

## Table of Content

Lesson One - Aerobic Training -----	p.1 – 3
Lesson Two - Weight Training-----	p.4 – 5
Lesson Three - Programme Development-----	p.6 – 8
Lesson Four - Course Assessment, Reminders and Bibliography	P.9
Appendix A - Estimation of One Repetition Maximum -----	P. 10-11
Appendix B - Table for Loading Selection Assignment -----	P.12

# Student Notes

## Lesson One

### **I. The general concept of Physical Fitness**

Physical Fitness is the ability to carry out daily tasks with vigor and alertness without undue fatigue and with ample energy to engage in leisure time pursuits and to meet the above average physical stresses encountered in emergency situations.

### **II. Components of Health Related Fitness**

2.1 Cardiorespiratory Endurance

It is the ability of heart, lung and circulatory system to supply O<sub>2</sub> and nutrients to working muscles efficiently.

2.2 Muscular Strength & Endurance

It refers to the ability of muscular system to perform work efficiently (such as maintaining good posture, low-back functions etc.)

2.3 Body Composition (relative leanness / fatness)

It views the body weight in terms of the absolute and relative amount of muscle and fat.

2.4 Flexibility

It is the ability to move a joint smoothly through its complete range of motion.

### **III. The Classification of Aerobic and Anaerobic Exercises**

Energy System	Aerobic	Anaerobic
Oxygen	Required	not required
Exercise Duration	more than 3 min.	less than few min.
Intensity	low	high

## IV. Program Development for Aerobic Training

### 4.1. Intensity

Method I : Max H.R. Formula

- a. For aerobic training, heart rate is a fairly reliable indicator of how hard the body is working.
- b. Determine the exercise intensity by monitoring the heart rate within the desirable Target Heart Rate Zone (THRZ).
- c. The Maximal Heart Rate Formula  

$$\text{Max. HR} = 220 - \text{Age}$$

$$\text{THRZ} = \text{Max HR} \times \% \text{ Intensity (60\% to 90\%)}$$
- d. Work out your THRZ  

$$\text{THRZ} = 220 - \underline{\hspace{2cm}} (\text{age}) \times (60\% \text{ to } 90\%)$$

Method II : Rating of Perceived Exertion (RPE)

It is to use “Sense of difficulty” to guide your exertion level during the exercise, you may adjust your own pace if your feeling too far away from the estimated range. To improve the cardio-respiratory fitness, the most effective and safe intensity is ranging from 4 to 7.

0	0.5	1	2	3	4	5	6	7	8	9	10	•
Nothing at all	Very, very weak	Very weak	Weak	Moderate	Some what strong	Strong	Very strong				Very strong	Maximal

Source from: Borg, G. 1982 *Psychological Bases of Perceived Exertion Modified Scale*, (*Medicine in Science & Exercise*).

### 4.2 Duration & Frequency

Keep exercising at the THRZ or training zone for at least 15 minutes, preferably a program of 30 - 60 minutes, 2-4 sessions per week on alternate day.

### 4.3 Type of Aerobic Exercises

Any type of activity that requires large muscle groups and to perform at moderate intensity with long duration exercise. e.g. jogging, brisk walking, distance swimming, cycling, aerobic dance, rope skipping and various game activities. The best exercise is the one you enjoy most.

Note : Popular games as tennis, badminton, squash, basketball are fine for maintaining fitness, but they may not allow you to maintain your heart rate in the training zone. You should be fit before you compete in these strenuous sports.

### 4.4 Advantages & Disadvantages of Jogging / Running

#### 4.4.1. Advantages

Jogging / Running costs little ( the only equipment it requires is a pair of running shoes and simple clothing), it has flexibility of time, year round availability and a relatively high level of benefit in return for time and effort.

#### 4.4.2 Disadvantages

Because the feet and legs are subjected to repetitive pounding on the running surface, overuse injuries are very likely to occur. Most of these injuries involve the muscles, tendons, ligaments, and occasionally bones of the lower extremity.

Note : Proper running and training techniques, and properly fitted running shoes can reduce the injuries.

### 4.5 The Jog-Walk-Jog Program

STEP	JOG	WALK	LOAD	DISTANCE JOGGED
1	30 sec	30 sec	8 to 12 sets	1/2 to 3/4 mile
2	1 min	30 sec	6 to 12 sets	3/4 to 1 1/2 miles
3	2 min	30 sec	6 to 10 sets	1 1/2 to 2 1/2 miles
4	4 min	1 min	4 to 6 sets	2 to 3 miles
5	8 min	2 min	2 to 4 sets	2 to 4 miles
6	12 min	2 to 3 min	2 sets	3 miles or more
7	continuous jogging for 20 to 30 min		cool down by walking	2 to 4 miles

## V. Use of Aerobic Training Machines

(Practical)

## Lesson Two

### I. Muscular Fitness

#### 1.1 Training Principles for Weight / Resistance Training

##### 1.1.1 Weight Selection

Training with heavier resistance builds strength whereas using lighter or moderate resistance with more repetitions are better for toning and endurance training.

##### 1.1.2 Progressive Overload

Gradually increase in resistance and slightly more than it is accustomed.

##### 1.1.3 Full Range of Motion (ROM)

Perform full range of motion from starting position to a safe ending position is recommended. Restriction of range of motion for a prolonged period of time can result in a shortening of the muscle and permanent restriction of specific movement.

##### 1.1.4 Breathing

Exhale while exerting or lifting weight, inhale while lowering weight down.

##### 1.1.5 Balance Musculature

Muscle groups of flexion and extension in the specific part are suggested to be trained equally. e.g. sit-up (abdominal flexion) & back-arch (hyper-extension).

##### 1.1.6 Reversibility

Training should be continuous, otherwise detraining occurs. (Use - Disuse Principle)

## **II. Types of Resistance Training Exercises**

- 2.1 Body Weight Exercises  
These utilize body weight as resistance, low cost and easy access, but lack of progressive resistance.
- 2.2 Machine Exercises  
Weights are already arranged in a stack. Desired weight can be selected by insertion of fixing pin.
- 2.3 Free-weight Exercises
  - a Dumbbells : are smaller, designed to be held in one hand, and exercises are usually done in pairs.
  - b Barbells : are longer versions of dumbbells, with a long bar to allow both hands to grip and weights added at both ends.
  - c E-Z Curl Bar & Tricep Bar : provide angled gripping to allow the muscles to be worked at different angles.

## **III. Safety Guidelines for Using Free-weights**

- 3.1 Secure collars of both ends of the bar before exercising.
- 3.2 Beginners are strongly advised to use light weights to master all techniques.
- 3.3 To work in pairs, (with partner spotting) when lifting at heavy weights.
- 3.4 Do not drop the weights to the floor after lifting.
- 3.5 All equipment must be returned to their appropriate places after use.

## **IV. Use of Weight Training Machines and Free Weight.**

**(Practical)**

## Lesson Three

### **I. The Three Phases of Exercises**

#### 1.1 Warm up Phase :

- 1.1.1 It is beneficial to joints and muscles and helps to prevent injuries and muscle soreness.
- 1.1.2 It includes static stretching ( holding a steady stretch with the desired muscles at their greatest possible length ) and limbering exercises to prepare the musculotendinous system.
- 1.1.3 Activities should include large muscle movements to gradually raise the cardiorespiratory mechanism to an intermediate level.

#### 1.2 Conditioning Phase :

- 1.2.1 To determine the training objective of the entire session, the workout should be emphasized on training of muscular fitness or aerobic / cardiovascular fitness.
- 1.2.2 When developing an exercise program, 3 basic variables should be considered :
  - a. Intensity (how hard to exercise)
  - b. Duration (how long to exercise)
  - c. Frequency (how often to exercise)

#### 1.3 Cool-down Phase :

- 1.3.1 Stopping exercise abruptly after a vigorous workout may trap a large quantity of blood in the muscles or lower parts of the body. As a result, an insufficient amount of blood circulates back to the brain or heart which may cause dizziness or faintness.
- 1.3.2 A gradual cool-down usually aids in the removal of accumulated metabolic wastes and may prevent cardiac arrhythmias following strenuous exercise.
- 1.3.3 When heart rates are near resting levels, stretching and limbering exercises may reduce the developing of delayed muscle soreness.

## II. Training Intensity for Weight / Resistance Training

### 2.1 Repetition Maximum (RM)

2.1.1 Repetition Maximum (RM) refers to the maximum number of repetitions that can be performed with a load. For example an individual can lift 10 times of a certain exercise with 100 lb loading, he is said to have a 10 RM of 100 lb.

2.1.2 One Repetition Maximum (1 RM) refers to an individual's ability to exert maximum force during a single effort, sometimes referred to the term of "strength".

### 2.1.3 Estimation of 1 RM

2.1.3.1 Use of 10 RM estimation table (Appendix A)

2.1.3.2 On-line calculation at ExRx.net

<http://www.exrx.net/Calculators/OneRepMax.html>

### 2.2 Determination of RM

Training Goal	Relative Loading	Repetition Range	No. of Sets	Rest between Sets
Muscular Endurance	Light (50% -60% of 1RM)	12-20 RM	2-3	15 -30 s
General Conditioning	Moderate (60% -70% of 1 RM)	8-12 RM	2-3	30 - 90 s
Muscular Strength	Heavy (70% - 90% of 1 RM)	4-8 RM	3+	2 - 5 min

### 2.3 Loading adjustment

		Reps completed with trial load									
		>18	16-17	14-15	12-13	10-11	8-9	6-7	4-5	2-3	<2
Goal reps	14-15	+10	+5		-5	-10	-15	-15	-20	-25	-30
	12-13	+15	+10	+5		-5	-10	-15	-15	-20	-25
	10-11	+15	+15	+10	+5		-5	-10	-15	-15	-20
	8-9	+20	+15	+15	+10	+5		-5	-10	-15	-15
	6-7	+25	+20	+15	+15	+10	+5		-5	-10	-15
	4-5	+30	+25	+20	+15	+15	+10	+5		-5	-10
	2-3	+35	+30	+25	+20	+15	+15	+10	+5		-5
Poundage increase (+) or decrease (-)											

Source from : T R Baechle, R W Earle, 1995. P. 121, *Fitness weight training, Human Kinetics.*

e.g . An individual wants to complete 10 reps (Goal reps) with 100 lb, but he/she is able to perform 15 reps, his/her goal reps of 10 can be reached by intersecting the column 14 to 15 at +10 lb, then the adjusted load should be 110 lb for 10 reps.

### 2.4 Duration & Frequency

For general conditioning, preferably 20-40 minutes per workout, 3 times per week on alternate day.



### **III Circuit Training**

#### 3.1 Definition of Circuit Training

3.1.1 Circuit Training employs a series of exercise stations that consist of various combinations of weight training, flexibility, calisthenics and brief aerobic exercises.

3.1.2 Circuits may be designed to accomplish many different training goals.

3.1.3 The series of resistance training exercise are performed one after the other with minimal rest (15 - 30 seconds) between exercise. Approximately 10 to 15 repetitions of each exercise per circuit at a resistance of 40% to 60% of a 1RM.

3.1.4 A typical circuit may consist of 8 to 12 stations and the entire circuit program is preferable to be repeated 2-3 times.

#### 3.2 Benefits of Circuit Program

Circuit Training is an effective way for improving strength and flexibility. If the pace or the time interval between stations is rapid and if workload is maintained at a high level of intensity, the cardiorespiratory system will certainly be benefited from the circuit.

#### 3.3 Example of Circuit Program

- Station 1 Treadmill running / jogging
- Station 2 Stretching : Hamstring & low back
- Station 3 Bench press (10 reps at 50% of 1RM)
- Station 4 Back arch (15 reps)
- Station 5 Leg press (20 reps at 60% of 1RM)
- Station 6 Bike (5 mins at 60% of THR)
- Station 7 Lat. pull down (10 reps at 50% of 1RM)
- Station 8 Abdominal Curl-up (20 reps)
- Station 9 Leg Curl (10 reps at 50% of 1RM)
- Station 10 Butterfly chest (10 reps at 50% of 1RM)

There should be a maximum of 60 seconds to complete each weight training station with minimal interval rest (15 - 30 seconds), and the entire circuit should be repeated 2-3 times in succession.

#### 3.4 Circuit Program Practice

### **VI (Practical)**

## Lesson Four

### I. Course Assessment

### II. Reminder for using the Fitness Room

- 2.1 The Fitness Room User Card
- 2.2 Proper attire
- 2.3 Handling of equipment
- 2.4 Be considerate to other users

- End -

### Bibliography

*Getchell & Bud, 1976. Physical Fitness : A Way of Life, John Wiley & Sons, Inc., United State*

*Howley ET & Franks B D, 1986. Health / Fitness Instructor's Handbook, Human Kinetics, United State.*

*Katch McArdle, 1988. Nutrition, Weight Control, and Exercise, Lea & Febiger, United State.*

*Sharley B J, 1984. Physiology of Fitness, Human Kinetics Publishers, United State.*

*T R Baechle, R W Earle, 1995. Fitness weight training, Human Kinetics.*

*William E P, 1991. Fitness for College and Life, Mosby-Year Book, Inc., United State.*

*Thomas R. Baechle, 1994. Essentials of Strength Training as Conditioning, Human Kinetics*

*ExRx.net is a recommended resource in ACSM's Resource Manual for Guidelines for Exercise Testing and Prescription, 5th ed. (pgs 224, 349). ExRx.net is also a NSCA authorized CEU provider. ExRx.net (Exercise Prescription on the Net) is a free resource for the exercise professional, coach, or fitness enthusiast featuring comprehensive exercise libraries, fitness assessment calculators, and reference articles.*

## Appendix A1

Estimation of One-Repetition Maximum  
(Table 1 : 5~200 lb)

% of IRM:	100.0	93.5	91.0	88.5	86.0	83.5	81.0	78.5	76.0	73.5
Repetitions :	1	2	3	4	5	6	7	8	9	10
Weight lifted (lb):	5.0	4.7	4.5	4.4	4.3	4.2	4.1	3.9	3.8	3.7
	10.0	9.4	9.1	8.9	8.6	8.4	8.2	7.9	7.6	7.4
	15.0	14.0	13.7	13.3	12.9	12.5	12.2	11.8	11.4	11.0
	20.0	18.7	18.2	17.7	17.2	16.7	16.2	15.7	15.2	14.7
	25.0	23.4	22.8	22.1	21.5	20.9	20.2	19.6	19.0	18.4
	30.0	28.1	27.3	26.6	25.8	25.1	24.3	23.6	22.8	22.1
	35.0	32.7	31.9	31.0	30.1	29.2	28.4	27.5	26.6	25.7
	40.0	37.4	36.4	35.4	34.4	33.4	32.4	31.4	30.4	29.4
	45.0	42.1	41.0	39.8	38.7	37.6	36.5	35.3	34.2	33.1
	50.0	46.8	45.5	44.3	43.0	41.8	40.5	39.3	38.0	36.8
	55.0	51.4	50.1	48.7	47.3	45.9	44.6	43.2	41.8	40.4
	60.0	56.1	54.6	53.1	51.6	50.1	48.6	47.1	45.6	44.1
	65.0	60.8	59.2	57.5	55.9	54.3	52.7	51.0	49.4	47.8
	70.0	65.5	63.7	62.0	60.2	58.5	56.7	55.0	53.2	51.5
	75.0	70.1	68.3	66.4	64.5	62.6	60.8	58.9	57.0	55.1
	80.0	74.8	72.8	70.8	68.8	66.8	64.8	62.8	60.8	58.8
	85.0	79.5	77.4	75.2	73.1	71.0	68.9	66.7	64.6	62.5
	90.0	84.2	81.9	79.7	77.4	75.2	72.9	70.7	68.4	66.2
	95.0	88.8	86.5	84.1	81.7	79.3	77.0	74.6	72.2	69.8
	100.0	93.5	91.0	88.5	86.0	83.5	81.0	78.5	76.0	73.5
	105.0	98.2	95.6	92.9	90.3	87.7	85.1	82.4	79.8	77.2
	110.0	102.9	100.1	97.4	94.6	91.9	89.1	86.4	83.6	80.9
	115.0	107.5	104.7	101.8	98.9	96.0	93.2	90.3	87.4	84.5
	120.0	112.2	109.2	106.2	103.2	100.2	97.2	94.2	91.2	88.2
	125.0	116.9	113.8	110.6	107.5	104.4	101.3	98.1	95.0	91.9
	130.0	121.6	118.3	115.1	111.8	108.6	105.3	102.1	98.8	95.6
	135.0	126.2	122.9	119.5	116.1	112.7	109.4	106.0	102.6	99.2
	140.0	130.9	127.4	123.9	120.4	116.9	113.4	109.9	106.4	102.9
	145.0	135.6	132.0	128.3	124.7	121.1	117.5	113.8	110.2	106.6
	150.0	140.3	136.5	132.8	129.0	125.3	121.5	117.8	114.0	110.3
	155.0	144.9	141.1	137.2	133.3	129.4	125.6	121.7	117.8	113.9
	160.0	149.6	145.6	141.6	137.6	133.6	129.6	125.6	121.6	117.6
	165.0	154.3	150.2	146.0	141.9	137.8	133.7	129.5	125.4	121.3
	170.0	159.0	154.7	150.5	146.2	142.0	137.7	133.5	129.2	125.0
	175.0	163.6	159.3	154.9	150.5	146.1	141.8	137.4	133.0	128.6
	180.0	168.3	163.8	159.3	154.8	150.3	145.8	141.3	136.8	132.3
	185.0	173.0	168.4	163.7	159.1	154.5	149.9	145.2	140.6	136.0
	190.0	177.7	172.9	168.2	163.4	158.7	153.9	149.2	144.4	139.7
	195.0	182.3	177.5	172.6	167.7	162.8	158.0	153.1	148.2	143.3
	200.0	187.0	182.0	177.0	172.0	167.0	162.0	157.0	152.0	147.0

Method : To estimate IRM from a 10 RM test-measured value, then refer to the table and find the weight on the same line to obtain your estimated IRM

Resource : Thomas R. Baechle, 1994. Essentials of Strength Training as Conditioning, Human Kinetics

## Appendix A2

Estimation of One-Repetition Maximum  
(Table 2 : 205~400 lb)

% of IRM:	100.0	93.5	91.0	88.5	86.0	83.5	81.0	78.5	76.0	73.5
Repetitions :	1	2	3	4	5	6	7	8	9	10
Weight lifted (lb):	205.0	191.7	186.6	181.4	176.3	171.2	166.1	160.9	155.8	150.7
	210.0	196.4	191.1	185.9	180.6	175.4	170.1	164.9	159.6	154.4
	215.0	201.0	195.7	190.3	184.9	179.5	174.2	168.8	163.4	158.0
	220.0	205.7	200.2	194.7	189.2	183.7	178.2	182.7	167.2	161.7
	225.0	210.4	204.8	199.1	193.5	187.9	182.3	176.6	171.0	165.4
	230.0	215.1	209.3	203.6	197.8	192.1	186.3	180.6	174.8	169.1
	235.0	219.7	213.9	208.0	202.1	196.2	190.4	184.5	178.6	172.7
	240.0	224.4	218.4	212.4	206.4	200.4	194.4	188.4	182.4	176.4
	245.0	229.1	223.0	216.8	210.7	204.6	198.5	192.3	186.2	180.1
	250.0	233.8	227.5	221.3	215.0	208.8	202.5	196.3	190.0	183.8
	255.0	238.4	232.1	225.7	219.3	212.9	206.6	200.2	193.8	187.4
	260.0	243.1	236.6	230.1	223.6	217.1	210.6	204.1	197.6	191.2
	265.0	247.8	241.2	234.5	227.9	221.3	214.7	208.1	201.4	194.8
	270.0	252.5	245.7	239.0	232.2	225.5	218.7	212.0	205.2	198.5
	275.0	257.1	250.3	243.4	236.5	229.6	222.8	215.9	209.0	202.1
	280.0	261.8	254.8	247.8	240.8	233.8	226.8	219.8	212.8	205.8
	285.0	266.5	259.4	252.2	245.1	238.0	230.9	223.7	216.6	209.5
	290.0	271.2	263.9	256.7	249.4	242.5	234.9	227.7	220.4	213.2
	295.0	275.9	268.5	261.1	253.7	246.3	239.0	231.6	224.2	216.8
	300.0	280.5	273.0	265.5	258.0	250.5	243.0	235.5	228.0	220.5
	305.0	285.2	277.6	269.9	262.3	254.7	247.1	239.4	231.8	224.2
	310.0	289.9	282.1	274.4	266.6	258.9	251.1	243.4	235.6	227.9
	315.0	294.5	286.7	278.8	270.9	263.0	255.2	247.3	239.4	231.5
	320.0	299.2	291.2	283.2	275.2	267.2	259.2	251.2	243.2	235.2
	325.0	303.9	295.8	287.6	279.5	271.4	263.3	255.1	247.0	238.9
	330.0	308.6	300.3	292.1	283.8	275.9	267.3	259.1	250.8	242.6
	335.0	313.2	304.9	296.5	288.1	279.7	271.4	263.0	254.6	246.2
	340.0	317.9	309.4	300.9	292.4	283.9	275.4	266.9	258.4	249.9
	345.0	322.6	314.0	305.3	296.7	288.1	279.5	270.8	262.2	253.6
	350.0	327.3	318.5	309.8	301.0	292.3	283.6	274.8	266.0	257.3
	355.0	331.9	323.1	314.2	305.3	296.4	287.6	278.7	269.8	260.9
	360.0	336.6	327.6	318.6	309.6	300.6	291.6	282.6	273.6	264.6
	365.0	341.3	332.2	323.0	313.9	304.8	295.7	286.5	277.4	268.3
	370.0	346.0	336.7	327.5	318.2	309.0	299.7	290.5	281.2	272.0
	375.0	350.6	341.3	331.9	322.5	313.1	303.8	294.4	285.0	275.6
	380.0	355.3	345.8	336.3	326.8	317.3	307.8	298.3	288.8	279.3
	385.0	360.0	350.4	340.7	331.3	321.5	311.9	302.2	292.6	283.0
	390.0	364.7	354.9	345.2	335.4	325.7	315.9	306.2	296.4	286.7
	395.0	369.3	359.5	349.6	339.7	329.8	320.0	310.1	300.2	290.3
	400.0	374.0	364.0	354.0	344.0	334.0	324.0	314.0	304.0	294.0

Method : To estimate IRM from a 10 RM test-measured value, then refer to the table and find the weight on the same line to obtain your estimated IRM

Resource : Thomas R. Baechle, 1994. Essentials of Strength Training as Conditioning, Human Kinetics

