which will be administered by CTEVT.

Distribution of marks for evaluation

Section	Evaluator/Paper	Distribution of marks			Total Marks
		Internal	Final	Time	
1	Related Physiotherapy hospital/clinical supervisor/teacher (continuous evaluation)	100			200
2	Related institution supervisor/teacher (continuous evaluation	100			200
3	CTEVT appointed examiner (at the end of the field practice)		200	3 hrs	200
	Total:	**200**	**200**		**400**

1. **Important note:** *Each student must pass in each of the section of the evaluation as presented above with a minimum of 60% marks. This means they must secure 60 each in section 1 and 2 and 120 marks in section 3.*

Experts Involved in Development