

**DEPARTMENT OF STRENGTH TRAINING AND CONDITIONING
(SPORTS SCIENCE)
RAJIV GANDHI UNIVERSITY**



SYLLABUS

FOR THE DEGREE OF

**Certificate in Strength Training and Conditioning
ONE SEMESTERS CERTIFICATE PROGRAMME**

(Under Credit Based Continuous Evaluation Grading System)

Session: 2021-22

**Approved by the Ministry of Youth Affairs and Sports
Government of India**



**युवा कार्यक्रम और खेल मंत्रालय
MINISTRY OF
YOUTH AFFAIRS AND SPORTS**

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SYLLABUS DETAILS

Title of the Course: Certificate in Strength Training and Conditioning

Duration of the Course: Six Months (One Semester)

Course Objective:

The concept behind introducing this program is based on to explore the ample opportunities present in field of strength training and conditioning. The concept is to prepare the experts who could be well equipped with knowledge of latest concept of fitness management and will be able to manage the fitness program of players at different levels and according to diversified requirement of sports. So that these trainer can incorporate with coaches and physio of teams to achieve the long and short term goal of the teams and players.

1. Prepare experts of fitness training who can contribute to attaining desired level of fitness for teams and players.
2. Prepare experts of fitness training who will equipped with the knowledge of preparing long and short term training plan.
3. Course can prepare trainees in such a way where trainees will have adequate expertise to assess the fitness level of players as well as individuals with the help of standardized testing protocols.
4. Motive of the course is to prepare trainee in such a way so that they could be efficient to manage a personalized fitness training structure according to requirement of different professions.

Eligibility: Graduation in any discipline, BPE and BPES with a minimum of 55% marks in aggregate with 5% relaxation for (SC/ST).

Orientation of Course: Six Month Certificate in Strength Training and Conditioning

Subject Code	Theory/ Practical	Paper Title	Marks		Credit
			External	Internal	
Theory					
CSTC - CC:101	Theory	Human Anatomy and Exercise Physiology	80	20	4
CSTC - CC:102	Theory	Sports Training	80	20	4
CSTC - CC:103	Theory	Fitness and Conditioning	80	20	4
CSTC - CC:104	Theory	Kinesiology and Sports Biomechanics	80	20	4
Practical					
CSTC - PC: 101	Practical	Human Anatomy, Exercise Physiology and Kinesiology	80	20	4
CSTC - PC: 102	Practical	Sports Training & Fitness and Conditioning	80	20	4
			600		24

**Detailed Syllabus for Six Month Certificate Course in
Strength Training and Conditioning, RGU, Rono Hills, Doimukh**

CSTC -CC: 101 Human Anatomy and Exercise Physiology

Learning Outcome: Students will be ready to study effect of exercise in detail and in application perspective. Students will also be able to measure the changes and interpret them in the context of sports.

Unit: I (Skeleton System and Muscular System)

1. Skeleton System: Structure and functions of skeleton
2. Classification of Skeleton (according to shape and according to location)
3. Joints: Definition and function of joints, Classification and characteristics of joints
4. Bones articulation at different joints: Shoulder, Elbow, Knee, Ankle, Inter-vertebral joints, Wrist joint
5. Definition, classification and function of muscles
6. Classification of Skeleton Muscles: Structural and functional

Unit: II (Cardiorespiratory and Endocrine System)

1. Definition of Cardiorespiratory System
2. Components of Cardiorespiratory System
3. Structure and function of Heart
4. Structure and function of Lungs
5. Definition of Endocrine and Exocrine Gland
6. Location and Function of Endocrine Glands
7. Effect of Pituitary, Thyroid and Adrenal Gland on health of bone and muscles

Unit: III (Bioenergetics for Exercise)

1. Aerobic and Anaerobic Glycolysis
2. Aerobic and Anaerobic System during Rest and Exercise
3. Exercise and Thermal Stress
4. Physiology of Aquatic Strength Training

Unit: IV (Neural Control of Exercise Muscle)

1. Function of Nerve, The Nerve Impulse
2. Nerve to Nerve Synapses, Neuromuscular Junction
3. Motor Unit, All or Non Law, Neuromuscular Fatigue
4. Muscles Spindles

Unit: V (Effect of Exercise on Different Systems of Human Body)

1. Effect of Exercise on Skeleton System
2. Effect of Exercise on Muscular System
3. Effect of Exercise on Cardiovascular System
4. Effect of Exercise on Respiratory System
5. Effect of Exercise on Endocrine System

References:

1. Exercise Physiology by J. Stregemann : Geroge Thieme Verlag, Stuttgart, NY
2. Human Physiological work capacity by Shephard : Cambridge Univ., Press, NY
3. Principles of Anatomy & Physiology : Harper Collins Publisher.
4. Sports Physiology by E.L Fox : W.B. Saunde5rs Co., Philadelphia
5. The Autonomic Nervous System & Exercise by J. Hillary Green : Ms. Chapman & Hall Ltd., London
6. Exercise Physiology by William D. McArdle, Frank L. Katch and Victor L. Katch
7. Exercise Physiology for Health, Fitness and Performance by Sharon A. Plowman and Denise L. Smith, Wolters Kluwer Publisher
8. Physiology of Sports and Exercise by W. Larry Kenney, Jack H. Wilmore and David L. Costill, Human Kinetics Publication

CSTC -CC: 102 Sports Training

Learning Outcome: Students will be able to understand the concept of sports training, they will be able to interpret the principles of training to prepare the training plan for beginners to elite players. Students will able to manage the training load of players according to their fitness level and long term training goal.

Unit: I

1. Sports training, definition aim and characteristics
2. Sports performance: Definition, model structure, factors, performance structure, performance capacity and training structure.
3. General principles of sports training
4. Means and methods of sports training.

Unit: II

Judgment of Load:

1. Training Load: Definition, Types of Load and Supercompensation
2. Principles of Load Adaptation
3. Over Load: Cause and Effect of Over Load
4. Judgment of Load

Unit: III

Concept of Motor Fitness

1. Strength: Components and Factors of Strength
2. Speed: Components and Factors of Speed
3. Endurance: Components and Factors of Endurance
4. Flexibility: Components and Factors of Flexibility
5. Coordinative Abilities: Components and Factors of Coordinative Abilities

Unit: IV

Planning and Periodization:

1. Periodization: Concept and Importance
2. Components of Periodization and Classification of Periodization
3. Training Session: Importance, types, structure, class organization and training session plan
4. Long term training process and its stages
5. Planning : definition principles of planning, formulation of a plan, planning of Micro, meso and macro cycles

Unit: V

Nutrition for Performance:

1. Balanced Diet and Mal Nutrition in respect to sports and fitness.
2. Nutritional factors that affect muscular endurance, hypertrophy, strength, and aerobic endurance.
3. Composition and timing of nutrient and fluid intake before, during, and after an exercise session or a sport event.
4. Ergogenic aids and dietary supplements and their effect (e.g., creatine, carbohydrate loading, caffeine)

References:

1. Beachle, T.R.: Earle, R.W.: Essentials of strength training and conditioning, NSCA Publication, 2000.
2. Bompa Tudor, O.: Theory and methodology of training: They key to athletic Performance, 1990.
3. Harre, D.: Principles of Sports Training. Sportsverlag, Berlin, 1988.
4. Kansal, D.K.: Test and measurement in sports and physical education, DVS Publication, New Delhi, 1996.
5. Matweyev, L.P.: Fundamentals of Sports training, Publication Moscow, 1984.
6. Michael Kent: The Oxford dictionary of sports sciences and medicine Oxford University Press, Inc., New York, 1994.
7. Scholisch, M.: Circuit Training, Sportvertag, Berlin, 1988
8. Singh, H.: Science of Sports Training. DVS Publication, New Delhi, 1991
9. Singh, H.: Sports Training: General Theory and methods, NIS, Patiala, 1984.

CSTC -CC: 103 Fitness and Conditioning

Learning Outcome: Students will be able understand the concept of Warm-up and will be able to utilize as according to requirement of different sports activity and according to individual requirement. They will be well prepared for designing fitness plan with proper blend of exercise and yogic practices.

Unit: I

Concept of Warm-up and Preparation of Warm-up Plan

1. Concept of Warm-up: Physical, Physiological and Psychological
2. General and Specific Warm-up (Targeted and Structured Warm-Ups)
3. Factors determining Warm-up Plan
4. Selection and inclusion of exercise and equipments for Warm-up session
5. Preparation of Individualized and Sports Specific Warm-up Plan
6. Warm-down: Physical and Physiological Concept and Importance of Warm-down to maintain the fitness

Unit: II

Concept of Fitness:

1. Meaning and Definition of Fitness
2. Classification of Fitness: General, Specific and Sports Specific
3. Factors Determining Fitness: Children's, Adult Male & Female.
4. Significance of Fitness for sports persons and non-sports
5. Fitness Assessment

Unit: III

Resistance Training:

1. Definition, Uses and Principles of Resistance training
2. Evaluation of Strength (Maximum, Explosive, Strength Endurance & Relative Strength)
3. Modalities of Resistance Training:
 - Own Body weight.
 - Partner Resistance.
 - Free Weight.
 - Cybex Machine
 - Medicine Ball.
 - Elastic TheraBand
 - Water & Environmental Resistance Training
 - Core Stability and Balance Training
 - Variable-Resistance Training
4. Training Frequency, Exercise Order, Training Load and Repetitions Rest Periods

Unit: IV

Program Design and Technique for Plyometric Training

1. Mechanics and Physiology of Plyometric Training
2. Mode of Plyometric Training: Lower Body Plyometrics, Upper Body Plyometrics, Trunk Plyometrics and Aquatic Plyometric
3. Plyometric and Other forms of Exercise: Plyometric Exercise and Resistance Training and Plyometric and Aerobic Exercise
4. Equipment and Facilities for Plyometric training

Unit: V

Recovery Modalities

1. Asanas, Pranayama and Meditation
2. Progressive Relaxation Technique, Autogenic Training and Biofeedback
3. Sleep and Sleep Deprivation
4. Hydration and Electrolyte Balance
5. Theory of Jacuzzi, Chilled Shower and their effects.
6. Theory of Steam Bath, Contrast Bath and their effects.
7. Theory of Sauna Bath and its effects.

References:

1. Bill Foran, High Performance Sports Conditioning.
2. Frank W. Dick, Sports Training Principles. 4th Edition, Friends Publication, 2006
3. G. Gregory Haff & N. Travis Triplett, Essentials of Strength Training and Conditioning. 4th Edition, Human Kinetics, 2016
4. Singh, H.: Science of Sports Training. DVS Publication, New Delhi, 1991
5. Beachle, T.R.: Earle, R.W.: Essentials of strength training and conditioning, NSCA Publication, 2000.

6. Susan Hollister. (2017). Yoga: The Top 100 Best Yoga Poses: Relieve Stress, Increase Flexibility, and Gain Strength,
7. Gregor Maehle. (2006). Ashtanga Yoga: Practice and Philosophy, Kaivalya Publications.

CSTC -CC: 104 Kinesiology and Sports Biomechanics

Learning Outcome: Students will be able to understand the interpretation of Kinesiological concept to understand the mechanics of fitness and how Kinesiological factors determine the fitness.

Unit: I

Foundations of Kinesiology

1. Definition, Importance in Human Motion Analysis
2. Anatomical Directions, Anatomical Plane and Axis
3. Terminology of Fundamental Movements
4. Posture: Meaning, Types and Factors affecting Posture
5. Importance of Good Posture

Unit: II

Kinesiology of Skeletal System:

1. Functions of Skeleton System
2. Bone Growth and Development
3. Bone Hypertrophy and Atrophy
4. Joints: Definition and function of joints, Classification and characteristics of joints
5. Articulation of Bones at different Joints: Shoulder joint, Elbow joint, Wrist joint, Hip joint, Knee joint and Ankle joint

Unit: III

Kinesiology of Skeletal Muscles:

1. Physiological Properties of Skeletal Muscles
2. Classification of Skeletal Muscles: Structural and Functional Classification
3. Types of Muscle Contraction, Muscle Size and its Effect on Force Production
4. Role of Muscles in Movement (e.g., agonist, antagonist, synergist, neutralizer, stabilizer)

Unit: IV

Basics of Biomechanics:

1. Definition and Implication of Biomechanics in Exercise
2. Fundamental of CG, LOG, Inertia, Weight, Mass & Momentum
3. Force - Meaning, Definition, Types and its Application to Physical Activities
4. Lever - Meaning, Definition, Types and Its Application to Human Body
5. Newton's Laws of Motion-Meaning, Definition and its Application to Physical Activities

References:

1. Bruce Abernethy, Vaughan Kippers, Stephanie Hanrahan, Marcus Pandy, Ali McManus, Laurel Mackinnon. Biophysical Foundations of Human Movement 3 Edition. 2013; Human Kinetics.
2. Bunn, J. W. (1972). Scientific Principles of Coaching. Englewood Cliffs, N.J.: Prentice Hall Inc.
3. Declan Connolly. Basic and Applied Sports Kinesiology. 2016; LWW
4. Hay, J. G. & Reid, J. G. (1982). The Anatomical and Mechanical Basis of Human Motion. Englewood Cliffs, N.J.: Prentice Hall Inc.

5. Hay, J. G. & Reid, J. G.(1988).Anatomy, Mechanics and Human Motion. Englewood Cliffs, N.J.: Prentice Hall Inc.
6. Hay, J. G. & Reid, J. G.(1988).Anatomy, Mechanics and Human Motion. Englewood Cliffs, N.J.: Prentice Hall Inc.
7. Hay, J. G. (1970).The Biomechanics of Sports Techniques. Englewood Cliffs, N.J.: Prentice Hall, Inc.
8. Peter Klavora. Foundations of Kinesiology Studying Human Movement and Health. 3rd Edition, 2007; Sport Books Publisher.
9. Susan J. Hall, Basic of Biomechanics. 4th Edition. 2004, McGraw Hill.
10. Terry Wood, Weimo Zhu. Measurement Theory and Practice in Kinesiology. 2006; Human Kinetics

Practical

CSTC -PC: 101: Human Anatomy, Exercise Physiology & Kinesiology

1. Preparation of Model of Different Organs.
2. Identification of Bones: Axial, Appendicular
3. Identification of Synovial Joints and Understanding Movements around synovial Joints
4. Locating Major Muscles in the body
5. Analysis of muscles involve in different sports movements.
6. Measurement of heart rate and blood pressure during and after exercise.
7. Heart rate response recording during sporting activities. (To be carried out as project and on sports persons). At least three different sports are to be covered by each student)
8. Body Temperature monitoring before, during and after exercise.
9. Preparation of flow chart for different endocrine glands of human body.
10. Determining standard fundamental and anatomical standing position.
11. Identification of muscular contraction during different sports activities.

CSTC -PC: 102: Sports Training & Fitness and Conditioning

1. Calculation of Training Load
2. Determining load intensity and volume
3. Graphical Presentation of Load adaptation principle
4. Analysis of fitness requirement in sports: Wrestling, Judo, Hockey, Football, Badminton
5. Measurement of glucose level and its interpretation
6. Measurement of Blood Pressure and its interpretation
7. Calculation of HR MAX and 70% HR max depending on protocol for Adult and Old age Persons
8. VO₂max testing
9. Calculation of Relative Strength

10. Identification and Familiarity with Equipments
11. Warm-up Drills:
 - High-Knees - 10 yards down and back
 - Heel-Ups – 10 yards down and back
 - Forward Lunge with Elbow to Instep – 10 yards
 - Side Lunge with Squat – 4 each side
 - High Knee Foreleg Extension – 10 yards down slow, 10 yards back quick
12. Technique Fundamentals and Spotting:
 - Handgrips for weight training
 - Grip Width for weight training
 - Stable Body and Limb Positioning
 - Breathing Considerations
 - Types of Exercises that Require Spotting
 - Spotting Overhead Exercises
 - Spotting Over-the-Face Exercises
 - Spotting Considerations for Power Exercises
13. Number of Spotters:
 - Communication between Athlete and Spotter
 - Amount and Timing of Spotting Assistance
14. Spotting Techniques:
 - Barbell Bench Press - Spotting Technique
 - Dumbbell Incline Bench Press - Spotting Technique
 - Barbell Standing Behind the Neck Shoulder Press Spotting Technique
 - Barbell Back Squat - Spotting Technique with One Spotter
 - Barbell Back Squat - Spotting Technique with Three Spotters
15. Plyometric Drills:
 - Drop Jump
 - Vertical Jump
 - Tuck Jump
 - Broad Jump with Vertical Jump
 - Depth Jump
 - Box Shuffle Step
 - Double Box Shuffle Step
 - Lateral Box Jump