TAMILNADU PHYSICAL EDUCATION AND SPORTS UNIVERSITY

DEPARTMENT OF YOGA

NAME OF THE THE PROGRAMME: M.SC YOGA

PROGRAMME CODE: 3

1.2.1 LIST OF NEW COURSES INTRODUCED DIURING THE YEAR

TAMILNADU PHYSICAL EDUCATION AND SPORTS UNIVERSITY

SCHEME OF EXAMINATION & SYLLABUS

OF

Master of Science (Yoga)

MSC (Yoga)

UNDER

FACULTY OF YOGA

w.e.f. Session 2023-24

23PB1CT403 – KUNDALINI YOGA

PROGRAM OBJECTIVES:

- To know the Aim and Objectives of Kundalini Yoga.
- To know about the special features of Kundalini Yoga
- To understand the concept of Awakening of Kundalini.
- To obtain the detailed knowledge about Chakras and Nadis.
- To know the benefits of Kundalini Yoga and its Relationship with other yoga.

UNIT - I

Introduction to Kundalini –textual references of Kundalini - Kundalini Physiology – kundalini and the Brain – Methods of Awakening- Diet for Kundalini awakening – Risks and Precautions.

UNIT - II

Four forms of Awakening – Descent of Kundalini – the experience of Kundalini – the path of Kriya Yoga.

UNIT - III

Introduction to Chakras: Ajna, Mooladhara, Swadhisthana, Manipura, Anahata, and Vishuddhi chakras – Bindu Visarga – Sahasrara and Samadhi.

UNIT - IV

Kundalini Yoga Practice: rules and preparations – posture – chakra sadhana – the kriya yoga practices.

UNIT - V

Kundalini Research: kundalini, Fact not Fiction – defining Nadis – evidence for the existing Nadis and Chakras –Neurophysiology of the Chakras.

Course Outcomes:

On successful completion of the course,

CO 1	Student can understand the Aim and Objectives of Kundalini Yoga.
CO 2	They can acquire the knowledge about the special features of Kundalini Yoga.

CO 3	They will obtain the knowledge about concept of awakening of Kundalini.
CO 4	They can get the detailed knowledge about Chakras and Nadis
CO 5	They can know the benefits of Kundalini Yoga and its Relationship with other yoga

Mapping With Programme Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	**S**	**L**	**M**	**S**	**M**
CO2	**S**	**M**	**L**	**S**	**M**
CO3	**S**	**M**	**M**	**S**	**S**
CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**M**	**S**	**S**

***S-Strong3;M-Medium2;L-Low1**

23PB1SE401 – ADVANCED YOGA TECHNICS

Program Objectives:

- To know about the Essential of Yoga Practices
- To know about the Loosening Exercise
- To understand the Basics of Asanas.
- To know about the Pranayama & Kriyas.
- To know about the concept of Bandas, Mudras and Relaxation Techniques.

UNIT – I:

Pawanmuktasana Series – III (Shakti Bandha Asanas): 1) Rajju Karshanasana 2) Gatyatmak Meru Vakrasana 3) Chakki Chalanasana 4) Nauka Sanchalanasana 5)

Kashthatakshanasana 6) Namaskarasana 7) Vayunishkasana 8) Kawa Chalasana 9) Udharakarshanasana

UNIT – II:

Surya namaskar: Advanced Surya Namaskar

Advanced Chandra Namaskar

UNIT – III:

Asanas: Brahmacharyasana, Moolabandhasana, Gorakshasana, Asta Vakrasana, Uthan Eka pada Shirshasana, Dwi pada Kandharasana, Parighasana, Padma Parvatasana, Kasyapasana, Vishwamitrasana.

UNIT – IV:

Pranayama: Moorcha, Plavini, Sahita Kumbhaka, Kevala Kumbhaka

Kriyas: Vastra Dhuti, Kapalbahti – Vatakrama, Sheetkrama, Vyutkrama, Lagoo Shankaprakshalana, Netra Shankaprakshalana, Nauli – Vamana, Dhakshina, Madyama.

UNIT – V:

Cyclic Meditation, Yoga Nidra, Mind Sound Resonance Technique, Pranic Energisation Technique.

Program Outcomes:

- Student can get the basic knowledge about Essential of Yogic Practices.
- They will get the full idea about the Asanas.
- Student can get full knowledge about Pranayama and Kriyas.
- They can get full knowledge about Mudras and Bandhas
- Finally, the student will get full theoritical Knowledge about Relaxation Technique.

References:

1. Iyengar B. K. S (1976) Light on yoga, London, Unwin paper packs.
2. Sivananda Saraswathi swami (1934) Yoga Asanas Madras: My magazine of India.
3. Satyendra Saraswathi swami (2008) Asana, Pranayama, Mudra, Bandha, Munger:

Yoga publications trust.
4. Iyengar B.K.S (2008) Light on pranayama, New Delhi: Haper Collins publishers India.
5. Vishnu Devananda Swami (1972) The complete Illustrated book of yoga, New York Pocket Books.
6. Chandrasekaran K (1999) sound health through yoga Sevdvfdapatti: Prem Kalyan Publications.
7. Yogeshwaranand saraswathi swami (1975) First steps to higher yoga, Gangothari: Yoga niketan trust.
8. Coulter, H David (2001) Anatomy and Hatha yoga, USA:Body and Breath Inc.
9. Kirk Martin (2006) Hatha Yoga Illustrated Champaign: Humenkinetics.
10. Gharote (2004) Applied yoga, Lonvla: Kaivalyadhama.
11. Kathy Lee Kapppmeier and Diane M. Ambrosini (2006) Instructing Hatha Yoga, Champaign: Human Kinetics.

23PC1AE301 - LIFE SKILLS MANAGEMENT

Unit I:

Introduction: Soft Skills - Concepts and Definition- Need and importance of Soft Skills – Developing Soft Skills – Implications on Youth Development.

Unit II:

Behavioral Skills: Attitude, Lateral Thinking, Emotional Intelligence, Leadership, Team Building and Interpersonal Skills.

Unit III:

Social Skills and Negotiation Skills: Self Awareness and Empath, Influencing, - Effective Communication –Oral Presentation Skills – Interviewing – Delegating.

Unit IV: Thinking Skills: Critical Thinking and Creative Thinking – Problem Solving and Decision Making skills.

Unit V:

Coping Skills: Coping with stress and Emotions – Conflict Resolution – Negotiating - Time and Stress Management Skills. Reference Books 1. G. Ravindran, S P Benjamin, Elango

and R. Arokiam (2007) - Success through Soft Skills, ICT 2. Kamin M (2013) Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. ISBN: 978-1-118-10037-0

Course Outcomes

On successful completion of the course,

CO 1	Student can Understand the basic concepts, Need and importance of Soft Skills
CO 2	Understand the essential of Behavioral Skills
CO 3	Application of Various Social Skills and Negotiation Skills training.
CO 4	Analyse the Thinking Skills
CO 5	Understand acquire deep insight into Coping with stress and Emotions.

Mapping With Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**L**	**M**	**S**	**M**
CO2	**S**	**M**	**L**	**S**	**M**
CO3	**S**	**M**	**M**	**S**	**S**
CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**M**	**S**	**S**

***S-Strong3; M-Medium2; L-Low1**

23PB1CE003 – BASIC RELEVANT OF YOGIC SCIENCE – I

Program Objective (PO):

- To develop the ability of reading and understanding of classical texts of yoga in the original language.
- To study about basics of Sanskrit.
- To study about the root words in sanskrit
- To get the knowledge of different schools of yoga.
- To study about BhagavatGita.

UNIT - I

Basic Sanskrit – I: Orthography of Devanagari Varnamala, classification of varnas, Purnakshara, Samyuktakshara, Karakas and Mrduvyanjanas, writing of Varnamala using Roman transliteration - Sanskrit words – classification of Sanskrit words, Subantas - AjanthaandHalanta words, Genders, Vachanas, cases of subanta words.

UNIT - II

Declaration -of the following words in cases – Rama, Hari, Guru,Lata, Mati, Dhenu, Phala, Vari, Gau,Asmad, Yushmad, Tad, Kim.Kriyapada in Sanskrit – Classification, Lakaras, Purushas, Vachanas. Declaration of the following root words in Lat, Lan, Lrt, Lot and Vidhi Lin –Bhu, Khad, Vad, Dhyai, Path, Sev, Kshi, Pracch, Tus, Kath, Chint, Kr.

UNIT - III

Basic Sanskrit – II: Avyayas in Sanskrit – Ca, Api, Va, Na, Vina, Saha, Tu, Kintu, Eva, Evam, Iti, Ittham, Athra, Iha, Tada, Gatva, Krtva, Labdhwa, Jitva.Upasargas – Pra, Para, Apa, Sam, Anu, Ava, Nis, Nir, Dus, Dur, Vi, Aa, Ni, Adhi, Api, Ati, Su, Abhi, Prati, Pari, Upa, Antar, Avir, Tiras.Sandhis –Savarnadhirgha, Vrddhi, Guna, Ayadhi, Stutva, SchutvaNipatas-Cha, Va, Api, Kim, Chiat, Ma Chana, Sma.Elementary knowledge of voices in Sanskrit – Active, Passive, Impersonal. Compound words – Tatpurusha, Karmadharaya, Dvigu, Dvandva, Bhahuvrihi, Avyayibhava, Karakas – its use in Sanskrit.

UNIT - IV

Study of the following chapters of Bhagavad-Gita: Sankhya yoga according to Bhagavad-GitaChapterII - Karma yoga according to Bhagavad-Gita Chapter II - Karma yoga according to Bhagavad-Gita Chapter VI - Dhyana yoga according to Bhagavad-Gita Chapter VI.

UNIT - V

Schools of Yoga: Rajayoga, Hathayoga, Jnanayoga, Karmayoga, Mantra yoga, Bhaktiyoga.

Reference Books:

1. Anantarama Sastri, Shabda Manjari, R.S. Vadhyar & Sons, Palghat -678003.

2. L. Anantarama Sastri, Dhatu Manjari, R.S. Vadhyar & Sons, Palghat -678003.

3. Appayyadikshitha, LaghusiddhantaKaumudi, Chaukamba Oriental Series, Varanasi 221001

4. Omananda Tirtha, Patanjala Yoga Pradeepa, Geeta Press, Gorakhpur.273005.

5. H. Kumar Kaul (1994), Aspects of Yoga, B.R. Publishing Corporation, Delhi 700014.

6. Swami Atmananda (1966), The Four Yogas, BharatiyaVidyaBhawan, Bombay400007

7. Swami Digambaraji (1970), Hathayoga Pradipika of Swatmarama, Kaivalyadhama, Lonavala, Pune - 410403.

8. Swami Niranjanananda (1997), Hathayogapradipika, Bihar School of Yoga-811201

9. Swami Niranjanananda (1997), Gheranda Samhita, Bihar School of Yoga-811201

10. Swami Digambarji (1997), Gheranda Samhita, Kaivalyadhama, Lonavala-410403

11. Swami Muktibodhananda (1999), Swara Yoga, Yoga Publications Trust, Munger, Bihar, India-811201

12. T. Krishnamacharya, T.K.V. Deshikachar (1998) Nathamuni's Yoga Rahasya, Krishnamacharya Yoga Mandiram, Chennai-600028.

13. Naikar Chandramauli S. (1997), Ghata Yoga Medha Publisher, Dharwad.

14. Vijayalakshmi M. Ed (2003), Gheranda Samhita, Shivalik Prakashan, Delhi.

15. Swami Vivekanda (1998), Four Yogas; Rama Krishna Ashrama Publication, Dehi Entally Road, Kolkata –700014.

Course Outcomes:

On successful completion of the course,

CO 1	Student can get the knowledge of the basics of Sanskrit
CO 2	They can understand the classical texts of yoga.
CO 3	They can acquire the knowledge about root words in Sanskrit.
CO 4	They can get the knowledge of yogic concepts in Bhagavad-Gita.
CO 5	They can obtain the knowledge of different schools of yoga.

Mapping With Programme Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	**S**	**L**	**M**	**S**	**M**
CO2	**S**	**M**	**L**	**S**	**M**
CO3	**S**	**M**	**M**	**S**	**S**
CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**M**	**S**	**S**

*Strong3; M-Medium2; L-Low1

23PB1CE005 - BIOMECHANICS AND KINESIOLOGY

Program Objectives:

- Helping learners to realize biomechanics importance to yoga practice;
- To learn general biomechanics concepts and principles that influence human movement;
- Illustrate the use of these general biomechanical concepts in the professional skill for the diagnosis of the movement during yoga practices.

UNIT - 1: Introduction to Kinesiology and the principles of Biomechanics in Yoga

Meaning and Definition of Kinesiology ; Basic Biomechanical terms – velocity; acceleration; angular velocity; angular acceleration; Mass; Pressure; Gravity; Friction; work; Power; Energy; Torque; Bio mechanics: Description of movement of the human body; Kinematics, Kinetics; Kinetics – the forces producing motion e.g. muscles, gravity; Kinematics – the description of motion e.g. type, location, direction, planes of movement; Type of displacement (movement); Location in space; Direction of movement; Magnitude of movement; Rate of movement; Importance of Kinesiology and Biomechanics for Yoga

UNIT - 2: Fundamental Concept

Fundamental concepts of following terms – Axes and Planes, Centre of Gravity, Equilibrium, Line of Gravity; Fundamental movements at various joints; Fundamental concepts of the following terms – Angle of Pull, All or None Law, Reciprocal Innervations and inhibition; Stretch and postural reflex during the practice of Yoga postures; Force – Meaning, definition, types and its application to various Yoga postures; Lever – Meaning, definition, types and its application to human body; Newton's Laws of Motion – Meaning, definition and its application to Yoga activities.

UNIT - 3: Biomechanics of Hip and spine

Biomechanics of Hip Structure & function of the bones & non contractile element of the Hip, mechanics & patho-mechanics of muscle activity at the hip & analysis of the forces on the Hip during various Yoga postures; Biomechanics of Spine:

Structure & function of the bones & joints of the cervical spine, mechanics & patho-mechanics of the cervical musculature, analysis of the forces on the cervical spine during activity, structure & function of the bones & joints of the thoracic spine.

UNIT - 4: Biomechanics of the musculature

Mechanics of the thoracic musculature, analysis of the forces on the thoracic spine during Yoga Postures & structure & function of the bones & joints of the lumbar spine. c. Mechanics of the lumbar musculature, analysis of the forces on the lumbar spine during Yoga postures, structure & function of the bones & joints of the pelvis, mechanics of the muscle activity in the pelvis & analysis of the forces on the pelvis during activity**.**

UNIT - 5: Biomechanics of Shoulder, elbow and wrist

Biomechanics of Shoulder: Structure & function of the bones & joints of the Shoulder complex, mechanics & patho-mechanics of the muscle activity in the Shoulder complex & analysis of the forces on the Shoulder complex during Yoga postures; Biomechanics of Elbow: Structure & function of the bones & no contractile element of the elbow, mechanics of muscle activity at the elbow & analysis of the forces on the elbow during Yoga postures; Biomechanics of Wrist & Hand Structure & function of the bones & joints of the wrist & hand, mechanics of the muscle activity in the wrist & hand, analysis of the forces on the wrist during activity, mechanics of the Special connective tissue in the hand

Text Books:

1. Hay, J.G. and Reid, J.G.: Anatomy, mechanics and human motion. Englewood Cliffs, N.J.: prentice Hall Inc. 1988.
2. Knudson, D.: Fundamentals of biomechanics. New York, NY: Springer, 2007

References:

1. McGinnis, P.: Biomechanics of sport and exercise. Champaign, IL: Human Kinetics, 2013’
2. Franc Bell: Principles of Mechanics and Biomechanics, Stanley Thornes Publications, 1998
   Iwan W. Griffiths, Principles of Biomechanics & Motion Analysis, Published by Lippincott Williams & Wilkins, 2006

Course Outcomes:

On successful completion of the course, the students should be able to:

CO 1	Student can get the basic knowledge about Yoga Text
CO 2	They will get the full idea about the principles of Yoga Upanishad
CO 3	Student can get full knowledge Essentials of Bhagavad Gita &Yoga Vashitha
CO 4	Finally, the student will get full blue print about basic yoga text.

Mapping With Programme Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	**S**	**L**	**M**	**S**	**M**
CO2	**S**	**M**	**L**	**S**	**M**
CO3	**S**	**M**	**M**	**S**	**S**
CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**M**	**S**	**S**

***S-Strong3; M-Medium2; L-Low1**

23PB1CE006 - SPORTS EDUCATION

Program Objectives:

- To get the knowledge about history of ancient Olympics.
- To know about Play Field Games.
- To obtain the knowledge about Court Games.
- To acquire the knowledge about Traditional Sports.
- To get the knowledge about Athletics.

UNIT – 1:

Ancient and Modern Olympics: History of Ancient Olympics- History and Development of Modern Olympics - Father of Modern Olympics. Olympic Flame, Olympic Motto, Olympic Flag. Philosophy of Olympics. Olympic Value Education.

UNIT – 2:

Play Filed Games: Football: Play Field, Equipment and Major Laws of the Game – Cricket: Play Field, Equipment and Major Laws of the Game- Hockey: Play Field and Major Rules of the Game.

UNIT – 3:

Court Games: Basketball: Play Area and Major Rules of the Game. Handball: Play Area and Major Rules of the Game. Volley ball: Play Area and Major Rules of the Game. Badminton: Play Area and Major Rules of the Game. Table Tennis: Table and Major Rules of the Game.

UNIT – 4:

Traditional Sports Kabaddi: Play Area and Major Rules of the Game. Kho-Kho Play Area and Major Rules of the Game. Attyapatya: Play Area and Major Rules of the Game. Ball Badminton; Kabaddi: Play Area and Major Rules of the Game.

UNIT – 5:

Athletics: World Athletics. Standard and Non-Standard Track Marking Procedure. Field Events: Implements and Markings. Major Rules of Events. Tie Breaking Procedures. Duties of Officials.

References:

1. Authors Guide (2000) Olympic Value Education, International Olympic Committee
2. Authors Guide (2002) Rules of Games and Sports, New Delhi: YMCA Publishing House.
3. Authors Guide (2000) FIBA Official Basket Rules: Munich
4. Bonder, J. B (1984). How to be a Successful Coach. New York: Prentice Hall, Inc.
5. Breshahan, Tuttle & Cretzmeyer. (1997). Track and Field Athletics. New Jersey: Prentice Hall, Inc.
6. Bunn, J. W (1951) The Art of Officiating Sports, Englewood Cliff.: Prentice Hall,

7. Cart E. Klafs., & D, Arnheim. (2000), Modern Principles of Athletic Training. St. Louis: C. Mosphy Company.
8. Chelliah, S.N (1990), VilayattuVithiMuraihal, Chennai: Raj Mohan Pathipagam.
9. Gangopaddhayoy, S. R. (2008). Encyclopaedia of Sports Training. New Delhi: SportPublication.
10. George Immanuel. (1997). Track and Field Event layout and Marking. Chennai: Krishnamurthy and Co.
11. Josse, P, Moprtensen & John, M, Copper. (1998). Track and Field for Coach and Athlete. St. Louis: C.V. Mosphy Company.
12. Osborne, M. P. (2004). Magictree House Fact Tracker: Ancient Greece and theOlympics: A Nonfiction Companion to Magic Tree House: Hour of theOlympics. New york: random house books for young readers

Course Outcomes:

On successful completion of the course, the students should be able to:

CO 1	Students can get basic knowledge about the history of the ancient Olympics
CO 2	They will get the full idea about playing field Games
CO 3	Students can get full knowledge about Court Games.
CO 4	They can get knowledge about Traditional Sports
CO 5	They can acquire knowledge about Athletics

Mapping With Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**M**	**L**	**S**	**M**
CO2	**S**	**M**	**L**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**
CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**M**	**S**	**S**

***S-Strong3; M-Medium2; L-Low1**

23PB1CE007 – YOGA IN WORLD RELIGION SYNTHESIS

Program Objectives:

- To get the knowledge about all the Religions.
- To know about the concept of Tri-Ratna.

- To obtain knowledge about Meditation Techniques.
- To acquire the knowledge about Elements of Yoga in Sufism.
- To get the knowledge about Meditation in Christian literature.

UNIT - 1:

Meaning of Religion; Introduction to Jainism and Goal of human life in Jainism; Introduction of Buddhism and Goal of human life in Buddhism; Introduction to Islam and Goal of human life in Islam; Introduction to Christianity and Goal of human life in Christianity; Introduction and Essence of Sufism and Goal of human life in Sufism.

UNIT – 2:

Anekantavada (Syadvada), Concept of Tri-ratnas, Concept of Kayotsarga (Preksha- dhyana); Inroduction to Buddhism, Skandha-vada, Concept of Arya-satya or Four Noble Truths.

UNIT – 3:

Arya-astangika-marga or Noble-eight-fold-path (Bouddha-Yoga);Tai Chi-based meditation, Zen meditation, Qi-gong meditation and G-Tum-O meditation.

UNIT - 4:

Elements of Yoga in Sufism, Sufi Meditation Techniques. Sufi Meditation: Muraqaba; Islam: Salat positions along with their most similar yoga positions; Qiyam and Namaste; Ruk'u and Ardha Uttanasana; Julus and Vajrasana; Sujud and Blasana;

UNIT - 5:

Contemplation, Meditation as practiced by Franciscan nuns, Rosary meditation, Meditation as prescribed by the church, Meditation in Christian literature; Hesychasm, Maranatha- a christian meditation mantra.

Text Book:

1. Lajpat, Rai & others: Meditation, Anubhava Rai Publications, Gurgaon, 1999

Reference Books:

1. Swami Niranjanananda Saraswati: Dharana Darshan, Yoga Publications Trust, 1996, Munger, Bihar, India,
2. Lajpat, Rai: Discovering Human Potential Energy, Anubhava Rai Publications, Gurgaon, 1999)
3. Parragon: World Religion, Parragon Publishing India

Course Outcomes:

On successful completion of the course, the students should be able to:

CO 1	Students can get knowledge about the Religions
CO 2	They came to know about Tri-Ratna
CO 3	Students can get full knowledge about Meditation Techniques.
CO 4	They can get knowledge about elements of yoga in sufism.
CO 5	They can acquire knowledge about Meditation in Christian Literature.

Mapping With Programme Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	**S**	**M**	**L**	**S**	**M**
CO2	**S**	**M**	**L**	**S**	**M**
CO3	**S**	**S**	**M**	**S**	**S**
CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**M**	**S**	**S**

23PB1CE009 - FUNDAMENTALS OF PSYCHOLOGY

Program Objectives:

- To know about Psych and holistic health
- To understand the concept of psychosomatic disorders.
- To obtain knowledge of Personality and Behaviour
- To acquire the knowledge of personality integration through yoga.
- To understand about Psychopathology

UNIT - 1: **Psych and Holistic Health**

1. Theoretical understanding Of Yoga and Modern Psychology,
2. Concept Of Holistic Health
3. Concepts and models of Nornnlity,

UNIT - 2: **Concepts of Psychosomatic disorders**

1. Meaning, Definations of Psychosomatic disorders
2. Concepts of Psychosomatic disorders according to Taittriya Upanisad.
3. Characteristics & types of psychosomatic disorders

UNIT - 3: **Personality & Behavior**

1. Eastern and western concepts of personality,
2. Modern theories of personality,
3. Indian approach to consciousness and human behaviour

UNIT- 4: Personality Integration through Yoga

1. Personal and interpersonal adjustment
2. Attitude formation for total personality integration
3. Role of yoga in personality integration

UNIT- 5: Psychopathology

1. Introduction to models of Psychopathology Psychoanalytic, behavioural, cognitive and biological models;
2. Sociobiology of health and disease;

3. Diagnostic classification of mental and behavioural disorders

References:

1. Woodwork, Contemporary school of psychology
2. P.L. Harrienan, 20th Century psychology
3. Abraham H. Maslov, towards a psychology of being
4. Mishlov Jeffery, The Roots of consciousness
5. N.C. Pande, Mind and supermind
6. Macnmupucnman Reddy, Internal yoga psychology
7. I.P Sachdeva, Yoga and depth psychology
8. Shanti Parkash Attari, Yoga psychology

Course Outcomes:

On successful completion of the course,

CO 1	Students can get the concept of Psych and Holistic health
CO 2	They will get the clear idea about the Concepts of Psychosomatic disorders
CO 3	They can get detailed knowledge in Personality & Behavior
CO 4	They will learn about the Personality Integration through Yoga
CO 5	They can acquire the knowledge about Psychopathology

Mapping With Programme Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	**S**	**L**	**M**	**S**	**M**
CO2	**S**	**M**	**L**	**S**	**M**
CO3	**S**	**M**	**M**	**S**	**S**
CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**M**	**S**	**S**

***S-Strong3; M-Medium2; L-Low1**

23PB1CE011 – APPLIED SPIRITUALITY

Program Objectives:

- To know about the principles of Spirituality.
- To understand the concept of General Health.
- To acquire the knowledge about development in Memory and Intuition
- To understand about the development in Attitude and Aptitude.
- To know about the concept of Samadhi

UNIT - 1:

Introduction - Spirituality- Meaning and Aim - Spirituality- Obstacles and Solution - Spirituality- Fundamentals and Qualities of a Sadhaka – Modern Sciences and Spirituality - Principles of Spiritual practice - Preparation, Place, Time, Food and Lifestyle - Yogic practices for spirituality as explained in Bhagavad Gita.

UNIT - 2:

General Health - Physical Health - Mental Health - Social Health - Spiritual Health – Emotion - Clarity in expression - Development in Structure, Mood and Behaviour.

UNIT – 3:

Development in Conscious - Development in Subconscious - Develop in Super conscious - Development in Memory and Intuition

UNIT – 4:

Development in Attitude and Aptitude - Decision making and thinking approach – Leadership, working capacity and organizing - Body, Mind, Intellectual level.

UNIT – 5:

Isvarapranidhana - Samprajnatha and Asamprajnata Samadhi - Dharmamegha Samadhi - Kaivalya

Course Outcomes:

On successful completion of the course,

CO 1	Student can get the knowledge about principles of Spirituality
CO 2	They will get the clear idea about General Health.
CO 3	They can get detailed knowledge about development in Memory and Intuition.

CO 4	They can obtain the knowledge about development in Attitude and Aptitude.
CO 5	The student will get the knowledge about concept of Samadhi.

Mapping With Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**L**	**M**	**S**	**M**
CO2	**S**	**M**	**L**	**S**	**M**
CO3	**S**	**M**	**M**	**S**	**S**
CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**M**	**S**	**S**

***S-Strong3; M-Medium2; L-Low1**

23PB1CE016 - YOGA AND MANAGEMENT

PROGRAM OBJECTIVES:

- To know about the Basic Concepts in Strategic Management.
- To know about the Yogic Vision and Mission.
- To understand the Internal and External Assessment, and business strategies.
- To know about the generic competitive strategies, Diversification strategies.
- To know about the Yoga and ethical strategic management.

UNIT 1:

Basic Concepts in Strategic Management, Meaning of strategy, Strategic Management: meaning, definition, role, scope, importance, stages, key terms in SM, SM Model, benefits, key terms, need for strategic planning, why firms avoid strategic planning? Pitfalls in

strategic planning, guidelines for yogic approach to effective strategic management. Key success factors of a business.

UNIT 2:

Yogic Vision and Mission: Need, meaning, Vision vs. Mission, importance, process, characteristics, components, writing and evaluating yogic vision and mission statements**.**

UNIT 3:

Internal and External Assessment, and business strategies, Key internal forces, process of performing an internal strategic management audit, basic functions or activities that make up the different functional areas of business. Key external forces, sources of external information, Porter's five forces model of competition, Cooperative vs. Competitive Strategies – examples and exercises.

UNIT 4:

Five generic competitive strategies, Diversification strategies – related and unrelated, core competencies, outsourcing. Horizontal and vertical integration, Joint Venture, Partnering, Merger, Acquisition, SM in Non-profit, Educational, Medical and Government organizations.

UNIT 5:

Yogic Approach to strategic management,Importance of ethics in the overall process, Yoga and ethical strategic management, convergence of Western and Eastern management practices, Compassionate Leadership through Yogic approach, Balancing Purusharthas through a holistic approach and Evolution of the SELF.

Course Outcomes:

On successful completion of the course,

CO 1	Student can get the knowledge about Basic Concepts in Strategic Management.
CO 2	They can obtain the knowledge about Yogic Vision and Mission
CO 3	They can get the idea about Internal and External Assessment, and business strategies

CO 4	They will come to know about the generic competitive strategies, Diversification strategies
CO 5	They can acquire the knowledge about Yoga and ethical strategic management

MappingWithProgrammeOutcomes:

	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**L**	**M**	**S**	**M**
CO2	**S**	**M**	**L**	**S**	**M**
CO3	**S**	**M**	**M**	**S**	**S**
CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**M**	**S**	**S**

***S-Strong3;M-Medium2;L-Low1**

1.2.1 Sports Technology

23PH1CL102 - NUMERICAL ANALYSIS LAB

LIST OF EXPERIMENTS

1- Expression and Variable command
2- Vector operation
3- Matrix operation
4- Conditional Branching
5- Interation 'for' statement Syntex6- script and functioning
7- Plotting 2D graphs
8- user defined input and output
9- Numerical integration algorithm
10- 10- Solving non linear equations
11- Linear equation Gaussian method
12- linear equations interactive method
13- Numerical Interpolation algorithms
14- ODEs using Euler Methods
15- ODEs Application

Reference

1. Introduction to Scilab: For Engineers and Scientists Book by Sandeep Nagar
2. IITB Spoken tutorial - https://spoken-tutorial.org/

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Understand vector and metrix operations.
	CO-2	Develop 2D plotting skills
	CO-3	Understanding and use numerical interpolation alogrithms
3	**MAPPING (CO's and PO's)**	

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	2	1								
2				3		2				
3			2						1	

MAPPING (CO's and PSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1		
2	1	2
3	2	3

23PH1CT202- Applications of Sensors and Transducers in Sports

Course Objectives:

• To understand the concepts of measurement technology.
• To learn the various sensors used to measure various physical parameters.
• To learn the fundamentals of signal conditioning, data acquisition and communication systems

UNIT I INTRODUCTION **9**

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

UNIT II MOTION, PROXIMITY AND RANGING SENSORS **9**

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS **9**

Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS **9**

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT V SIGNAL CONDITIONING and DAQ SYSTEMS **9**

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi channel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

Total No of periods: 45

Course Outcomes:

The students will be able to

- Expertise in various calibration techniques and signal types for sensors.
- Apply the various sensors in the sports applications
- Study the basic principles of various smart sensors.

References

- ***1.*.** Franz Konstantin Fuss**,** Aleksandar Subic**,** Sadayuki Ujihashi "*The Impact of Technology on Sport II"* Taylor and Francis 2007
- *2. Craig J.J., " Introduction to Robotics Mechanics and Control ", Addison-Wesley, 1999.*
- *Murty, D.v.s. Transducers And Instrumentation Prentice Hall of India, 2008*

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Gain knowledge of the electronics and sensor technology
	CO-2	Measure performance of the athlete error free
	CO-3	increase athlete performance and to avoid injury by providing with feed to the players/athletes

3 MAPPING (CO's and PO's)

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	3					2				
2		2								
3			3	3		3				

MAPPING (CO's and PSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1		
2	1	2
3	1	3

23PH1CL201 Sports Performance Analysis Lab

Course Objectives:

- To apply movement analysis through image capturing through high resolution camera and motion analysis software to evaluate and optimize the sports

performance.

LIST OF EXPERIMENTS

1 - Tagging using default setup

2 - Tagging panel creation and Analysis for basketball

3 - Tagging panel creation and Analysis for volleyball

4 - Tagging panel creation and Analysis for Circket

5 - knee angle analysis for cyclist

6 - Basketball shoot analysis in stroMo

7 - Chucking analysis of the bowler in Dartfish

8 - Data generation and analysis from the Dartfish

Reference

1. Dartfish feedback and support - https://support.dartfish.tv/support/solutions/folders/27000053999

LIST OF EQUIPMENTS AND SOFTWARES REQUIRED

1.Computers with latest configuration 30 Nos.

2.Power back up for the required capacity

3.Colour printer

4. High resolution camera

5.Motion analysis software like Dartfish and SportCAD etc .

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Acquire knowledge on Athletes movement capturing using high resolution camera Movement analysis software
	CO-2	Capture and analyse movements in various sports and athletic events
	CO-3	Optimize players performance

3 **MAPPING (CO's and PO's)**

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	3				3					
2					3	3	2			
3			3						2	

MAPPING (CO's and PSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1		
2	1	2
3	1	3

23PH1CL202 CFD and FEM Sports Simulation and Analysis Lab

Course Objectives:

- To implement the CFD and FEM simulation for the Sports engineering problems

1. Flow over laminar and turbulent pipe

2. Flow over a cylinder and 2D Airfoil

3. Flow over a cyclist

4. Flow over a Golf ball

5. Cross ventilation study at indoor stadium

6. Plate with hole

7. Bike Crank FEM simulation

8. Cantilever beam FEM analysiss

9. Plane frame FEM analysis

10. A step shaft in axial teny FEM analysis.

Outcome

- Increasing the sports performance through the CFD and FEM simulation
- To design and implementation of the CFD and FEM Analysis for sports apparel and infrastructure

Reference

1. EDX - A Hands-on Introduction to Engineering Simulations
https://www.edx.org/course/a-hands-on-introduction-to-engineering-simulations

LIST OF SOFTWARES REQUIRED

1. **Any latest modelling software like ProE, CATIA, CAD etc.,**

2. **Analysis package such as ANSYS ,MATLAB etc**

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Classify a given problem on the basis of its dimensionality as 1-D, 2-D, or 3-D, time-dependence as Static or Dynamic, Linear or Non-linear.
	CO-2	Develop system level matrix equations from a given mathematical model of a problem following the Galerkin weighted residual method or principle of stationary potential.
	CO-3	While demonstrating the process mentioned in 2 above, he will be able to identify the primary and secondary variables of the problem and choose correct nodal degrees of freedom and develop suitable shape functions for an element, implement Gauss-Legendre scheme of numerical integration to evaluate integrals at element level, and assemble the element level equations to get the system level matrix equations. He will also be able to substitute the essential boundary conditions correctly and obtain the solution to system level matrix equations to get the values of the field variable at the global nodes.
	CO-4	state three sources of errors in implementing FEM and suggest remedies to minimize the same for a given problem, viz. Modeling errors, Approximation errors, and numerical errors.
	CO-5	Obtain consistent and lumped mass matrices for axial vibration of bar sand transverse vibration of beams and obtain fundamental frequency of natural vibration using the methods mentioned in the curricula.
	CO-6	use MATLAB for implementation of FEM to obtain elongations at nodes of a bar subjected to traction and concentrated loads and prescribed boundary conditions
	CO-7	use commercial software like ANSYS or ABAQUS for implementation of FEM to obtain stress concentration due to a small hole in a rectangular plate subjected to traction on edges and concentrated loads at points on the edges and prescribed boundary conditions and present his/her work using the above software in a conference or publish the work in a peer reviewed journal 3
3	**MAPPING (CO's and PO's)**	

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	1	3								
2	2	2								
3	3	3								
4					3					
5	3	3								

6					3					
7						3	3	3	2	

MAPPING (CO's and PSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1		
2	2	
3		
4		2
5	1	
6	3	
7		3

23PH1DE001– ROBOTICS AND MACHINE VISION SYSTEM

OBJECTIVES:

- Students will learn about basics of robots
- programming and Machine vision applications in robots

UNIT I BASICS OF ROBOTICS **9**

Introduction- Basic components of robot-Laws of robotics- classification of robot-work spaceaccuracy-resolution –repeatability of robot. Power transmission system: Rotary to rotary motion,Rotary to linear motion, Harmonics drives

UNIT II ROBOT END EFFECTORS **9**

Robot End effectors: Introduction- types of End effectors- Mechanical gripper- types of gripper mechanism- gripper force analysis- other types of gripper- special purpose grippers.

UNIT III ROBOT MECHANICS **9**

Robot kinematics: Introduction- Matrix representation- rigid motion & homogeneous transformation- forward & inverse kinematics- trajectory planning. Robot Dynamics: Introduction - Manipulator dynamics – Lagrange - Euler formulation- Newton - Euler formulation

UNIT IV MACHINE VISION FUNDAMENTALS **9**

Machine vision: image acquisition, digital images-sampling and quantization-levels of computation Feature extraction-windowing technique- segmentation- Thresholding- edge detection- binary morphology - grey morphology

UNIT V ROBOT PROGRAMMING **9**

Robot programming: Robot Languages- Classification of robot language-Computer control and robot software-Val system and Languages- application of robots.

OUTCOMES:

- knowledge for the design of robotics
- Upon completion of this course, the students can able to apply the basic engineering

TEXT BOOKS:

1. M.P.Groover, M.Weiss ,R.N. Nagal, N.G.Odrey, "Industrial Robotics - Technology, programming and Applications" Tata , McGraw-Hill Education Pvt Limited, 2008

REFERENCES

1. Sathya Ranjan Deb, robotics Technology & flexible Automation Sixth edition, Tata Mcgraw-Hill Publication, 2003.
2. Gorden M.Dair, Industrial Robotics, PHI 1988.
3. K.S.Fu, R.C.Gonzalez, C.S.G.Lee, Robotics: Sensing, Vision& Intelligence, Tata Mcgraw-Hill Publication, 1987.
4. John.J.Craig, Introduction to Robotics: Mechanics & control, Second edition-2002.
5. M.P.Groover, Industrial robotics- Technology, programming and Applications, McGraw-Hill, 1986

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	To Understand the foundational and latest robotic technology used in the sports and physical education
	CO-2	Implementing the robotics technology to enhancement of the sports manufacturing, equipment and instrument
	CO-3	Understanding the programming and algorithm for the robotic technology

3 **MAPPING(CO's and PO's)**

Course Outcomes	ProgramOutcomes									
	1	2	3	4	5	6	7	8	9	10
1	1					2		1		
2		1						1	2	
3	1		3				2	3		

MAPPING(CO'sandPSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1		
2	2	3
3	3	1

23PH1DE002–Digital Image Processing

OBJECTIVES:

- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- To learn concepts of degradation function and restoration techniques.
- To study the image segmentation and representation techniques.
- To become familiar with image compression and recognition methods

UNIT IDIGITAL IMAGE FUNDAMENTALS 9

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Colour fundamentals and Colour models.

UNIT IIIMAGE ENHANCEMENT 9

Spatial Domain: Basics of intensity transformation – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Preliminary concepts.

UNIT III IMAGE RESTORATION 9

Image Restoration – degradation model, properties, noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.

UNIT IV IMAGE SEGMENTATION 9

Edge detection – Edge models and basic edge detection thresholding – Foundation, basic global thresholding - Region based segmentation – Region growing – Region splitting and merging – Use of motion segmentation.

UNIT V IMAGE COMPRESSION 9

Need for data compression, fundamentals of compression – Coding redundancy, Spatial and temporal redundancy, irrelevant information, image compression – Basic compression methods – Huffman, Coulomb, Arithmetic and Run Length coding.

OUTCOMES:

At the end of the course, the students should be able to:

- Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
- Operate on images using the techniques of smoothing, sharpening and enhancement.
- Understand the restoration concepts and filtering techniques.
- Learn the basics of segmentation, features extraction, compression and recognition methods for color models.

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods,Digital Image Processing, Pearson, Third Edition, 2010.
2. Anil K. Jain,Fundamentals of Digital Image Processing Pearson, 2002.

REFERENCES:

1. Kenneth R. Castleman,Digital Image Processing Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,Digital Image Processing using MATLAB Pearson Education, Inc., 2011.
3. D,E. Dudgeon and RM. Mersereau,Multidimensional Digital Signal Processing Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt,Digital Image Processing John Wiley, New York, 2002
5. Milan Sonka et al Image processing, analysis and machine vision Brookes/Cole, Vikas Publishing House, 2nd edition, 1999

2	**COURSEOUTCOMES:Studentsareableto**	
	CO-1	Operate on images using the techniques of smoothing, sharpening andenhancement.
	CO-2	Learn the basics of segmentation, features extraction, compression and recognition methods for color models.
	CO-3	Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.

3 **MAPPING (CO's and PO's)**

Course Outcomes	ProgramOutcomes									
	1	2	3	4	5	6	7	8	9	10
1	3		2			1				
2			1			2				
3			3			1				

MAPPING(CO'sandPSO's)

Course Outcomes (CO)	ProgramSpecific Outcomes(PSO)	
	1	2
1		3
2	2	
3		3

23PH1DE003– Digital Video Processing

COURSE OBJECTIVE:

- To introduce the fundamentals of digital video representation, filtering and compression,
- Popular algorithms for 2-D and 3-D motion estimation,
- Object tracking, frame rate conversion, deinterlacing, image enhancement,

the emerging international standards for image

- video compression, with such applications as digital TV, web-based multimedia, videoconferencing,

videophone and mobile image communications.

- more advanced image compression techniques such as entropy coding, subband coding and object-based coding.

UNIT IDIGITAL VIDEO FUNDAMENTALS 9

Basics of Video – Analog video, digital video, digital video processing – Time varying image formation models – Three dimensional motion models, geometric image formation, photometric image formation, observation noise.

UNIT IISPATIO-TEMPORAL SAMPLING 9

Sampling structures – Two dimensional rectangular sampling – Two dimensional periodic sampling – Sampling on 3D structures – Reconstruction from samples.

UNIT III MOTION DETECTION AND ESTIMATION 9

Introduction – Notations and preliminaries – Motion detection methods – Hypothesis testing and MAP detection – Motion estimation – Models, estimation and search – Practical motion estimation algorithms.

UNIT IV VIDEO SEGMENTATION 9

Introduction – Change detection – Dominant motion segmentation – Multiple motion segmentation – Simultaneous estimation and segmentation – Semantic video object segmentation.

UNIT V VIDEO COMPRESSION 9

Introduction – Application requirements – Digital video signals and formats – Video compression techniques – Video encoding standards and H.261

TEXT BOOKS:

1. A.Murat Tekalp, Digital Video Processing, Prentice Hall,Signal Processing Series, 1995.
2. Al Bovik, Hand book of Image and Video Processing, Academic Press, 2000.

References:

1."Multimedia Communication Technology", J.R.Ohm, Springer Publication.
2. "Video Coding for Mobile Communications" David Bull et al, Academic Press.
3. "Handbook on Image and Video Processing", A.I.Bovik, Academic Press.

2	**COURSE OUTCOMES : Students are able to**	
	CO-1	Implementing and understanding the importance of the digital technology in sports
	CO-2	To understand the video technology in the broadcast of the sport event and performance improvement
	CO-3	To improve the video technology on the sports performance and research

3 **MAPPING(CO'sandPO's)**

Course Outcomes	ProgramOutcomes									
	1	2	3	4	5	6	7	8	9	10
1	2	3								
2				2	1	2				
3		1		2	1			2		

MAPPING(CO's and PSO's)

CourseOutcomes(CO)	ProgramSpecific Outcomes(PSO)	
	1	2
1	2	
2		3
3	1	

23PH1DE004– Computer Vision

Objectives:

- Students will learn basic principles of image formation
- image processing algorithms and different algorithms for 3D reconstruction and recognition from single or multiple images (video). This course
- Emphasizes the core vision tasks of scene understanding and recognition.
- Applications to 3D modelling, video analysis, video surveillance, object recognition and vision based control will be discussed.

UNIT I IMAGE FORMATION 9

Geometric primitives and transformations – 2D transformations, 3D transformations, 3D rotations, 3D to 2D projections and lens distortion.

UNIT IIFEATURE DETECTION AND MATCHING 9

Points and patches – Feature detectors and descriptors – Edges – Detection and linking – Lines – Successive approximation, Hough transforms and vanishing points.

UNIT III SEGMENTATION 9

Active contours – Snakes, Scissors, level sets – Split and Merge – Watershed, region splitting, region merging, graph-based segmentation – Mean shifting and mode finding.

UNIT IV FEATURE BASED ALIGNMENT 9

2D and 3D feature based alignment – Alignment using least squares, Iterative algorithms, 3D alignment – Pose estimation algorithms – Geometric intrinsic calibration.

UNIT V TRACKING 9

Simple tracking strategies – Tracking using matching – Tracking linear dynamical models using Kalman filters – Data association – Particle filtering – The simplest particle filter.

Course Outcome:

After learning the course the students should be able to:

1. To implement fundamental image processing techniques required for computer vision
2. Understand Image formation process
3. To perform shape analysis
4. Extract features form Images and do analysis of Images
5. Generate 3D model from images
6. To develop applications using computer vision techniques
7. Understand video processing, motion computation and 3D vision and geometry

TEXT BOOKS:

1. Richard Szeliski, Computer Vision: Algorithms and applications, Springer, 2010.
2. David A.Forysyth & Jean Ponce, Computer Vision : A Modern Approach, Second Edition,Pearson, 2012.

2	**COURSE OUTCOMES : Students are able to**	
	CO-1	To implement fundamental image processing techniques required for computer vision
	CO-2	Understand video processing, motion computation and 3D vision and geometry
	CO-3	Extract features form Images and do analysis of Images

3 **MAPPING(CO's and PO's)**

Course Outcomes	ProgramOutcomes									
	1	2	3	4	5	6	7	8	9	10
1	2	3			1	3	2			
2			3		2	2	3			
3	3	2		2		3	3			

MAPPING(CO's and PSO's)

CourseOutcomes(CO)	ProgramSpecific Outcomes(PSO)	
	1	2
1	3	
2		3
3		

23PH1DE005– Mobile Computing

OBJECTIVES:

- To understand the basic concepts of mobile computing.
  - To learn the basics of mobile telecommunication system .
  - To be familiar with the network layer protocols and Ad-Hoc networks.
  - To know the basis of transport and application layer protocols.
  - To gain knowledge about different mobile platforms and application development.

UNIT I INTRODUCTION **9**

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA

UNIT II MOBILE TELECOMMUNICATION SYSTEM **9**

Introduction to Cellular Systems - GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRSUMTS – Architecture – Handover - Security

UNIT III MOBILE NETWORK LAYER **9**

Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security.

UNIT IV MOBILE TRANSPORT AND APPLICATION LAYER **9**

Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

UNIT V MOBILE PLATFORMS AND APPLICATIONS **9**

Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

OUTCOMES:

At the end of the course, the students should be able to:

- Explain the basics of mobile telecommunication systems
- Illustrate the generations of telecommunication systems in wireless networks
- Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
- Explain the functionality of Transport and Application layers
- Develop a mobile application using android/blackberry/ios/Windows SDK

TEXT BOOKS:

1. Jochen Schiller, ―Mobile Communications‖, PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, ―Fundamentals of Mobile Computing‖, PHI Learning Pvt.Ltd, New Delhi – 2012

REFERENCES

1. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems",Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, ―Principles of Mobile Computing‖, Springer, 2003.
3. William.C.Y.Lee,―Mobile Cellular Telecommunications-Analog and Digital Systems‖, Second Edition,TataMcGraw Hill Edition ,2006.
4. C.K.Toh, ―AdHoc Mobile Wireless Networks‖, First Edition, Pearson Education, 2002.
5. Android Developers : http://developer.android.com/index.html
6. Apple Developer : https://developer.apple.com/
7. Windows Phone DevCenter : http://developer.windowsphone.com
8. BlackBerry Developer : http://developer.blackberry.com

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Explain the basics of mobile telecommunication systems
	CO-2	Explain the functionality of Transport and Application layers
	CO-3	Determine the functionality of MAC, network layer and Identify a routing protocol for a given Adhoc network

3 **MAPPING(CO's and PO's)**

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1		2	3		3					
2	3			3						
3				2		2	3			

MAPPING (CO's and PSO's)

CourseOutcomes(CO)	ProgramSpecific Outcomes(PSO)	
	1	2
1		3
2	3	
3		2

23PH1DE007– Polymer Engineering

UNIT I Introduction **9**

Importance of polymers in sports, types and Classification of polymers, Concept of functionality, Polydispersity and Molecular weight [MW], Molecular Weight Distribution [MWD], various methods of determination of MWD.

UNIT II Kinetics and Mechanism: **9**

Polymerization Kinetics Free radical polymerization, Mechanism of Polycondensation Techniques of Polymerization and nanocomposites:

UNIT III Techniques of Polymerization and nanocomposites **9**

Techniques of polymerization, bulk, emulsion, suspension, Polymer composites and nano-composites.

UNIT IV Polymer Processing **9**

Methods of spinning for additive manufacturing: Wet spinning, Dry spinning. Biopolymers, Compatibility issues with polymers. Moulding and casting of polymers, Polymer processing techniques and the effect of these processing techniques on polymer structure,

UNIT V Designing of polymeric devices and application of polymers for Sports: 9

Aspects of designing polymeric devices and polymer additives, Polymers used for sports goods and equipment manufacturing: polyamide, PF resin, polyesters and case studies.

REFERENCES

1. F.W. Billmeyer Jr Text book of Polymer Science, Inter science Publisher John Wiley and Sons, 3rd edition 1999
2. G Odian Principles of Polymerization, Wiley Inerscience John Wiley and Sons, 4th edition, 2005
3. V.R. Gowarikar Polymer Science, , New Age Int., 2002

2	**COURSE OUTCOMES :Students are able to**	
	CO-1	Implementation of the polymer technology in the sports goods and equipment
	CO-2	Understanding the importance and manufacturing of the polymer
	CO-3	Manufacturing of the polymer sports goods and equipment

3 **MAPPING (CO's and PO's)**

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1		3	2							3
2	3		3	2	3		2		2	
3	3	2		3	2		3	2		

MAPPING (CO's and PSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1	2	3
2		3
3	3	2

23PH1DE009– Reverse Engineering

Course Objective:

• Understand basic engineering systems.
• Understand the terminologies related to re-engineering, forward engineering, and reverse engineering.
• Disassemble products and specify the interactions between its subsystems and their functionality
• Understand Reverse Engineering methodologies.
• Understand Reverse engineering of Systems, Mechanical RE, Electronic RE, and Computer RE.

UNIT I Introduction to reverse engineering: 9

Reverse Engineering–The Generic Process Methodologies and Techniques for Reverse Engineering – The Potential for Automation with 3-D Laser Scanners, What Is Not Reverse Engineering, Computer-aided (Forward) Engineering, Computer-aided Reverse Engineering.

UNIT II Reverse Engineering–Hardware and Software: 9

Contact Methods Noncontact Methods, Destructive Method ,Computer Vision and Reverse Engineering, reverse engineering verses forward engineering

UNIT III Selecting a Reverse Engineering System: 9

The Selection Process, Some Additional Complexities, Point Capture Devices, Triangulation Approaches, "Time-of-flight" or Ranging Systems, Structured-light and Stereoscopic Imaging Systems, issues with Light-based Approaches, Tracking Systems, Internal Measurement Systems, X-ray Tomography, Destructive Systems, Some Comments on Accuracy, Positioning the Probe, Post processing the Captured Data, Handling Data Points, Curve and Surface Creation, Inspection Applications, Manufacturing Approaches

UNITIV Integration Between Reverse Engineering and Additive manufacturing 9

Modeling Cloud Data in Reverse Engineering, Data Processing for Rapid Prototyping, Integration of RE and RP for Layer-based Model Generation, he Adaptive Slicing Approach for Cloud Data Modeling, Planar Polygon Curve Construction for a Layer, Determination of Adaptive Layer Thickness

UNIT V Reverse Engineering in Sports, Medical, Automotive, Aerospace sectors: 9

Legal Aspects of Reverse Engineering: Copyright Law, Reverse Engineering, Recent Case Law Barriers to Adopting Reverse Engineering, case studies.

Outcomes:

1. The basic understanding of engineering systems. - Understanding the terminologies related to re-engineering, forward engineering, and reverse engineering.

2. The Understanding of Reverse Engineering methodologies. - Understanding of Reverse engineering of Systems, Mechanical RE, Electronic RE, and Computer RE.

REFERENCES

1. K. Otto and K. Wood, Product Design: Techniques in Reverse Engineering and New Product Development, Prentice Hall, 2001.
2. Reverse Engineering: An Industrial Perspective by Raja and Fernandes, Springer-Verlag 2008.

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	The basic understanding of engineering systems. - Understanding the terminologies related to re-engineering, forward engineering, and reverse engineering.
	CO-2	The Understanding of Reverse Engineering methodologies. - Understanding of Reverse engineering of Systems, Mechanical RE, Electronic RE, and Computer RE.

3 **MAPPING (CO's and PO's)**

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	3	3		3						
2			2	3		3		2		

MAPPING(CO'sandPSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1	3	2
2	3	

23PH1DE010– Introduction to Embedded Systems

OBJECTIVES:

- To introduce the Building Blocks of Embedded System
- To Educate in Various Embedded Development Strategies
- To Introduce Bus Communication in processors, Input/output interfacing.
- To impart knowledge in Various processor scheduling algorithms.
- To introduce Basics of Real time operating system and example tutorials to discuss on one
- real-time operating system tool

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems – The build process for embedded systems- Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols -RS232 standard – RS422 – RS485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) –need for device drivers.

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication-shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: Vx Works, чC/OS-II, RT Linux.

UNIT V EMBEDDED SYSTEM APPLICATION DEVELOPMENT 9

Case Study of Washing Machine- Automotive Application- Smart card System Application,.

TOTAL: 45

Course Outcomes:

1. Ability to understand and analyse, linear and digital electronic circuits.
2. Apply the concepts studied in sports engineering applications

TEXT BOOKS:

1. Rajkamal, ‘Embedded System-Architecture, Programming, Design’, Mc Graw Hill, 2013.
2. Peckol, “Embedded system Design”, John Wiley & Sons,2010
3. Lyla B Das,” Embedded Systems-An Integrated Approach”, Pearson, 2013

REFERENCES:

1. Shibu. K.V, "Introduction to Embedded Systems", Tata Mcgraw Hill,2009.
2. Elicia White," Making Embedded Systems", O' Reilly Series,SPD,2011.
3. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.
4. Han-Way Huang, "Embedded system Design Using C8051", Cengage Learning,2009.
5. Rajib Mall "Real-Time systems Theory and Practice" Pearson Education, 2007

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Ability to understand and analyse, linear and digital electronic circuits.
	CO-2	Apply the concepts studied in sports engineering applications

3 **MAPPING (CO's and PO's)**

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	2		2			3				
2		3		3	2			2		

MAPPING(CO'sandPSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1		3
2	3	

23PH1DE011– Introduction to Internet of Things (IOT)

Objectives

- Describe what IoT is and how it works today
- Recognise the factors that contributed to the emergence of IoT
- Design and program IoT devices
- Use real IoT protocols for communication
- Secure the elements of an IoT device 6. Design an IoT device to work with a Cloud Computing infrastructure.
- Transfer IoT data to the cloud and in between cloud providers
- Define the infrastructure for supporting IoT deployments

UNIT I INTRODUCTION TO IoT 9

Introduction - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs- Health and lifestyle

UNIT II IoTand M2M **9**

Introduction-M2M –Difference between IoT and M2M –SDN and NFV for IoT-IoT System Management with NETCONF-YANG

UNIT III IOT PLATFORMS DESIGN METHODOLOGY **9**

Introduction- purpose and requirement specification- process, domain model, information model and service specification- IoT level, functional view, operational view specification- device and component integration- application development- case study on IoT system for weather monitoring

UNIT IVLOGICAL DESIGN USING PYTHON **9**

Installing python- python data types and data structures- control flow- function- modules – packages- file handling- date time operations- classes- python packages of interest for IoT

UNITV IOT PHYSICAL DEVICES AND ENDPOINTS **9**

Building blocks of an IoT device- Rasperry Pi- Linux on Raspberry Pi- Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

OUTCOMES:

Upon completion of the course, the students will be able to Identify and design the new models for market strategic interaction

- Design business intelligence and information security for WoB

- Analyze various protocols for IoT
- Design a middleware for IoT
- Analyze and design different models for network dynamics

REFERENCES:

1. ArshdeepBahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
3. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Design business intelligence and information security for WoB
	CO-2	Analyze and design different models for network dynamics

3 **MAPPING(CO's and PO's)**

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	3					3	3		3	
2		2		3			2			

MAPPING(CO'sandPSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1	2	3
2	3	3

23PH1DE012– Product Design and Development

OBJECTIVE

- The course aims at providing the basic concepts of product design, product features and its architecture so that student can have a basic knowledge in the common features a product has and how to incorporate them suitably in product.

UNIT I INTRODUCTION 9

Modern Product development and design theories: Understanding the opportunity, Develop a concept, Implement a concept, Reverse engineering and redesign methodology. Product development process tools: Product development teams, Planning Process, Planning and scheduling tools.

UNIT II CUSTOMER NEEDS AND ANALYSIS 9

Understanding customer needs: Kano diagram of customer satisfaction, Prioritising Customer needs Establishing product function: Function analysis system technique, Function structure. Product tear down and experimentation: Tear down process, methods, applications, Post teardown reporting.

UNIT III BENCHMARKING AND CONCEPT GENERATION 9

Benchmarking and establishing engineering specifications:
Product Portfolios and portfolio Architecture: Portfolio architecture types and choice, Product modularity, Clustering.Generating concepts and concept selection: Information gathering, Brainstorming, TRIZ, Morphological Evaluation, Concept selection Process, Numerical Concept scoring.

UNIT IV CONCEPT EMBODEMENT 9

Concept embodiment: System modeling and embodiment principles. Modelling of Product metrics: Modelling approaches and case studies.

UNIT V DESIGN FOR ENVIRONMENT 9

Design for the environment: DFE methods, Life cycle assessment, Techniques to reduce environmental impact. Analytical and Numerical model solutions: Simulation and optimization techniques. Design for robustness: Robust Design model construction, methods.

OUTCOMES:

On completion of the course the student will be able to understand the integration of customer requirements in product design

Apply structural approach to concept generation, selection and testing

- Understand various aspects of design such as industrial design , design for manufacture , economic analysis and product architecture

REFERENCES

1. Kevin N. Otto, Kristin L. Wood, Product Design, Pearson Education, 2004.
2. Gahl, W Beitz J Feldhusun, K. G. Grote, Engineering Design, 3rd Edition, Springer 2007.
3. W. Ernest Eder, S. Hosendl., Design Engineering, CRC Press, 2008.
4. Ali K. Kamrani and Emad Abouel Nasr, "Engineering Design and Rapid Prototyping", Springer, 2010

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Understand various aspects of design such as industrial design , design for manufacture , economic analysis and product architecture
	CO-2	On completion of the course the student will be able to understand the integration of customer requirements in product design

3 **MAPPING (CO's and PO's)**

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	1		3			3			2	
2		1	3	2			2			3

MAPPING (CO's and PSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1	3	
2	2	2

23PH1DE013– Sports and Event Management

UNIT I INTRODUCTION **9**

Parameters and definition, history of sports, trends in sports paorticipation, pricing of sports participation, the economic impact of sports, sports clubs. Sports club's effectiveness, issues facing sport, trends affecting sports. The role and importance of sport in our society, the benefit of sports, the aim and objectgivees of sport, current issues, sports and society, sport and health.

UNIT II THE VOLUNTARY SECTOR AND LEADERSHIP **9**

Voluntary organizations, sports is a voluntary concept, voluntary ethos, voluntary sports organizations, management of sports organizations, the nature of voluntary organizations, organizsational structures and personalities, governing bodies volunteerism and change, voluntary commitment paid staff dynamic, to retain volunteers, the many roel of sports development officer. Leadership – Transactional or transroamationa, leadership qualities in sports situation. Partnership ana liasions, agenecies involved in sports.

UNIT III PEOPLE AND ORGANISATIONAL MANAGEMENT **9**

Performance appraisal, managing people, what makes a manager, staff app;raisal, staff motivation, delegation, communication, getting the right people, team building team development, personel management. The role of the sports manager, general management approaches, quality management, strategic management, measuring performance, the complexity of sports management, plannint, objectives, control, organizational changers, the management of change, decision making.

UNIT IV MANAGEMENT IN PRACTICE AND CHALLENGES **9**

Management process, financial management, legislation, management of safety, health and safety at work, managing support services, administration, the management of sport as a public service. Challenges – citizens charter, competition, best value, financial control, national standards, pressure for change, voluntary input and management, philosophical challenges, investors in people, leisure trusts, ageing facilities, performance indication.

UNIT V MARKETING, EVENT MANAGEMENT, EDUCATION AND TRAINING AND PERSONAL SKILLS **9**

Marketing ethics, maketing participation, implementing the marketing process, marketing activites, public relations, fund raising, sports spornsorship. Event management – Event feasibility, event planning, event requirements, characteristics of the best events, event evaluation. Education and training – Coaching awards, education versus training, sports management education, running sport, volunteering in sports. Personal Skills – Time management, time management action plan, managing meetings, meetings in practice, personal management.

Total No.of Periods : 45

Reference

1. Hans Westerbeek, Aaron Smith, Paul Turner, Paul Emery, Christine Green, Linda van Leeuwen "Managing Sport Facilities and Major Events", Routledge July 2006

2. David C Watt "Sports Management and Administration", Routledge, Taylor & Francis Group, 2003

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Understand various kinds of management concepts
	CO-2	Apply specific leadership styles different state
	CO-3	Modify suitable management skills for different sports event organization
3	**MAPPING (CO's and PO's)**	

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	3									
2										
3										

MAPPING (CO's and PSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1	3	
2		
3		3

23PH1DE014– Additive Manufacturing Processes and Applications

Unit I Introduction **9**

Introduction to AM, AM evolution, Distinction between AM & CNC machining, Advantages of AM, AM process chain: Conceptualization, CAD, conversion to STL, Transfer to AM, STL file manipulation, Machine setup, build , removal and clean up, post processing.

Unit II Classification of AM processes and Design **9**

Liquid polymer system, discrete particle system, molten material systems, solid sheet system.Design for AM: Motivation, DFMA concepts and objectives, AM unique capabilities, Exploring design freedoms, Design tools for AM, Part Orientation, Removal of Supports, Hollowing out parts, Inclusion of Undercuts and Other Manufacturing Constraining Features, Interlocking Features, Reduction of Part Count in an Assembly, Identification of markings/ numbers etc.

Unit III AM process selection and applications **9**

Guidelines for process selection: Introduction, selection methods for a part, challenges of selection, example system for preliminary selection, production planning and control AM Applications: Functional models, Pattern for investment and vacuum casting, Medical models, art models, Engineering analysis models, Rapid tooling, new materials development, Bi-metallic parts, Re-manufacturing. Application examples for Sports, Aerospace, defense, automobile, Bio-medical and general engineering industries

Unit IV :Post processing of AM parts **9**

Post processing of AM parts: Support material removal, surface texture improvement, accuracy improvement, aesthetic improvement, preparation for use as a pattern, property enhancements using non-thermal and thermal techniques.

Unit V Future Directions of AM **9**

Future Directions of AM: Introduction, new types of products and employment and digiproneurship. Current research on sports products.

REFERENCES

1. Chua Chee Kai, Leong Kah Fai, “Rapid Prototyping: Principles & Applications”, World Scientific, 2003.
2. Ian Gibson, David W Rosen, Brent Stucker., “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, Springer, 2010
3. Ali K. Kamrani, EmandAbouel Nasr, “Rapid Prototyping: Theory & Practice”, Springer, 2006.
4. D.T. Pham, S.S. Dimov, Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling, Springer 2001

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Learning the foundation of additive manufacturing and applying in sports manufacturing process
	CO-2	Understanding the improvement of sports performance and injury prevention due to additive manufacturing process.
	CO-3	Exploring the R&D of additive manufacturing for sports goods

3 **MAPPING (CO's and PO's)**

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	3				3		2		3	
2			2	3	2		2			
3		2		2			3	2	3	3

MAPPING (CO's and PSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1	2	2
2	2	1
3	3	2

23PH1DE015– CFD and FEM simulation for Sports Engineering

Unit 1. Introduction to engineering simulation **9**

History of engineering simulation - Why we need simulation - Experiment vs simulation - Need of Verification and validation - Problem solving through simulation - Simulation accuracy vs Experimental cost - challenges in sports

Unit 2. CFD Equations and Process **9**

Continuity equation, momentum equation, energy equation - Steps involved in the CFD - Equation of state - Navier stoke equation - Boundary condition - RANS, URANS, LES, DES - Introduction to discretisation - structured and unstructured Grid - Grid independent study - Types of errors in CFD - Verification and validation with case study - FDM VS FEM - Guide line and best practices in CFD

Unit 3. FEM Equations and Process **9**

Introduction to FEM - FEM governing equations - 1D FEM analysis - linear and quadratic bar elements - beam and frame elements - 2D FEM analysis - 3, 4 & 6 node elements - Natural coordination and transformation coordination

Unit 4. Heat transfer Simulation **9**

Introduction to Heat transfer Simulations - Types of heat transfer - heat transfer in fluid and related CFD Equations - heat transfer in solids and FEM 1D heat transfer problem.

Unit 5. CFD and FEM application in sports with case studies **9**

Sport's engineering CFD and FEM applications - Stadium and athletes CFD simulation case study - Sport ball and cycle crank FEM simulation case study - athletes helmet heat transfer Simulation case study - Simulation documentation

Text Books

1. An Introduction to Computational Fluid Dynamics: The Finite Volume Method Book by H. K. Versteeg and W. Malalasekera
2. TEXTBOOK OF FINITE ELEMENT ANALYSISTextbook by P. SESHU

References

3. A Hands-on Introduction to Engineering Simulations - https://www.edx.org/course/a-hands-on-introduction-to-engineering-simulations
4. Routledge Handbook of Sports Technology and Engineering. Edited By Franz Konstantin Fuss, Aleksandar Subic, Martin Strangwood, Rabindra Mehta

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Learning the FEM and CFD foundational equation for the simulation
	CO-2	Understanding and implementing the FEM and CFD for the Sports performance improvement and equipment manufacturing
	CO-3	In building the practical knowledge in FEM and CFD for industry readiness and for R&D

3 **MAPPING (CO's and PO's)**

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	3	2		2		3	3	1	2	3
2		3	3	2			2	1	2	
3			3		3			1	3	3

MAPPING (CO's and PSO's)

Course Outcomes (CO)	Program Specific Outcomes(PSO)	
	1	2
1	3	
2	3	2
3		1

23PH1DE017– Wind Engineering for Sports

Objectives:

- Understanding the wind importance and effect in the sports and infrastructure
- Understand the building aerodynamics

- Effect of wind in the sports performance

Unit 1 - Introduction to Wind Engineering **9**

Wind science - atmosphere composition and layers - wind and aerodynamics - wind classification - wind atmosphere boundary layer - ground level measurements.

Unit 2 - Wind action and effect of structure **9**

Evolution of suspension bridge, skycrapter and tower - Design wind speed - Building aerodynamics - Dynamic response to turbulent wind - vortex shedding - galloping - flutter

Unit 3 - Wind measurements in sports and Boundary layer wind tunnel **9**

Measurements of wind speed in sports (100m sprint and long jump) - Effect of wind in the different stadium in running track - ultrasonic anemometer - Wind tunnel - ABL Wind tunnel

Unit 4 - Wind effect in the sports **9**

Effect of wind in the 100 m sprint - wind effect in the field sports - need of indoor stadium

Unit 5 - Wind Engineering Infrastructure and Arena **9**

Building aerodynamics - wind effect on sports infrastructure (long span roof and long High Poles) - stadium cross ventilation - wind comfort and pollution - bioclimatic city planning and architecture

Outcome

1. Optimization of the sports athletes performance from the wind effect
2. Applying the wind science to design the effective and efficient sports infrastructure

Reference

1. Wind Science and Engineering: Origins, Developments, Fundamentals and Advancements (Springer Tracts in Civil Engineering) written by Giovanni Solari
2. MOOC :- Sports and Building Aerodynamics by Eindhoven University of Technology https://www.coursera.org/

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Optimization of the sports athletes performance from the wind effect
	CO-2	Applyingthewindsciencetodesigntheeffectiveandefficientsportsinfrastructure

3 **MAPPING (CO's and PO's)**

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	3			2	2		2	1	2	3
2		3		3	2	3		1	2	

MAPPING (CO's and PSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1	2	1
2	1	3

23PH1GE005 PHYSICS OF SPORTS

Objectives

- To understand the Physics begin the sports action and apparels

Unit 1 Physics Foundation

Measurements and units - fundamental and derived quantity - S.I unit system - Theory of error - Types of error - error reduction - rules of significant figures and round off - Dimensional formula - Kinematics: rest and motion - types of motion - Distance and displacement - velocity and acceleration - Relative velocity - average acceleration - Equation of motion under gravity: falling object, vertically throwing upward - Projectile motion: Horizontal and angular projection - Circular motion.

Unit 2 law of motion, Work, power and energy

Newton's laws of motion - application of Newton law in sports - 2 body contact in horizontal surface - Motion of connected bodies - Lami's theory - conservation of momentum - impulse - Friction - centrifugal and centripetal force

Unit 3 Physics of Field and track sports

Physics of sprint take off and running aerodynamics - wind and altitude effect in the 100 m sprint - Physics of shot put - Physics of high jump

Unit 4 Physics of ball sports

Basic fluid flow - Reynolds number - laminar and turbulent - boundary layer - cricket ball swings - golf ball dimple effect - football banana shot

Unit 5 Physics of water and winter sports

Water resistance, Physics of swimming and sailing- Physics of skiing and ice hockey

Outcome

- Applying the Physics concepts to the sports for coaching and Analysis
- Increasing the athletic performance using Physics

Reference

1. For the love of Physics by Walter Lewin
2. An introduction to Physics of sports by VassiliosMacInnes.
3. The Physics Of Sports
https://www.real-world-physics-problems.com/physics-of-sports.html

2	**COURSE OUTCOMES: Students are able to**	
	CO-1	Applying the Physics concepts to the sports for coaching and Analysis
	CO-2	Increasing th eathletic performance using Physics

3 MAPPING (CO's and PO's)

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	2	3	2		2		1	1		
2		3		3		3	2	2	3	

MAPPING(CO's and PSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1	3	1
2	3	2

23PH1DE019– Aerodynamics in Automobile

Objectives

- To understand the sports car design and vehicle aerodynamics in sports race.
- To understand the Aerodynamics of different vehicles

Unit 1. Introduction to Basic concepts **9**

Introduction to aerodynamics - 1-D frictionless flow (venturi, pitot tube, orifice, nozzle and injector) - high Reynolds number flow and turbulence - Types of drag - drag in different shape - lifting surface - effect of Reynolds number in drag and lift.

Unit 2. Automobile Aerodynamics **9**

Ground effect, Generic automobile shape and vortix, Downflow and vehicle performance, Expected results in CFD, wind tunnel and road (measurements techniques)

Unit 3. Aerodynamics devices and vehicle example **9**

Variable and adaptive devices, passenger car, pickup truck, motorcycle, comparative cars and open wheel race cars

Unit 4. Automobile Aero - Acoustic **9**

Introduction - sound as pressure wave - sound loudness scale - 1D linear wave equation - sound radiation, transmission, reflection, absorption - vortex sound - buffeting - sound and flow control.

Unit 5 Supersonic Aerodynamics - high speed cars **9**

Compressible flow - Normal shock equation- expansion and oblique shock relations - flow over a wedge and cone - Detached shock wave - supersonic nozzle - turbojet engine - thrust SSC land speed record

Outcome

- To design a power efficient and less drag race cars for Sports
- To design environmental friendly race car with less Emission and sound.

Reference

1. Automotive Aerodynamics Book by Joseph Katz
2. Fundamentals of Aerodynamics Book by John D. Anderson
3. Meet the fastest cars in the world 20 years after Thrust SSC's land speed record By Craig Glenday
Published 15 October 2018
https://www.guinnessworldrecords.com/news/2018/10/meet-the-fastest-cars-in-the-world-20-years-after-thrust-sscs-land-speed-record-544103

2	**COURSEOUTCOMES: Students are able to**	
	CO-1	To design a power efficient and less drag race cars for Sports
	CO-2	To design environmental friendly race car with less Emission and sound.

3 **MAPPING(CO'sandPO's)**

Course Outcomes	Program Outcomes									
	1	2	3	4	5	6	7	8	9	10
1	2	3	2	3	2		1	2		
2	3	1	3	2			3	2	3	3

MAPPING(CO's and PSO's)

Course Outcomes (CO)	Program Specific Outcomes (PSO)	
	1	2
1	2	3
2	1	3

23UB1AE501 - VALUE EDUCATION

Course Objectives

1. To incorporate human values in educational system.
2. To imbibe deeper understanding of the need and importance of value-based living.
3. To develop an honourable character.
4. To make the students understand how values lead to success.
5. To make the student realize that all the problems can be solved by one's innate goodness

Unit I: Truth Doesn't Change with Time

1. Universal and Ethical Values
2. Integrity
3. Honesty

Unit II: Living with Values Leads to Success

1. Ethics – Conscience and Loyalty
2. Characteristic Features of an Honourable Person
3. If by Rudyard Kipling

Unit III: Development of Character

1. Character – a Learnt Behaviour
2. Reputation and Character
3. Honourable Character Building

Unit IV: Effect of Thought on Character

1. Man is the Master of Thought
2. Thoughts Crystallize into Habits
3. Good Thoughts and Actions Produce Good Results

Unit V: How to conquer your Problem

1. God is with you to Solve Your Problems
2. You are Greater Than Your Problem
3. Every Human Being has the Built-in Potential to Solve All his Problems

Course Outcomes

1. The students understand the importance of value-based living.
2. Students become aware of the Universal Value System.
3. Students learn how success is directly value based
4. Students develop an honourable character.
5. Students learn to face all the problems courageously

Text Books:

1. Khera, Shiv, Living with Honour, Macmillan Publishers India limited, Chennai, 2003. (Chapters1: Principles of Honour, Chapter 2: Foundation for Success, Chapter 4: Character and Reputation)

2. Peale, Norman Vincent, The Positive way to Change Your Life, Cedar Books (Chapters 3: The Concept That Conquers problems)

3. Alen, James, As a Man Thinketh , Finger print Publishing , 2017 (Chapter 1: Thought and Character, Chapter 2: Effect of Thought on Circumstances).

Supplementary Readings

1. Nagarajan. A Text Book on Professional Ethics and Human Values. New Age International limited Publishers, 2006.

2. Kalam, Abdul. My journey –Transforming Dreams into Actions. Rupa Publications, 2013

23UB1CT401 - RESEARCH PROCESS IN YOGA

Program Objectives:

- To know about the scope of Research in Yoga
- To know about the conception of Formulation of hypothesis
- To understand the Case study method
- To know about the Sampling
- To know about the concept of Historical Research

UNIT - I:

Research- Meaning, Definition, Need, Nature and scope of Research in Yoga, Types of research-Basic- Applied- Action- Qualities of a researcher-Criteria in locating and selecting research problem.

UNIT - II:

Preparation of Research Proposal- Mechanism of research proposal - Formulation of hypothesis- Variables and its types.

UNIT - III:

Types of Research Design, Descriptive Research- Survey method, Case study method, Experimental method- Categories: Longitudinal design, Quasi Experimental design, cross sectional design, Double blind placebo design Experimental Design Types: Single group design, Reverse group design, Repeated Measures design, Static group comparison design, otated group design, Random group design, Equated group design, Factorial design.

UNIT - IV:

Data- Population- Sample- Subject- Sampling: Characteristics, principles, steps, determining the sample size, criteria in selection, Types of sampling: probability sampling methods-Random and complex, non-probability sampling methods

UNIT - V:

Methods of Research: Experimental, Descriptive, Historical, Qualitative and Quantitative methods.

Course Outcomes:

- Student can get the Preparation of Research Proposal
- They will get the full idea about the Types of Research Design
- Student can get full knowledge in Types of sampling.
- They can get knowledge about the Methods of Research
- Finally, the student will get full blueprint about Basic Research in Yoga.

Reference:

- Clarke David II and Clarke ,Hamison (1984) Research processes in Physical Education, New Jersey: Prentice Hall Inc.
- Bea, John W. and Kalm James, V. (1980) Research in Education, New Delhi: Prentice Hall of India.
- Clarke, H. Hanison and Clarke David H. (1972) Advanced Statistics, New Jerycy Prentice Hall Inc.
- GarvetHeary E and Woodworth R.S (1958) Statistics in Psychology and Education, Bombay:Allied publication pvt L.
- Thirumalaisamy (1998) Statistics in Physical Education, KaraikudiSemhilkumar publishers
- Thomson AL (1986) The Art of Using Computers, Boyd &Frasher Baston Publishing Co.
- Jerry R Thomas And Jack K Nelson 2000) Research Methods in Physical i Activities, Illaosis: Humas Kinetics,
- Craig Willians and Chris Wragg 2006) -Data Analysis and research for sport and exercise science, London Routledge Press
- Paul Kinnear and Colin D Gray (2006)-SPSS 14 Made Simple, New York: Psychology Press.
- Kothari CR (1985) Research Methodology, New De: Wiley Eastems Limited
- Stangeven R (2016) Research forouerses yoga chema: publications.

MappingWithProgrammeOutcomes:

	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	M	S	M	S	S

CO3	**M**	**M**	**S**	**M**	**S**
CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**S**	**S**	**S**

***S-Strong3;M-Medium2;L-Low1**

23UB1CT402 - YOGA THERAPY - I

Program Objectives:

- To know about the origin and History of Yoga Therapy
- To know about the Ayurveda
- To understand the Therapeutic applications for diesase
- To know about the Therapeutic applications for stress
- To know about the Therapeutic applications for pregnancy- Pre and post-natal care

UNIT I:

The four aspects of life (Soul, Mind, Senses and Body) - Panchamahabhutas (the five-element theory) - Ahara, Vihara and Ausadhi (three pillars of ayurveda) - Concept, role and importance of Dosa, Dhatu, Mala, Updhatu, Srotas, Indriya, Agni,Prana, Panayatna, Prakrti, Deha Prakrti, Manasa Prakrti.

UNIT II:

Stress management - Stress definition - Stress in daily life – How stress affects one's life -Identifying the cause of stress - Symptoms of stress -Managing stress (habits, tools, training, professional help) – Complications of stress mismanagement.Sleep - Sleep and its importance for mental wellness-Sleep and digestion.Immunity- Types and importance – Ways to develop immunity

UNIT – III:

Basic Concepts of Yoga therapy

- Physiology and Pathology in the Yoga – Shastra
- Ahimsa
- Union
- Work with the mind
- Important of breath

- Body – the power tool
- Technique vs effect

Unit IV:

General introduction, definition, history and principles of Nisargopachara - Concept, role, qualities, functions and importance of five elements - Relationships of five elements with seasons, body and mind - Philosophy of Nisargopachara - Western and Indian Concept of health and disease in Nisargopachara - Main principles of Naturopathy (Nisargopachara).

Unit V:

Therapeutic applications for Typhoid, Tuberculosis, Crohn's, Appendictis; Inflammatory diseases of appendix and large intestine: Amoebic colitis, Bacillary dysentery; Ulcerative Colitis; Ischemic and Pseudomembranous enterocolitis, diverticulosis

Program Outcomes:

- Student can get the basic knowledge about Yoga Therapy
- They will get the full idea about the Traditional Indian medical systems and therapies
- Student can get full knowledge in Therapeutic applications for disorders
- They can get the very valuables thoughts in Therapeutic applications for psychological disorders
- Finally, the student will get full idea about the Therapeutic applications for the problems of women

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2. Atharale V.B. (1980) basic principles of Ayurveda, Bombay: Pediatric clinics.
3. Frawley David (2000) Yoga and Ayurveda Delhi: Motilal banarsidass Publishers Pvt Ltd.
4. Balkrishna Acharya (2012) A practical approach to the Science of Ayurveda, Haridwar: Divya Prakashan.
5. Frawley David and Sandra Summer field kozak (2011) Yoga for your type New Delhi: New Age Books.

6. Vasant Dattatray Lad (2007) Secrets of the pulse The Ancient art of Ayurvedic Pulse Diagnosis Delhi: Motilal Banarsidass Publishers Pvt.Ltd.

7. Ashwini yogi (2011) Sanatan Kriya. The Ageless Dimension, New Delhi: Dhyan Foundation.

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9. Sivananda Swami (2006): Practice of Ayurveda Shivanandanagar: The Divine Life Society.

10. Atreya (2000) Ayurvedic Healing for women, Delhi, Motilal Beharsidass.

11. Joshi Rajani (2007) Health tips from the Vedas Haridwar: Shri .Vedmata Gayathri trust.

12. Thirunarayanam (2012) Introduction to Siddha Medicine, Chennai: centre for Traditional Medicine and Research.

13. Bakhru (2011) The complete Hand book of Nature cure, Mumbai: Jaico publishing House.

14. Gala DR, Dhiren Gala and Sanjay gala (2008) Nature cure for common diseases, Ahmadabad: Navneet publications (India) Ltd.

15. Murthy Chidananda (2010) yogic and naturopathic treatment for common ailments, New Delhi: Central council for research in Yoga and Naturopathy.

16. Basavaraddi Ishwar (2012) Important therapeutic modalities used in Naturopathy, New Delhi. Central council for Research in Yoga & Natruopathy.

17. Murthy Chidananda(2011) Yoga and Naturopathy New Delhi: central council for Research in yoga and Naturopathy.

Mapping With Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	M	M	S	S
CO 2	M	S	M	S	L
CO 3	M	M	S	M	S
CO 4	S	M	L	S	M
CO 5	S	S	S	S	S

***S-Strong 3 ; M-Medium 2 ; L-Low**

23UB1CT503 - CLASSICAL YOGA WITH PROPS & MODIFICATIONS – IV

Program Objectives:

- To know about the practices of Chandra namaskar with properties.
- To know about the practices of Asanas with properties
- To understand the practices of Pranayama
- To know about the Shat Kriya practices.
- To know about the meditation practices.

UNIT - I:

i Essentials of Yogic Practices

ii Loosening Exercies - Pawanmuktasanaseries.-3

iii Surya namaskar: Sivananda model, Chandra namaskar.

iv Usage of props like wooden brick and foot rest, Belts, Ropes, Slanting planks, Chair, Stool, Bench & box, The heart rack, Ladder stool and drum, Bolsters and pillows, Bandage, Weights, Horse (big & small)

UNIT -II:

Asanas&Pranayama

Virabhadrasana, Parsvottanasana, UtthitaTrikonasana, AdhomukhaSvanasana, Karnapitasana, Kandharasana, Tittibhasana, Padma Sarvangasana, SalambaSirshasana, Gomukhasana, SetuBandhasana, Chakrasana, TriangaMukhaikapadaPachimottanasana, Marichyasana, Virasana, Svastikasana, Shashangasana, Garudasana, Mayurasana, Padma mayurasana, Bhadrasana, Simhasana, AkarnaDhanurasana, Parsvakonasana, Savasana .

Usage of props like wooden brick and foot rest, Belts, Ropes, Slanting planks, Chair, Stool, Bench & box, The heart rack, Ladder stool and drum, Bolsters and pillows, Bandage, Weights, Horse (big & small)

Pranayama

Moorchapranayama

Anulomaviloma

Sadanta Pranayama

Pranayama with Kumbhaka and bandhas

UNIT -III:

Kriya, Bandha and Mudra

Shat Kriya (Kapalapathi, Trataka, Neti, Dauti, Nauli, Basti.)

Bandha: Uddiyana bandha, Molabandha

Mudras: Yoni mudra, Lotus mudra, Dhyani mudra, Sakthi mudra, Shambavi mudra, Pashinee mudra, Maha Bheda mudra, Ksepana mudra.

UNIT -IV:

Relaxation Techniqe & Meditation

QRT (Quick Relaxation Techniqe)
Meditation: walking meditation, Vipasana meditation, nine centred meditation, yogic Sukshma vyayama, Sudharshana kriya, Zen meditation, Savita kidhyan Dharana, Mind Sound Resonance technique.

UNIT - V:

Physiological, Psychological effects on asana, pranayama and meditation.

Course Outcomes:

- Student can get the basic knowledge about Practices of Loosening Exercises, Surya namaskar & Chandra namaskar wit properties.
- They will get the full idea about the Asana with props & Pranayama with Kumbhaka and bandhas
- Student can get full knowledge in Practices of Bandha, Mudra &Relaxation Technique
- They can get knowledge about the different ways of meditation
- Finally, the student will get full blue print about Yoga practices with props.

References:

- Iyenger BKS (1976) Light on yoga, London, Unwin paper packs.

- Sivananda Sarawathi swami (1934) Yoga Asanas Madras: My magazine of India.
- Satyanadasatawaniwami (2008) Asana, Pranayama, Mutra, Bandha, Munger Yoga publications trust.
- Iyenger BKS (2008) Light on pranayam, New Delhi: Haper Collins publishers India.
- Chandrasekaran (1999) Sound Health Through Yoga, Sodapatti, Prem kalyan Publications.
- Vishnu Devananda Swami (1972) The complete Illustrated book of yoga, New York: Pocket Books
- Yogeshwaran and saraswathi swami (1975) First steps to higher yoga, Gangothari: Yoga niketan trust.
- Coulter, H David (2001) Anatomy and Hatha yoga, USA. Body and Breath Inc.
- Kirk Martin (2006) Hatha Yoga Illustrated Champaign: Hamenkinetics.
- Gharote (2004) Applied yoga, Lonvla: Kaivalyadhama.
- Kathy lee Kappmeier and Diane M.Ambrosini (2006) Instructing Hatha Yoga. Champaign: Human Kinetics.
- Satyanadasaraswati Swami (2007) Meditations from thitantras. Murgar: Yoga publications trust.

Mapping With Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5
CO1	**S**	**M**	**M**	**S**	**S**
CO2	**M**	**S**	**M**	**S**	**S**
CO3	**M**	**M**	**S**	**M**	**S**
CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**S**	**S**	**S**

***S-Strong3;M-Medium2;L-Low1**

23UB1CT603 – REVENUE MODELS IN YOGA

PROGRAM OUTCOME :

➢ To know about the Yoga discipline and significance
➢ To learn details about International Yoga Day
➢ To understand the CSR model Yoga
➢ To understand the concept of AYUSH
➢ To know about the Essentials and demand of Yoga

UNIT- I:

Significance of Yoga discipline - Yoga Careers-Yoga 360-Innovations in Yoga disciplines - Yoga trends- Yoga discipline major and minor triggers International Yoga Day, Covid etc.

UNIT- II:

Yoga ecosystem - Yoga studio - start up enterprise -Government initiative towards Yoga- Corporate Social Responsibility CSR-model initiative implementing Yoga 4.0 for initiative.

UNIT- III:

International outlook-corporate linkage- Yoga retreat.

UNIT- IV:

Role Yoga in Integrated medicines and interdisciplinary studies- Role of Yoga in AYUSH -customization of Yoga.

UNIT – V

On demand progress - affiliated marketing- membership site - affiliated marketing monetizing social media.

COURSE OUTCOME:

➢ Student can get the information about IDY Yoga
➢ They learned way of practices advance technology.
➢ Student can get the overall perfection of smart work
➢ They will learn how to pepper technology, knowledge, and ecosystem.

REFERENCES:

1. Acsm's (2001) Guidelines for Exercise Testing and Prescription by American College of Sports Medicine Human kinetics USA.
2. Asikainen, A. M. (2015). Revenue Models of Mobile Health Applications: Free-to-play applications.
3. Boykin, J., Leitheiser, J., & Martin, F. (2015). The HPT model applied to a yoga studio's performance. Performance Improvement, 54(1), 28-38.
4. Yoga, I., & Yudiarta, I. G. A. (2021). Grey forecasting of inbound tourism to bali and financial loses
from the COVID-19. International Journal of Grey Systems, 1(1), 48-57.
5. Kepner, J., Taylor, M., Gates, J., Crutchfield, L., & Roth, B. (2005). Financial Support for Yoga
Therapy: A Montage of Possibilities. International Journal of Yoga Therapy, 15(1), 105-118.
6. Swamy, H. D., & Agoramoorthy, G. (2021). The coronavirus pandemic impact on India's Yoga
tourism business. Yoga Mimamsa, 53(2), 145-148.

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8. Saheb, T. (2020). An empirical investigation of the adoption of mobile health applications: integrating big data and social media services. Health and Technology, 10(5), 1063-1077.
9. Torous, J., & Roberts, L. W. (2017). The ethical use of mobile health technology in clinical psychiatry. The Journal of nervous and mental disease, 205(1), 4-8.
10. Helen Purpleheart (2004), The Yoga Adventure for Children. Netherlands: A Hunter House book.
11. Chakravorty, P., & Kugle, S. (2009). Performing Ecstasy. New Delhi: Manohar.
12. Ernst, C. W. (1998). The psychophysiology of ecstasy in Sufism and Yoga. North Carolina medical
journal, 59, 182-185.
13. White, J. Achieve Cosmic Consciousness Through Sexual Ecstasy.
14. Morgan, P. (2023). Journal of Contemplative & Holistic Education. Reflections, 5, 10-2023.
15. James-Palmer, A., Anderson, E. Z., & Daneault, J. F. (2022). Remote delivery of yoga interventions
through technology: Scoping review. Journal of Medical Internet Research, 24(6), e29092.
16. Singleton, M., & Goldberg, E. (Eds.). (2013). Gurus of modern yoga. Oxford university press

Mapping With Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	M	S	M	S	S
CO3	M	M	S	M	S
CO4	S	M	M	S	M
CO5	S	S	S	S	S

***S-Strong3;M-Medium2;L-Low1**

23UB1CT604 - YOGA THERAPY - II

Program Objectives:

- To know about the origin and History of yoga therapy
- To know about the Definition of Cikitsa
- To understand the Physiology and Pathology in the Yoga
- To know about the Yogam and Ksemam
- To know about the concept of koshas &doshas

UNIT - I

History of yoga therapy- Essence and Principles of Yoga therapy
Principles of Vini Yoga

- Definition of Vini Yoga
- Srsti Karma
- Siksana Krama
- Rakshana Krama
- Cikitsa mode of application

UNIT – II

Fundamental Principles of Yoga therapy

- Definition of Cikitsa
- Medical System vs Health Management
- Its exact role in health management
- The focus of Cikitsa
- Relationship

- Acharya

UNIT – III

Basic Concepts of Yoga therapy

- Physiology and Pathology in the Yoga – Shastra
- Ahimsa
- Union
- Work with the mind
- Important of breath
- Body – the power tool
- Technique vs effect

UNIT – IV

Progression and Individual focus in Yoga therapy

- Starting Point
- Fixing the goal
- Progression
- Coming out of practice
- Yogam and Ksemam
- Kala, Desa, Vaya, Vrtti, Sakti
- The nature of ailment
- Isvarapranidhana

UNIT – V

Physiology and pathology in the yoga- Shatra- koshas- doshas- Pancha prana- Application of Yoga and its types - Methodology in Yoga Therapy - Factors (Heyam, Hetu, Hanam and Upayam).

Course Outcomes:

- Student can get the basic knowledge about Essence and Principles of Yoga therapy
- They will get the full idea about the Basic Concepts of Yoga therapy
- Student can get full knowledge in Progression and Individual focus in Yoga therapy
- They can get idea about the physiology and pathology method in Yoga Therapy
- Finally, the student will get full blue print about Principles of Yoga therapy.

References:

- Translated by TKV Desikarchar, 'Nathamuni`s Yoga Rahasya' 1998, Chennai, KYM publications.
- Translated by TKV Desikachar, 'Patanjali`s Yoga Sutra'.1987, Chennai, KYM publications.
- TKV Desikarchar with Kausthub Desikachar and Frans Moors, 'The Viniyoga of Yoga' 2001, Chennai, KYM Publications.
- Gopi Warrier and Deepika Gunawant, 'The complete Illustrated guide to Ayurveda' 2000, Elemetn Books Ltd.
- TKV Desikachar, 'The Heart of Yoga'. 200, USA, Inner Traditions

Mapping With Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	M	S	M	S	S
CO3	M	M	S	M	S

CO4	**S**	**M**	**M**	**S**	**M**
CO5	**S**	**S**	**S**	**S**	**S**

***S-Strong3;M-Medium2;L-Low1**

23UB1DE201 - Human Anatomy and Physiology –II

General Physiology

Program Objective:

- To acquire the knowledge about essential of cell and tissue's function.
- To understand the formation and function of Blood in our Body.
- To obtain the detailed knowledge about Cardiovascular system.
- To obtain the detailed knowledge about Respiratory system.
- To obtain the detailed knowledge about Digestive system.
- To get the knowledge of Reproductive system.
- To understand the types of Neuro muscular and functions.

UNIT- I :1. Introduction and Scope of Physiology

Cell and tissue - Its structure, principal constituents, properties and functions including cell division.

Body Fluid.

(a) Blood: Composition and general functions of plasma. Blood cells – structure and function - Red Blood cells, white Blood Cells – including numbers and approximate length of life –position, structure and function of cells of Reticulo endothelial system.

(b) Blood clotting including bleeding time and clotting time, factors accelerating or slowing the process. Blood groups and their significance, Rh-factor, Haemoglobin and E.S.R.

(c) Formation of Blood, tissue fluid and lymph.

UNIT – II

Cardio-Vascular System.

(d) Structure and properties of Heart Muscles and nerve supply of Heart.

(e) Structure and functions of arteries, capillaries and veins.

(f) Cardiac cycle and Heart sound.

(g) Cardiac output measurements, factors affecting Heart Rate and its regulation.

(h) Cardio-vascular reflexes**.**

(i) Blood pressure, its regulation, physiological variation, peripheral resistance, Factors Controlling Blood Pressure, Haemorrhage.

(j) ECG study and stress test.

Respiratory System.

(k) **Mechanism of Respiration**, Changes in diameter of thorax, Intra-pleural and Intra-pulmonary pressure.

(l) Quantities of lung volume, tidal and residual volume, vital capacity.

(m) Gaseous inter-changes in lung and tissues.

(n) Control of respiration-Nervous and chemical significance of changes in rate and depth, transportation of oxygen and carbon dioxide.
(o) Respiratory states-anoxia, asphyxia, Cyanosis, Acclimatization.

Digestive System

(p) General arrangement of alimentary canal, liver, pancreas-**position, structure and functions.**
(q) Nutrition and Diet-carbohydrate, protein, fat, salts, water, vitamins and minerals digestion, absorption and Metabolism.

Definition, Guidelines, Procedure, Breathing technique, Awareness, Contra-indication, and Benefits.

UNIT – III

Reproductive System.

(a) Sex determination and development of puberty, male sex hormones, spermatogenesis, Female sex hormones, menstrual cycle. Ovulation, pregnancy, Function of placenta, lactation.

1. Excretory System.

(a) Gross and minute structures of kidney, renal circulation, Mechanism of formation of urine, Glomerular filtration rate and tubular function, renal function and renal tests. Physiology of micturition.

2. Endocrine System.

(a) Structure and function of pituitary (anterior & posterior). Thyroid, Para-thyroid, adrenal cortex, adrenal medulla, Thymus and pancreas.
(b) Blood sugar regulation.

UNIT - IV

Neuromuscular Physiology

1. **Cell Membrane**–Ionic and Potential gradient and transport.
2. **Muscle**s – Types of muscular tissue – Gross and Microscopic structure – function. Basis of muscle contraction – changes in muscle contraction, Electrical – Biphasic and mono-phasic action potentials, chemical, Thermal and physical changes, Isometric and Isotonic contraction.
3. **Motor units and its properties**–clonus, tetanus, Allor none law, Fatigue.
4. **Nerve**–Gross and microscopic structure of nervous tissue, one neuron–Generation of action potential – Nerve impulse condition

UNIT -V

5. Neuromuscular Junction.

6. **Degeneration** – Regeneration of peripheral nerves, electro tonus and Pfluger's law.
7. Types and properties of receptors, types of sensations, synapse, reflex arc, its properties-occlusion, summation, sub minimal fatigue etc.
8. **Tracts**–Ascending and descending and extra-pyramidal tracts.
9. Functions of E.E.G.
10. Functions of Cerebral cortex, cerebrum, cerebellum, Basal ganglia.
11. Thalamus – connection and functions.
12. Reticular formation – tone posture & equilibrium, Autonomic nervous system.
13. Special Senses Eye-Errors of refraction, equilibrium, Autonomic nervous system.
14. Speech and its disorders.

15. Ear and Vestibular apparatus, taste, olfactory, somatic sensations.

Course Outcomes:

- Student can get the thorough knowledge of cell and tissue function
- They will get the idea about formation of Blood in the body.
- They can get the knowledge of Cardiovascular system.
- They can obtain the knowledge of Respiratory system.
- They can acquire the knowledge of Digestive system.
- They can get the knowledge of Reproductive system.
- They can came to know about neuro muscular functions.

Text Books:

1. Tortora and Bryan: Anatomy and Physiology
2. Khurana: Anatomy and Physiology
3. Text book of Anatomy (III volumes)–BD Chaurasia
4. Practical Anatomy–Cunningham
5. Dr Shirley Telles & Dr HR Nagendra, AG limpse into the human body, Swami Vivekananda Yoga Prakashana, Bangalore, 2002

References:

1. Gore, M.M.: Anatomy and Physiology of Yogic practices (Kanchan Prakshan, Lonavala, 2003)
2. SriKrishna: Notes on Structure and Functions of Human Body and Effects of Yogic practices on it (Kaivalydhama S.M.Y.M Samiti, Lonavala,1988)
3. Charu, Supriya: Sarir Rachanaevam Kriya Vigyan
4. Evelyn, C. Pearce: Anatomy and Physiology for Nurses (Faber and Faber Ltd. London,1968)
5. Chatterjee, C. C.: Human Physiology (Vol.I & II) (Medical Allied Agency, Calcutta,1992)
6. Lan Peate and Muralidharan Nayar–Fundamental of Anatomy and Physiology for students nurses
7. Evelyn, C. Pearce-Anatomy and Physiology for Nurses

MappingWithProgrammeOutcomes:

	PO1	PO2	PO3	PO4	PO5
CO1	S	M	L	S	S

CO2	**S**	**S**	**M**	**S**	**L**
CO3	**M**	**L**	**S**	**M**	**S**
CO4	**S**	**L**	**M**	**S**	**M**
CO5	**S**	**M**	**M**	**L**	**S**

***S-Strong3;M-Medium2;L-Low1**

23UB1IT501 - INTERNSHIP (Hospital)

Duration	:	Five Days
Semester	:	IV
Mode of Evaluation	:	Internal Assessment
Maximum Marks	:	100
Subject	:	Yoga
Nature of Programme	:	To bring awareness to gain knowledge, to teach and train people

23UB1SE202 - PRACTICAL -II: HUMAN ANATOMY AND PHYSIOLOGY - II

Program Objectives:

- To know about the Measurement of Blood Pressure.
- To know about the Muscle Examinations.
- To understand the Sensory function.
- To know about the Measurement of Pulse rate, Respiratory rate and Temperature.
- To know about the Identification of a Specimen.

UNIT-I

(a) Hematology: RBC count, WBC count, differential count. ESR, Bleeding & Clotting time,Estimationofhemoglobin, Bloodgroups.

UNIT-II

Human Physiology: Examination of (a) Respiratory system (b) heart and arterial pulse (c)deep and superficial reflexes (d) cranial nerves(e) motor system (f) sensory systemincludinghigherfunction(g) measurement ofblood pressure.

UNIT-III

Measurement of Blood Pressure
Measurement of Temperature, Pulse rate, Respiratory rate Sensory function –Examinations- Muscle Examinations

UNIT-IV

Identification of a specimen organ and explain its functions.

UNIT -V

Identification of a specimen organ and explain its functions.Effect of Exercises on body physiology

Course Outcomes:

- Student can get the basic knowledge about Muscle Examinations.
- They will get the full idea about the Measurement of Temperature and Pulse rate in Human body.
- Student can get full knowledge about Sensory functions.
- They can get the idea about how to measure Blood pressure.

- Finally, the student will get full knowledge about Physiology.

References:

- Arthur C. Guyton & John Edward Hall (2006), Textbook of Medical Physiology, Florida, United States, Elseiver Standards.
- Surinder H Singh & Krishna Garg. (2008), Anatomy and Physiology for nurses & allied health sciences, New Delhi CBS Publishers.
- Sivaramakrishnan S. (2006), Anatomy and Physiology for Physical Education, New Delhi, Friends Publishers.
- Anne Waugh & Alson Graunt (2005) Anatomy and Physiology in Health and Wellness, Allahabad, Churheill Livingtone.
- Clark Robert K (2005), Anatomy & Physiology-Understanding the Humanbody, Suddury, United States, Jones & Bartiett.
- Shri Krishna (1985) Notes on Structure and Functions of Human body &Effects of Yogic practices in it, Mumbai. ICYHC Kaivalyadhama.
- Dutta Ray (2001) Yogi Exercises, New Delhi: Jaypee Brothers.
- Shirley Telles (2006) A Glimpse of the human, Bangalore: SwamiVivekananda yoga prakashana
- 9 Leslie kaminoff (2007) yoga anatomy, champaign: Human Kinetics
- 10 Peter L. Williams & Roger Waswie (1988) Gray's Anatomy, Edinburgh:Chuchill Livingstone.
- 11. Evelyne C peace (1997) Anatomy & Physiology for Nurses, New Delhi:Jaypee Brothers.
- 12. Gore MM. (2003) Anatomy & Physiology for yogic practices, Lonavala :KamhanPrakshan.

Mapping With Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5
CO1	S	M	L	S	S
CO2	M	S	S	M	L
CO3	M	M	S	L	S
CO4	S	L	M	S	M
CO5	M	S	M	L	S

*S-Strong3;M-Medium2;L-Low1

23UB1SE503 - YOGA PROJECT & VIVA VOCE

Each candidate shall be registered to take up project work in the final year. The student will select the topic and the project report along with the signature of project supervisor, shall be submitted to the Controller of Examination, Tamil Nadu Physical Education and Sports University.

COURSE CODE – 23UC1CT602

CLINICAL EXERCISE PHYSIOLOGY

Learning Objectives:

1. To understand the relationship between exercise and Overweight versus Obesity

2. To understand knowledge of various factors that must be considered in planning

and implementing detailed exercise programme on diseased populations.

3. Students will be able to define terminology related to exercise for special

populations.

4. Will be able to explain general principles of exercise prescription for special

populations.

5. Able to identify the important differences between children and adult.

UNIT - I- Overweight versus Obesity- Estimation of Body Fatness Using Body Mass Index- Use of Body Mass Index in the Clinical Setting - Fat Cell Size and Number: Hypertrophy versus Hyperplasia - Specific Health Risks of Excessive Body Fat- Importance of Body-Fat Distribution Pattern- Influence of Genetics Versus Environmental Factors.

UNIT-II- Meaning and Definition of Exercise and ageing- Theories of ageing: Biological theories-Psychological theories-Sociological theories- Impact of Ageing on Major Physiological Systems and Performance: Cardiovascular and respiratory systems- Musculoskeletal system-Nervous system-Endocrine system -Exercise guidelines for older people.

UNIT-III- Meaning and Definition of Arthritis- Types of Arthritis: osteoarthritis and rheumatoid arthritis- Epidemiology-Pathophysiology-Exercise for Osteoarthritis and Rheumatoid Arthritis: Aerobic activity-Flexibility exercise-Proprioceptive exercise-Strength training for osteoarthritis and rheumatoid arthritis.

UNIT – IV- Meaning and Definition of Osteoporosis and Osteopenia- Risk factors for osteoporosis and osteopenia-Assessment of osteoporosis-Physical Activity and Bone Health: Exercise guidelines -Jumping-Walking-Resistance training- Asthma-Diagnosis and Causes-Prevention of Asthma- Exercise-Induced Asthma.

UNIT – V- Relative Energy Diet (RED-S) - Physiology of the Exercising Female: Definition of menstrual cycles-Regulation of Menstrual Cycle – Menstrual disorders for female athletes. The menopause-Cause for Menopause-Physical activity guidelines for thepostmenopausal female-Pregnancy-Changes in Physiological Systems-Physical activity guidelines for the pregnant female-Special Considerations.

Reference Books:

1. John P. Buckley, (2008), Exercise Physiology in Special Populations, Advances in Sport and Exercise Science, Churchill Livingstone/Elsevier.

2. Sembulingam. K and Prema Sembulingam, (2012), Essentials of Medical Physiology, Jaypee Brothers Medical Publishers (P) Ltd, Ansari Road, Daryaganj, New Delhi.

3. Longenbaker, Susannah Nelson, (2017), Mader's Understanding, Human Anatomy & Physiology, McGraw-Hill Education, 2 Penn Plaza, New York.

4. Scott J. Power and Edward Howley, (2009), Exercise Physiology Theory and Application to Fitness and Performance, McGraw-Hill Higher Education, Boston Burr Ridge, IL Dubuque, IA New York.

Course Outcomes

After successful completion of the course the student will be able to

CO1	To understand the physiology of Overweight and Obesity
CO2.	To understand the aging in the body system and Exercise guidelines for older people.
CO3.	Gain knowledge of Strength training for osteoarthritis and rheumatoid
CO4.	Gain knowledge of Strength training for Osteoporosis and Osteopenia.
CO5.	To understand Menstrual disorders for female athletes

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	L	M	S	M
CO 2	S	M	L	S	M
CO 3	S	M	M	S	S
CO 4	S	M	M	S	M
CO 5	S	S	M	S	S

***S-Strong 3 ; M-Medium 2 ; L-Low 1**

COURSE CODE – 23PC1DSE003

CLINICAL SPORTS NUTRITION

Learning Objectives:

Focuses on the components of the fitness associated with optional health

1. Learners will explore the associations among physical activity, health and hypothetic disease, health screening, principles of assessment.

2. Describe and discuss the relationship between physical activity and health across the lifespan.

3. To understand the nutritional requirements and considerations for athletes with clinical conditions, special conditions and special dietary need

Unit I: Nutritional Genomics: Genetic Fundamentals - Genetics and Genomics: Nutritional Genomics, Nutrigenetics, and Nutrigenomics - Modes of Inheritance: Mendelian inheritance, mitochondrial inheritance, and epigenetic inheritance- Genetics and Nutrition TherapyNutrigenomic Influences on Health and Disease- Epigenetic Influences on Health and DiseaseNutritional Genomics and Chronic Disease.

Unit II: Disordered eating in athletes: Disordered eating categories/classifications- Prevalence of disordered eating among athletes- Etiology of disordered eating among athletes- Performance and health consequences disordered eating- Prevention of disordered eating among athletesManagement of disordered eating among athletes, Female Athlete Triad- Prevention and treatment of the Female Athlete Triad.

Unit III: Bone, exercise and nutrition: Definitions of sports osteopenia and osteoporosisExercise effect on bone in athletes and healthy people- Calcium intake and bone mineral changes at various life stages- Effect of calcium intake during childhood and adolescence on bone mineral density- Effect of calcium intake on BMD during the premenopausal years, early postmenopausal and later postmenopausal years on BMD- Effects of amenorrhea on bone mass- Stress fractures in athletes with menstrual disturbances.

Unit IV: Iron- Stages of iron depletion- Iron Depletion in Athletes- Sport Anaemia- Causes of iron deficiency in athletes- Assessment of iron status of an athlete: Serum ferritin- Serum transferrin- Red blood cell- Hemoglobin and haematocrit- Hepcidin- Clinical symptoms- Dietary intervention for iron depletion and iron deficiency.

Unit V: Gut Health : Definition of Gut Health – sign of poor Gut Health – signs of good Gut health – Gut Health and Its importance – Brain –Gut connection – Gut Health and Skin Health –

Gut microbiome – Gut Health and Depression – Gut Health and Emotional Wellbeing – Best Probiotics for Gut Health – Gut Health Diet – IBD , IBS – signs and symptoms – food to avoid.

Reference Book:

1. Louise Burke and Vicki Deakin, (2010), Clinical sports nutrition, 4th ed., McGraw-Hill Australia Pty Ltd

COURSE OUTCOME:

On successful completion of the course, the students should be able to:

CO1 Understand the Nutritional Genomics

CO2 Explain the Disordered eating in athletes

CO3 Understand the knowledge of Bone, exercise and nutrition

CO4 Describe the Sport Anaemia and Causes of iron deficiency in athletes

CO5

Applying the knowledge of nutritional requirements for athletes with Gut Health and Its Importance

MAPPING WITH PROGRAMME OUTCOMES:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	L	M	S	M
CO 2	S	M	L	S	M
CO 3	S	M	M	S	S
CO 4	S	M	M	S	M
CO 5	S	S	M	S	S

*S-Strongly correlated 3 ; M- Moderately correlated 2 ; L-Low 1

TAMIL NADU PHYSICAL EDUCATION AND SPORTS UNIVERSITY

CHENNAI – 600 127

REGULATIONS FOR

BACHELOR OF BUSINESS ADMINISTRATION

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DEPARTMENT OF SPORTS MANAGEMENT AND SPORTS PSYCHOLOGY & SOCIOLOGY

23UE1AE101 – I - SOFT SKILLS – I (Présentation Skills)

OBJECTIVES:

To enrich the Presentation skill of the students.

LEARNING OUTCOMES:

Students will be able to communicate their ideas through different modes and medium. They will be able to make memorable presentations professionally. Students will understand different strategies to adopt while communicating with different personalities with different goals.

BRIEF CONTENTS

Self Introduction – News Reading – Story Telling - Group Discussions - Talk Shows and Role Plays - Personal Interview - Movie Reviews, Article Reviews, Book Review and Speech in General Occasions.

Evaluation:

The performance of the students for this course will be evaluated for a total of 100 marks, of which 50 marks for internal (Evaluation of the student by the Faculty In-charge of the program) and 50 marks for external (Viva Voce Examination duly conducted by an external Examiner). Students have to appear for the Viva voce Examination in the presence of Panel of Examiner and secure a minimum of 40% of marks in the two components to clear the course. A student who fails in the Viva voce examination will have to redo the same during the subsequent year.

SEMESTER- II - PAPER CODE – 23UE1SE202
Part – III – Skill Enhancement Course – IV – SPORTS FIRST AID

OBJECTIVES:

This course is designed students to get first aid awareness for sports time.

LEARNING OUTCOMES:

Students will demonstrate an understanding of basic first aid process for sports time.

Unit-I

Sports first aid - sports first aider – aims and principles of first aid – functions of first aider - responding to an emergency - assess a situation quickly (drabc) – basic first aid inspection for consciousness (avpu) – priority of casulaties - responsiblities of first aider – recovery position.

Unit – II

Sports injuries – types of injuries – definition, causes, clinical features, management and prevention of soft tissue injuries: skin injuries – strain – sprain – contusion – cramp tendon injuries – bursitis. Bone injuries: fracture – subluxation - dislocation.

Unit – III

Principles of injury management - warm up - cool down - stretching - types of stretching – principles of stretching. Price technique - immobilization -splinting - handling & transfer - cryotherapy: methods of application (ice packs, ice towel, ice immersion, ice cube massage, excitatory cold, vapocoolant spray.

Unit – IV

Techniques and equipment - removing clothing in lower body injuries - removing clothing in upper body injuries - removing headgear - casualty handling - first aid bag and supplies - sterile dressings – bandages – types of bandages – taping – importance of taping.

Unit - V

Emergency first aid - action in an emergency - cpr for an adult - cpr for a child - heart attack - stroke - choking adult – asthma - anaphylactic shock – snake bite – epilepsy – fracture and dislocation – sprain and strain.

Text books:

1. Christopher m. (1993). Norris sports injuries diagnosis and management for physiotherapists, east kilbride: thomson litho ltd.

2. Sports injuries: prevention, diagnosis, treatment and rehabilitation by mahmut nedim doral & jon karlsson (eds.)

3. Netter’s sports medicine by christopher madden & margot putukian & craig young

Reference books:

1. Morris, b. Mellin (1989). Sports injuries and athletic problems. New delhi: surjeet publication.

2. Steven roy. & richard irvin. (1983). Sports medicine. New jersey: prentice - hall inc.

SEMESTER- II - PAPER CODE – 23UE1AE201

Part III- Ability Enhancement Course- II – NAN MUDHALVAN SCHEME -I

A Course offered by Naan Mudhalvan Scheme for second semester BBA has to be chosen by the students while second semester. The students can refer to the website https://naanmudhalvan.tn.gov.in/ for further details.

SEMESTER- III - PAPER CODE – 23UE1SE301

Part III – Skill Enhancement Course – V- E-COMMERCE

UNIT -I

Fundamental of E-Commerce: Traditional commerce and E commerce – Internet and WWW – role of WWW – value chains – strategic business and Industry value chains – role of E commerce. Driving forces – benefits and limitations of e-commerce.

UNIT -II

Business Applications in E-Commerce: Retailing in E-commerce – market research on internet customers – e-commerce for service sector – Advertising in e-commerce – B2B e-commerce.

UNIT -III

E-Commerce Infrastructure: Intranet, Internet & Extranet – Structure, Architecture, Applications & Business Models, search engines

UNIT -IV

E-Commerce Payments and Security: Computer security classification – copy right and Intellectual property – electronic commerce threats - strategies for marketing – sales and promotion E-Payments and Internet fraud. Principles of e-fund transfer, credit and debit card usage, E-check and unified payment systems.

UNIT -V

Issues in E-Commerce: Intelligent Agents - Definition and capabilities – limitation of agents – security –Legal, Ethics and Privacy issues – Protection needs and methodology - Consumer protection, Cyber laws, contracts and warranties. Taxation and Encryption Policies.

References Books

1.Efraim Turban et al., 'Electronic Commerce – A managerial perspective', Pearson Education Asia

2.Kalakota et al, 'Frontiers of Electronic Commerce', Addison Wesley.

3. Sandeep Krishnamurthy, 'E-Commerce Management – Text and Cases', Thomson Learning.

4. Greenstein Firsman, 'Electronic Commerce', Tata McGraw Hi

SEMESTER- IV - PAPER CODE – 23UE1AE401

Part III- Ability Enhancement Course- IV – NAN MUDHALVAN SCHEME -II

A Course offered by Naan Mudhalvan Scheme for fourth semester BBA has to be chosen by the students. while fourth semester. The students can refer to the website https://naanmudhalvan.tn.gov.in/ for further details.

SEMESTER- IV - PAPER CODE – 23UE1ES401
Part IV- ENVIRONMENTAL STUDIES

Objective:

The objective of the course is to acquaint the student with a basic understanding of the concept and structure of environment. The course will help the student to develop and understanding about the significance of the development of environmental science as a discipline. The global environmental issues and disasters will also be introduced to the students through the course.

Learning Outcomes:

The course will empower the undergraduate students by helping them to: i. Gain in-depth knowledge on natural processes that sustain life, and govern economy. ii. Predict the consequences of human actions on the web of life, global economyand quality of human life. iii. Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development. iv. Acquire values and attitudes towards understanding complex environmental-economic social challenges, and participating actively in solving current environmental problems and preventing the future ones we adopt sustainability as a practice in life, society and industry.

Unit 1: Introduction to Environmental Studies • Multidisciplinary nature of environmental studies; Scope and importance; concept of sustainability and sustainable development. Ecosystem - Structure and function of ecosystem.

Unit 2 : Natural Resources : Renewable and Non – renewable Resources - Deforestation : Causes and impacts due to mining, dam building on environment, case studies.

Unit 3 : Biodiversity and Conservation • Levels of biological diversity: genetics, species and ecosystem diversity; Threats to biodiversity : Habitat loss, poaching of wildlife, man- wildlife conflicts, biological invasions; Conservations of biodiversity.

Unit 4: Environmental Pollution: types, causes, effects and Control measures of urban and industrial waste • Pollution case studies. Environmental Policies & Practices - Environment Protection Act, Air (Prevention & Control of Pollution) Act; Water (Prevention and Control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. Kyoto protocols and Convention on Biological Diversity

Unit 5: Human Communities and the Environment - Human population growth, impacts on environment, human health and welfare. Disaster management: floods, earthquake, cyclone and landslides. Environmental ethics; Field Work - Visit to an area to document environmental assets: river / forest/ flora/ fauna etc - Visit to a local polluted site – Urban / Rural/ Industrial/ Agricultural etc.

References

1. Gadgil , M.,& Guha, R. 1993.This Fissured Land: An Ecological History of India. Univ.of California Press.
2. Glesson, B. and Low, N.(eds.)1999. Global Ethics and Environment, London, Routledge.
3. Groom, Martha J., Gary K.Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates,2006.
4. McCully,P.1996.Rivers no more :the environmental effects of dams(pp.29-64).Zed books.
5. Pepper,I.L.,Gerba,C.P & Brusseau,M.L.2011.Environmental and Pollution Science. Academic Press.
6. Raven,P.H.,Hassenzahl,D.M & Berg,L.R.2012 Environment.8th edition. John Willey & sons.
7.Singh,J.S.,Singh,S.P and Gupta,S.R.2014.Ecology,Environmental Science and Conservation. S.Chand Publishing, New Delhi.
8. Sodhi,N.S.,Gibson,L.&Raven ,P.H(eds).2013.Conservation Biology :Voices from the Tropics. John Willey & Sons.
9. Willson,E.O.2006. The Creation: An appeal to save life on earth..New York: Norton.

SEMESTER- V- PAPER CODE – 23UE1CI501
Part – III - INTERNSHIP– INTERNSHIP REPORT

OBJECTIVES:

To offer the opportunity to the students to gain experience about the working and functioning of the sports organization throughout the program.

LEARNING OUTCOMES:

On successful completion of the course students will have a complete understanding about the sports organizations and pave way for their final Project work in the same concern.

Internship

At the end of fourth Semester, each student shall undertake Internship for a minimum of 4 weeks. It is mandatory for the students to seek written approval from the Faculty Guide and the Head of the Department about the topic and the Organization before commencing the Internship. The Internship must be carried out compulsorily in any Sports Organization or Sports Related Organizations only. It can be a Corporate Entity / NGO / SME / Government Undertaking / Cooperative Sector / Sports Academies. On Successful completion of the Internship, the student shall submit a structured report based on the work done during this period in a prescribed format provided. A report of the same should be submitted to the Department on or before the last working day of the fifth semester.

Viva-Voce Examination

The performance of the students for the Internship will be evaluated for a total of 100 marks, by Internal Examiners only. The Viva-voce will be conducted by a panel consisting of the Faculty guide in the presence of the Head of the Department.

Students have to secure minimum 40% of marks to get a pass in the Internship. Students who fail in the Internship or who were absent for the Viva or who fail to submit the report before the due date will have to redo the Internship during the subsequent year and attend the Viva-Voce during the subsequent academic year.

SEMESTER- V - PAPER CODE – 23UE1VE501

Part IV- VALUE EDUCATION

OBJECTIVES:

The course is designed to the objective of this paper is to impart basic human values to students through formal education and Understand the importance of harmonious living in a diverse society.

LEARNING OUTCOMES:

After completion of the course the Students will understand the importance of value based living. Students will gain deeper understanding about the purpose of their life and start applying the essential steps to become a value based professionals.

UNIT-I

Value Education - Definition - relevance to present day - Concept of Human Values - self introspection - Self esteem.

UNIT-II

Family values - Components, structure and responsibilities of family - Neutralization of anger - Adjustability - Threats of family life - Status of women in family and society - Caring for needy and elderly - Time allotment for sharing ideas and concerns.

UNIT-III

Ethical values - Professional ethics - Mass media ethics - Advertising ethics - Influence of ethics on family life - psychology of children and youth - Leadership qualities - Personality development.

UNIT-IV

Social values - Faith, service and secularism - Social sense and commitment - Students and Politics - Social awareness, Consumer awareness, Consumer rights and responsibilities - Redressal Mechanisms.

UNIT-V

Effect of international affairs on values of life/ Issue of Globalization - Modern warfare - Terrorism. Environmental issues - mutual respect of different cultures, religions and their beliefs.

Reference Books:

1. T. Anchukandam and J. Kuttainimathathil (Ed) Grow Free Live Free, Krisitu Jyoti Publications, Bangalore (1995)

2. Mani Jacob (Ed) Resource Book for Value Education, Institute for Value Education, New Delhi 2002.

3. DBNI, NCERT, SCERT, Dharma Bharti National Institute of Peace and Value Education, Secunderabad, 2002.

4. Daniel and Selvamony - Value Education Today, (Madras Christian College, Tambaram and ALACHE, New Delhi, 1990)

5. S. Ignacimuthu - Values for Life - Better Yourself Books, Mumbai, 1991.

6. M.M.Mascaronhas Centre for Research Education Science and Training for Family Life Promotion - Family Life Education, Bangalore, 1993.

SEMESTER- VI - PAPER CODE – 23UE1PC601
Part – IV – PRFESSIONAL COMPETENCY SKILL – EMPLOYABILITY SKILL

OBJECTIVES:

To offer the opportunity to the students to gain expertise on a diverse range of topics, including theoretical, simulation and experimental studies learned through employability skill

LEARNING OUTCOMES:

Students will be able to undertake in future problem identification, formulation and providing suitable solution with a sound technical knowledge of their work.

UNIT -I

Leadership Theories: Nature of leadership theories & models of leadership - attributes of effective leaders - traits of leadership - interpersonal competence & leadership

UNIT -II

Leadership Styles: Leadership qualities -styles of leadership -attitudes-role models & new leadership - cultural differences and diversity in leadership - leader behaviour leadership in different countries- leadership ethics & social responsibility.

UNIT -III

Leadership Skills: Leadership skills - Leadership & management - transactional & transformational in leadership -Strength based leadership in practice - Tasks & Relationship approach in leadership - influence tactics of leaders- motivation and coaching skills. Establishing constructive climate- listening to out group members- communication and conflict resolution skills.

UNIT -IV

Team Work: Working in group & teams - characteristics of effective team- types- team development: Tuckman's team development stages- Belbin team roles - Ginnett - team effectiveness leadership model.

UNIT -V

Exploring team roles & processes: mapping the stages of group development -Building: and developing teams-overcoming resistance coping and conflict and Ego-leading a team managing meetings.

References Books

1.Gonda, C. M. (2016) Master of Business Etiquette: The Ultimate Guide to Corporate Etiquette and Soft Skills Embassy Books, First Edition.

2. Mehra, S. K. (2012) Business Etiquette A Guide For The Indian Professional. Noula: HarperCollins.

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23PE1SS201 - SOFT SKILLS II - BUSINESS ETIQUETTE

UNIT -I

Introduction to business etiquette: The ABCs of etiquette Meeting and greeting scenarios- Developing a culture of excellence the principles of exceptional work behaviour - What is the role of Good Manners in Business? -Enduring Words Greetings and Introductions: Guideline for receptionists - Making introductions and greeting people- Greeting Components- The protocol of shaking hands- Introductions - Introductory scenarios - Addressing individuals.

UNIT -II

Meeting and Boardroom Protocol: Guidelines for planning a meeting - Before the meeting - On the day of the Meeting - Guidelines for Attending the meeting - For the Chairperson- For attendees - For Presenters - Planning a power point presentation-Dealing with customer complaints. Entertaining Etiquette: Planning a meal- Issuing invitations -Business meals basics - Basics of table etiquette - Holding and resting utensils - Business dining etiquette - Multi-cultural Highlight: Japanese Dinning-Specific food Etiquette guidelines.

UNIT -III

Telephone Etiquette: Cell phone etiquette-Social Media Usage etiquette- Telephone etiquette guidelines - Mastering the telephone courtesy - Active listening - Putting callers on hold -Transferring a call - Screening calls - Taking at message - Voice Mail-Closing the call - When Making calls - Closing the call-Handling rude or impatient clients Internet & email etiquette: Internet usage in the workplace Email- Netiquette - Online chat - Online chat etiquette - Online chat etiquette guidelines

UNIT -IV

Business Attire & Professionalism: Business style and professional image - Dress code - Guidelines for appropriate business attire - Grooming for success - Guidelines for appropriate business attire - Grooming for success - Multicultural dressing Diversity Management- Gender Sensitivity- Social Media and Communication with colleagues- Preventing sexual harassment-Disability Etiquette: Basic disability Etiquette practices - Courtesies for wheelchair users Courtesies for blind or visually impaired - Courtesies for the deaf- People with speech impairments.

UNIT -V

Business Ethics: Ethics in the workplace - The challenge of business ethics - Creating an ethical compass - Business ethics and advantages - Ethical Issues - Conflict Management- Conflict resolution strategies - Choosing the appropriate gift in the business environment Multi-cultural challenges: Multi-cultural etiquette - Example of cultural sensitivity - Cultural differences and their effect on business etiquette- onsite projects-Cultural Highlight: China-Cultural Highlight: India.

23PE1SS202 - SOFT SKILLS III – COMPUTING SKILLS

UNIT -I

MS Excel – Basic Functions - Workbook – Building – modifying - navigating; Worksheet – Auto fill copying and moving cells, inserting and deleting rows, printing; Formulas and functions-Troubleshooting formulas, Functions and its forms like database, reference, Databases – creating, sorting filtering and linking.

UNIT -II

MS Excel Advanced Functions – Vlookup – Hlookup – Charts – Count - Countif – Sum - Sumif – Product – Sumproduct. Functions: Mathematical - Financial - logic – Text - Statistical

UNIT -III

MS Access – Components, creating a database and project, import and exporting, customizing; Tables – creating and setting fields; Queries – types, creating, wizards – Reports – creating and layout.

UNIT -IV

Cloud based apps – Google Drive, Google Sheets, Google Docs

UNIT -V

Cloud based apps - Google Forms, Google Slides – Google Cloud Print.

23PE1SS301- SOFT SKILLS III – LEADERSHIP & TEAM BUILDING SKILLS

UNIT -I

Leadership Theories: Nature of leadership theories & models of leadership - attributes of effective leaders - traits of leadership - interpersonal competence & leadership

UNIT -II

Leadership Styles: Leadership qualities -styles of leadership -attitudes-role models & new leadership - cultural differences and diversity in leadership - leader behaviour leadership in different countries- leadership ethics & social responsibility.

UNIT -III

Leadership Skills: Leadership skills - Leadership & management - transactional & transformational in leadership -Strength based leadership in practice - Tasks & Relationship approach in leadership - influence tactics of leaders- motivation and coaching skills. Establishing constructive climate- listening to out group members- communication and conflict resolution skills.

UNIT -IV

Team Work: Working in group & teams - characteristics of effective team- types- team development: Tuckman's team development stages- Belbin team roles - Ginnett - team effectiveness leadership model.

UNIT -V

Exploring team roles & processes: mapping the stages of group development -Building: and developing teams-overcoming resistance coping and conflict and Ego-leading a team managing meetings.

23PE1CE110 - SPORTSMANSHIP AND ETHICS

UNIT -I

Sportsmanship- Fundamental of Sportsmanship; 6 pillars of Sportsmanship- Respect, Responsibility; fairness; caring; good citizenship and Trustworthiness; Importance of Sportsmanship; Sportsmanship as an ethical value.

UNIT -II

Ethics in Sports- Role of Ethics in Sports**;** Morality and ethical issues pertaining to sport; concept of personal and professional ethics; ethical decision-making in sport; Code of Sports ethics for students, Code of Sports ethics for Coaches; Code of Sports ethics for Athlete; Code of Sports ethics for Administrators; Responsibilities of Players and Coaches on and Off the Pitch.

UNIT -III

Gamesmanship, Fairness and Integrity- Gamesmanship and the moral ideal of fair play; Sports behavior and sportsmanship in Athletic program and venues; Cheating and strategic fouling; Bribery; Match Fixing; Gambling in Sports and Society; violence in Sports; Fan-behavior; gender equity in sport; Sportsmanship vs Gamesmanship.

UNIT -IV

Ethical Issues- Ethical and moral issues that exist in the sports management profession; Diversity and Discrimination in sports; Sexual Harassment in Sports; The Ethics of Drug use and testing; Equity in Sports; Ethical Consideration in Sports Media; Ethical issues involving Coaches; Ethical Issues involving Parents and Fans.

UNIT -V

National Sports Ethics:Commission Bill 2016; The IOC Code of Ethics; FIFA Code of Ethics, ICC Code of Conduct; WADA Code of Ethics.

23PE1CE111 - SPORTS POLICY AND GOVERNANCE

UNIT -I

Sports policy - Introduction to Sports Policy; Understand the importance of policy in sports organizations; Objectives of Sports policy; Strategic management and sport policy development; Impact of sports policy in community development. Challenges of Policy Implementation and Sports Development in India.

UNIT -II

National Sports Policy and Good Governance Code in India – The National Sports Policy 1984, The National Sports Policy 2001; National Sports Development Code of India, 2011; National Code for Good Governance in sports, 2017 (Draft).

UNIT -III

Sports Governance Basics- Introduction to Sports Governance; Identifying the three levels of sports governance (local, national, international); Understanding the five R's of governance (regulations, rules, rankings, records, results); Importance of planning process in sport governance organizations; Issues and challenges in international sport governance.

UNIT -IV

Measuring the Principles of Transparency, Accountability, Solidarity, Democratic process, and Social Responsibility in sporting organizations; Ethics in sport policy and governance; Olympic ideals in international sport policy and governance; Sports Governance Structures in India.

UNIT -V

Benchmarking Good Governance tool- 'Basic Indicators for Better Governance in International Sport' (BIBGIS) by Chappelet and Mrkonjic; Sports Governance Observer' by AGGIS group; Future directions and strategy for the development of sports in India.

23PE1CE112 - SPORTS FINANCE

UNIT -I

The Basics of Sport Finance- Financial Issues in Sport; Basic Financial Concepts; Identifying the role of accounting and financial data in sport decision making; Determining financial objectives of a sport organization; Evaluating internal and external sports finance constraints; Business Structure utilized in Sports- sole proprietorships, partnerships, corporations, limited liability corporations and limited liability partnerships.

UNIT -II

Principles of Financial Analysis- Financial Statements, Forecasts, components of the balance sheet, income sheet and cash flow statements; Assessing an organizations liquidity, activity, leverage, profitability and inventory through ratio analysis; Analyzing risk and return of financial assets.

UNIT -III

Capital Structuring- Identifying sources and strategies to obtain capital (personal funds, private financing and leverage) for different types of sport businesses; Capital Stocks; Bonds

UNIT -IV

Financial Management- Managing production and inventory of seasonal sport venues; Establishing income generating strategies for a losing team; Calculating the value of a sport business; Capital Budgeting; Short-term Financial Management; Inventory and Production Management.

UNIT -V

Professional Sports- Evaluating escalating salaries and salary caps; Understanding revenue sharing and league financial implications; Managing government interaction in professional sport; Valuing franchises/teams; Understanding publicly owned and privately owned sports franchises; Projecting future profitability of franchises.

23PE1CE113 - SPORTS HUMAN RESOURCE MANAGEMENT

UNIT -I

Human Resources Management in Sport and Recreation- Significance of Human Resources in sports; Sport and Recreation Services; A Model of Human Resource Management; volunteers and Volunteerism; Role of the Sport or Recreation Manager; Customer Participation in Sport and Recreation Services; Customer as Input, Throughput, and Output.

UNIT -II

Individual Differences in Human Resources- Abilities- Issues in the Study of Ability; Cognitive Abilities; Emotional Intelligence. Personality- Determinants of Personality; Type Theories; Trait Theories; Personality and Organizational Behavior. Values- Values, Beliefs, Attitudes, and Norms; Sources of Values; Terminal and Instrumental Values; Hierarchy of Values. Motivation- A Model of Motivation; Other Theories of Motivation; Motivation as Personal Investment.

UNIT -III

Human Resource Practices in Sports Organisation- Organizational Justice, Distributive Justice, Procedural Justice, Interactional Justice. Job Design- Job Design Strategies, Task Attributes, Motivational Properties of Tasks, Implementing Task Attributes, Task Attributes and, Individual Differences, Other Approaches to Job Design

UNIT -IV

Staffing and Career Considerations in Sports- Purposes of Staffing, Focus of Staffing, Mentoring. Multidimensional Model of Leadership, Transformational, Transactional, Servant, and Authentic Leadership. Performance Appraisal- Purposes of Performance Appraisal. Types of Rewards in Sports Organizations.

UNIT -V

Attitudinal Outcomes- Satisfaction- Theories of Job Satisfaction, Satisfaction with Volunteer Work, Participant Satisfaction, Measurement of Satisfaction. Commitment- Multidimensionality of Organizational Commitment, Occupational Commitment.

23PE1CE114 - SPORTS LOGISTICS AND SUPPLY CHAIN MANAGEMENT

UNIT -I

Introduction to Sports Logistics and Supply Chain Management: Definition and Importance sports logistics and supply chain management- Key components and functions of sports supply chains- Scope of sports logistics and supply chain management- Evolution of supply chain management. Trends and Challenges in Sports Logistics and Supply Chain Management.

UNIT -II

Supply Chain Network Design and Strategy for Sports Organizations: Reviewing supply chain Network design in the sports industry: Key performance indicators (KPIs) for sports supply chains. Performance measurement techniques and tools. Evaluating the efficiency and effectiveness of sports supply chains. Risk management in sports supply chains: Identifying and assessing risks in sports supply chains. Developing risk mitigation strategies and contingency plans. Network Design in an Uncertain Environment. Understanding Supply Chain Strategy in Sports: Importance of supply chain strategy. Differentiating supply chain strategy from overall organizational strategy. Aligning supply chain strategy with the goals and objectives of sports organizations.

UNIT -III

Planning and Managing Inventories in a Supply Chain: Introduction to Inventory Management: Importance of inventory management in supply chain. Role of inventory in balancing supply and demand. Inventory Planning and Forecasting: Aggregate Planning Sales and operations planning (S&OP), Demand forecasting- Forecasting methods and techniques in the sports industry. Inventory control techniques for sports equipment and merchandise - Just-in-time (JIT) and lean principles in sports inventory management. Emerging Trends and Technologies in Inventory Management.

UNIT -IV

Transportation and Distribution Management in Sports: Importance of transportation management in supply chain operations. Transportation Modes, Selection and their characteristics- Transportation Planning and Routing. Scheduling for sports deliveries, and freight consolidation, Last-Mile Delivery and Customer Service.

UNIT -V

Warehouse and Sustainability in Sports Supply Chain Management: Warehouse layout and design for sports organizations- Importance of warehouse management in supply chain. Role of warehouses in the overall logistics process. Challenges of warehouse management. Sustainable Warehouse Practices: Concept of sustainability in warehouse management. Incorporating sustainability considerations in packaging, material handling, and transportation. Environmental and social sustainability in supply chains. Green logistics and reverse logistics, Ethical considerations in supply chain operations.

23PE1CE115 - SCHEMES FOR SPORTS DEVELOPMENT

UNIT -I

Introduction to Sports Development: Definition, scope and importance of sports development- Historical overview and evolution of sports development: Objectives and benefits of sports development- Importance of sports development in society- Key principles of sports development. Outcomes of sports schemes.

UNIT -II

Government Initiatives for Sports Development Schemes: Schemes for Development- National-level sports schemes and policies- State-level sports development programs: Objective, and Significance of sports development schemes - Implementation and Evaluation of sports development schemes. Overview of different types of sports development schemes in India**.**

UNIT -III

Funding Strategies and Resource for Sports Development: Government grants and funding schemes for sports development- Corporate sponsorships and private investments in sports. Fundraising strategies for sports initiatives- Practical aspects of implementing sports development schemes. Fundraising and crowdfunding for sports initiatives- Community-based sports initiatives. School sports and educational institutions in grassroots development.

UNIT -IV

Infrastructure Development Schemes in Sports

Introduction to Infrastructure Development in Sports- Importance and significance of sports infrastructure- Overview of infrastructure development schemes. Sports Infrastructure Planning and Needs Assessment- Conducting needs assessments for sports facilities. Identifying facility requirements for different sports- Maintenance and management of sports infrastructure.

UNIT -V

Talent Identification and Development Schemes: Introduction to Talent Identification and Development- Definition and significance of talent identification and development. Role of talent identification and development in athlete progression. Key principles and models of talent identification- Talent Identification Frameworks and Models- Long-term athlete development models. Talent identification in specific sports disciplines. Gender-specific considerations in talent identification and development Schemes.

23PE1CE116 - SPORTS ANALYTICS

UNIT -I

Introduction to Sports Analytics Management: Overview of analytics management and its significance in sports organizations - Role of analytics in decision-making in sports-Key challenges and opportunities in sport analytic. Ethical considerations in sports analytics. Evolution of analytics in business.

UNIT -II

Performance Analysis and Evaluation: Definition and scope of performance analysis in sports -Statistical analysis of player performance- Advanced metrics for player evaluation- Evolution of analytics in business. Overview of performance metrics and indicators used in sports analysis- Predictive modelling for player performance forecasting, Performance benchmarking and comparative analysis. Team and Game Strategy Analysis. Predictive models for player potential and future performance.

UNIT -III

Sports Analytics Tools and Technologies: Introduction to sports analytics software - Data visualization techniques for sports data. Machine learning and predictive modelling in sports analytics. Demonstrations of sports analytics applications.

UNIT -IV

Emerging Trends in Sports Analytics: Introduction to cutting-edge topics in sports analytics- new data sources and technologies in sports analytics. Impact of artificial intelligence on sports analytics. Discussion on future directions and career opportunities in sports analytics.

UNIT -V

Sports Economics and Financial Analytics: Economic Principles in Sports: Introduction to sports economics- Scope, objectives, and key concepts. Financial Analysis of Sports Organizations: Financial statement analysis- Understanding and interpreting financial statements of sports organizations- Revenue analysis- Cost analysis. Sports Valuation and Investment Analysis: Valuation methods for sports teams and franchises. Investment analysis and decision-making in the sports industry. Financial modelling and forecasting for sports organizations. Financial Analytics in Sports Sponsorship. Analyse the impact of economic factors on the business of sports.

COURSE CODE – 23PC1CT201

ENVIRONMENTAL EXERCISE PHYSIOLOGY

1. The course focuses on learning about the various forms of environmental stress and how the resulting human organism responds physiologically to them.

2. Students will study how physical performance is affected by environmental stress such as heat, cold and high altitude and underwater environments.

Learning outcomes:

1. Students who successfully complete the paper will develop an understanding of the physiological adaptations that have evolved them to survive, adapt, participate and to train in various sports activities.

Unit – I Different Terms In Environmental Physiology: Definition of Environmental Physiology , Homeostasis - Functions of Homeostasis – Definition of thermoregulation - Goal of Thermoregulation - metabolism – heat stress – - Fundamental principles involved in thermoregulation – Conduction – Convection - Radiation – Evaporation – Hypothalamus and heat losing mechanism- Homeostasis and Temperature Control- role of endocrine glands in regulating body temperature – temperature regulation during exercise .

Unit – II Hot And Cold Climate: Definition of Acclimatization , Acclimation , Adaptation - Acclimatization to heat – Acclimatization to heat exposure – the heat equation – heat training – heat related illness – How to beat the heat – heat stress – signs and symptoms of mild and moderate stress – contributing factors of heat stress – dehydration and symptoms of dehydration – Heat Exhaustion - signs and symptoms of heat exhaustion- Algorithm for management of heat stroke and heat exhaustion- heat cramps- causes of heat cramps – Heat stroke - Heat stress injuries – precaution to be taken to avoid heat illness – safety consideration to prevent heat injuries. Temperature regulation in cold environment – acclimatization to cold – fine motor activity – facilitation of metabolic heat production - precaution to be taken in cold environment.

Unit – III Altitude: Definition of Barometric presence, High Altitude – different Altitudes – Different Air Pressure (PSI) at different Altitudes – Oxygen levels at altitude - The environmental differences between High altitude and sea level – immediate physiological changes at high altitude - Acclimatization - in respiratory system – in cardiovascular system – long term adaptation - time of acclimatization – acute and chronic mountain sickness - the importance of training at altitude- aerobic process – anaerobic process – Exercise and sports

performance at Altitude – Altitude training – Intermittent Hypoxic Training – Altitude exposure technique – Live High- Train High , Live Low- Train High , Live High Train Low – Artificial Training - Hypoxic training methods for improving endurance exercise performance

Unit – IV Under Water Environment: Definition of underwater environment - Marine Eco System - underwater pressure - General characteristics of underwater environment- – SCUBA diving – Different depth at sea level and Atmosphere – Nitrogen Narcosis – Oxygen Toxicity – Carbon dioxide Toxicity – Nitrogen and Volume of Nitrogen at Different levels – Decompression Sickness – Bends, compressed air sickness , Caissons disease , Divers Paralysis and Dysbarism - treatment - Nitrogen Elimination and Decompression - PADI Dive table - physiology of underwater diving – physiological response to water immersion – exposure – breath hold limitations – Ambient pressure changes – breathing under pressure .

Unit – V Factors affecting physiological performance: Environmental factors in exercise and sports performance skeletal system – muscular system – cardiovascular system – respiratory system – Bio-energetic system – lactate tolerance – maximum aerobic capacity – hormonal difference.

Reference Books:

1. Stephen S. Cheung., (2010), Advanced environmental exercise physiology , United States: Human Kinetics, P.O. Box 5076 Champaign, IL 61825-5076

2. William D. Mcardle, Frank I. Katch, Victor L. Katch, (2005),“Essentials of exercise physiology“, Lippincott Williams and Wilkins.

3. Victor L. Katch, Frank. I. K atch, William D. Mcardle, (2003), “Essentials of exercise physiology “, Williams and Wilkins.

4. Lorry G. Shaver (1981) “Essentials of exercise physiology” Delhi: SurjeethPuplications.

5. William E.Garrett J.R., Donald T. Kirendall, (2000), Exercise and sports science”,

Lippincott Williams and Wilkins.

6. McArdle William D. (1998) “Essentials of exercise physiology” Malveern, Pennsylvania:

Lea and Febiger.

7. Roger M. Enoka, (2002), “Neuromechanics of human movement”, Human Kinetics. P.O.

Box 5076 Champaign, IL, United States.

Course Outcomes

On successful completion of the course, the students should be able to:

CO1	Understand the basic concepts of Thermoregulation and role of endocrine glands in regulating body temperature
CO2	Understand the essential and environmental features and requirements of hot and cold climate
CO3	Application of Various training methods of Altitude training.
CO4	Analyse the physiological response of under water, SCUBA Diving, Decompression Sickness.
CO5	Understand acquire deep insight into Factors Affecting Performance, factors influencing body temperature and common cold injuries.

Mapping With Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	L	M	S	M
CO 2	S	M	L	S	M
CO 3	S	M	M	S	S
CO 4	S	M	M	S	M
CO 5	S	S	M	S	S

***S-Strongly correlated 3 ; M- Moderately correlated 2 ; L-Low 1**

COURSE CODE – 23PC1CT202

EXERCISE AND SPORTS NUTRITION

Learning Objectives:

1. To impart knowledge on sports specific nutrition and hydration guidelines- in power/strength, weight class-combat and racket sport athletes.

2. To help students understand the role or ergogenic aids- their dose, safety and efficacy to enhance sports performance.

3. To enable the students to understand the characteristics, physiology and body composition needs of different power/strength sports.

Unit I: Sports nutrition: Definition of Nutrition, Sports Nutrition- Principles of Sports Nutrition - Basic training and nutrition principles - Basic nutrition standards and guidelines - Basic sports nutrition guidelines. Measuring nutritional status of athletes: Clinical and research perspectives - Dietary measurement - Techniques for measuring dietary intakes: Diet records- 24-hour recallFood frequency questionnaires- Diet history- Clinical examination and medical historyBiochemical analysis- Anthropometric assessment

Unit II: Carbohydrates as a Source of Energy for Exercise: Use of Muscle Glycogen - Use of blood glucose - Muscle Glycogen -Time Course of Glycogen Depletion- Carbohydrate Loading – Super compensation - Carbohydrate Ingestion during Exercise-Carbohydrate Intake at RestPractical Measures for Glycogen Modulation. Fat Reserves: Fat as Fuel for Muscle - Fatty Acid Uptake by Muscle-Strategies to improve Fatty Acid Oxidation-Physical Training-Medium Chain Triacylglycerol (MCT) Ingestion. Protein Reserves: Plasma Proteins/Amino Acids- Muscle Protein- Visceral Protein- Protein Intake.

Unit III: Biology of protein and amino acid requirements: Body protein mass-Protein synthesis, degradation, and turnover- Protein Utilization in Athletic Performance- Protein requirements for Endurance Athletes - Protein requirements for Strength Athletes – Protein essential and in recovery from exercise - Benefits and Risks of a High-Protein Diet-Nitrogen Balance.

Unit IV: Dietary Planning Adapted to Different Sports: Nutrition for Running events: Fuelling and hydration strategy for running -Core menu plans for running events. Nutrition for Jumping and Throwing Events: Fuelling and hydration strategy and Core menu plans for Jumping and Throwing events - Nutrition for Swimming: Fuelling and hydration strategy for swimmingPreparing for a competition- Core menu plans for swimming. Nutrition for Cycling: Fuelling an hydration strategy for Cycling- Nutrition for Team and Racket Sports: Fuelling and hydration

strategy for team and racket sports- Core menu plan for team and racket sports

Unit V: Nutrient Timing and Recovery Nutrition: Eating before training -Eating during trainingRecovery nutrition-Nutrition, exercise and immunity. Composition of Body Fluids: Intracellular

Fluid - Extracellular Fluid - Fluid guidelines - Fluid need before exercise - Fluid need during exercise - Fluid need after exercise, Dehydration, Rehydration - Effects of dehydration and overhydration - Heat cramps, Sports drinks - Types of sports drinks - Energy drinks, Fluid and Electrolyte balance before, during and after training- Strategies to delay fatigue- Effects of hyperthermia and dehydration on performance.

Reference Books:

1. Heather Hedrick fink, Lisa A.Burgoon, Alan E.Mikesky, (2006), “Practical Application in Sports Nutrition”, Jones and Bartlett.

2. Janice Thompson, Melinda Manore, (2005), “Nutrition: An Applied Approach”, Pearson.

3. Robert E.C.Wildman, Barry S. Miller, (2004), “Sports and Fitness Nutrition”, Thomson.

4. William D.Mcardle, Frank I.Katch, Victor L.Katch, (2000), “Essentials of Exercise Physiology”, Lippincott Williams and Wilkins.

5. McArdle William D. et.al. (2005) “Exercise Physiology, Nutrition and Human Performance”, Philadelphia: lea and Febiger.

6. Fred Brouns& Cerestar Cargill (2002) Essentials of sports nutrition.-2nd ed, John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England.

7. Louise Burke, Vicki Deakin,(2011), Clinical sports nutrition -4th ed, McGraw-Hill Australia Pty Ltd Level 2, 82 Waterloo Road, North Ryde NSW.

8. Dan Benardot ,(2006), Advanced sports nutrition, Human Kinetics,P.O. Box 5076 Champaign, United States of America.

Course Outcomes

On successful completion of the course, the students should be able to:

CO1 Understand the basic concepts and analyze the different methods for assessing nutritional status

CO2 Identifying the requirement of carbohydrate and fat diet before, during, and after training

CO3 Understand the biology of protein and amino acid requirements before, during, and

after training

CO4 Applying and developing a fuelling and hydration strategy for Adapting to different sports

CO5 Understand the composition of body fluids and fluid needs before exercise, fluid needs during exercise, fluid needs after exercise

Mapping With Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	L	M	S	M
CO 2	S	M	L	S	M
CO 3	S	M	M	S	S
CO 4	S	M	M	S	M
CO 5	S	S	M	S	S

*S-Strongly correlated 3 ; M- Moderately correlated 2 ; L-Low 1

COURSE CODE – 23PC1CE002

EXERCISE SCIENCE AND FUNCTIONAL ASSESSMENT

Course Objectives:

1. To feel comfortable selecting and performing appropriate fitness assessments, including all related equipment manipulation, calculations, conversions, data collection/summary, and interpretation of results.

2. To explain the anatomy, physiology, and biomechanics underlying various fitness assessments.

Learning Out Come:

1. To consider scope of practice when selecting fitness assessments and interpreting data from assessments.

2. To appreciate the historical development of modern fitness assessments, especially with regard to trends and technology.

3. To appreciate the value of the methods section of a scientific publication.

4. To appreciate how and why fitness assessments are used in various settings: fitness industry, sports, clinical, and even basic sciences.

UNIT – I Diagnostic testing: Pretesting Guidelines and procedure – Laboratory and Field testing – Cardiovascular and Pulmonary assessment – Treadmill and Ergometers – Metabolic measurement equipment – pulmonary function equipment – Electrocardiograph equipment – pulse oximeter – Blood pressure assessment.

UNIT – II Musculoskeletal Function assessment: Electromyography equipment – force platforms - Pressure Sensitive Insoles –Isokinetic Dynamometers. Magnetic Resonance Imaging – Magnetic Resonance Spectroscopy – Muscle Biopsy Equipment Computer Tomography – Isometric Strength Tests - Isometric Handgrip Strength Test-YMCA Bench Press Protocol.

UNIT – III Energy Balance Assessment: - Measuring energy intake – Measuring energy expenditure - Whole room indirect calorimeter – Double Labeled Water – other Assessment Instruments – Heart rate monitor – pedometer Accelerometers.

UNIT – IV Measuring Body Composition: Densitometry- Dual Energy x- ray Absorptiometry – Bio- Electrical Impedance – Skinfold assessments– Anthropometric measurements.

UNIT V Blood collection and analysis: General equipment – Common blood measures –

routine check-up – haemoglobin- urine analysis- urea, uric acid and lipid profile- Blood Lactate Measurement at Rest - Lactate Analyzer Test - Blood Lactate after Anaerobic Exercise.

Course Outcome:

On successful completion of the course, the students should be able to:

CO1 Describe the Preliminary Health Evaluation

CO2 Understand the different methods of clinical assessment

CO3

Understand the different methods of assessment of components of Health

Related physical fitness

CO4

Understand thedifferent methods of assessment of different components of

physical fitness

CO5 Understand the different methods of assessment of VO2 Max Test Protocol

Mapping With Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	L	M	S	M
CO 2	S	M	L	S	M
CO 3	S	M	M	S	S
CO 4	S	M	M	S	M
CO 5	S	S	M	S	S

*S-Strongly correlated 3 ; M- Moderately correlated 2 ; L-Low 1

COURSE CODE – 23UC1CT302

FUNDAMENTALS OF SPORT AND EXERCISE BIOCHEMISTRY

Learning Objective:

The learners will be able to

1. Understand the role of enzymes in metabolism and clinical conditions.

2. Interpret the significance of macronutrient metabolism, and thereby understand the

implications of disorders resulting from these. 3. Acquire knowledge about different metabolism.

UNIT – I Biochemistry: Definition and Importance. Organization of matter - Matter and elements - Atoms and atomic structure - Atomic number and mass number - Atomic mass - Ions, molecules, compounds and macronutrients. Chemical bonding - Ionic bonds - Covalent bonds - Molecular formulae and structures - Functional groups. Chemical reactions - ATP and energy - Energy – ATP - Units of energy - Types of chemical reactions. Water - General functions of water - Water as a solvent. Metabolism – Anabolism & Catabolism.

UNIT – II Carbohydrates: Relevance of carbohydrates for sport and exercise - Types and structure of carbohydrates: Monosaccharaides, Disaccharides and polysaccharides - Metabolism of carbohydrates – Glycogenolysis – Glycolysis - Lactate metabolism - The TCA (or Krebs) cycle - Electron transport chain - Oxidative phosphorylation - Calculation of ATP generated in glucose oxidation - Fructose metabolism - Gluconeogenesis – Glycogenesis.

UNIT – III Proteins: Protein function - Amino acids - Protein structure: Primary structure - Secondary structure - Tertiary structure - Quaternary structure - Proteins as enzymes - Mechanisms of enzyme action - Classification of enzymes - Protein turnover - Amino acid metabolism - Free amino acid pool - Transamination – Deamination - Branched chain amino acids - Glucose-alanine cycle – Glutamine - The urea cycle.

UNIT – IV Lipids: Relevance of lipids for sport and exercise - Structure of lipids - Classification of lipids - Compound lipids - Derived lipids - Metabolism of lipids - Lipolysis - β -oxidation - Ketone body formation - Formation of fatty acids - Triglyceride synthesis – Cholesterol metabolism. Water - General functions of water - Water as a solvent. Acid- base balance - Acids, bases and salts - pH Scale – Buffers – Acidosis – Alkalosis.

UNIT – V Energy sources for muscular activity: Adenosine triphosphate: the energy currency - Energy continuum - Energy supply for muscle contraction - Energy systems and running speed - Energy sources and muscle. Mechanisms of fatigue - Reduced ATP - Reduced PCr - Increased Pi - Lactate and H+. Energy production during high-intensity exercise - Energy sources used in HIE - Metabolic regulation during high-intensity exercise - Energy systems utilized in HIIT exercise -

Metabolic regulation in HIIT exercise - Energy production in endurance exercise - metabolic regulation in endurance exercise

References

1. Biochemistry for Sport and Exercise Metabolism, First Edition. Don MacLaren and James Morton, 2012 John Wiley & Sons, Ltd. Published 2012 by John Wiley & Sons, Ltd.

2. The Cell: A Molecular Approach (2009) 5th ed., Cooper, G.M. and Hausman, R.E., ASM Press & Sunderland (Washington DC), Sinauer Associates, MA, ISBN: 978- 0-87893- 300.

3. Molecular Biology of the Cell (2008) 5th ed., Alberts, B., Johnson, A., Lewis, J., and Enlarge, M., Garland Science (Princeton), ISBN: 0-8153-1619-4 / ISBN: 0- 8153-1620-8.

4. Physical Biochemistry (2009) 2nd ed., Sheehan, D., Wiley-Blackwell (West Sussex), ISBN: 9780470856024 / ISBN: 9780470856031

Course Outcome

After successful completion of the course the students will be able to

CO1	Describe the role of enzymes and co enzymes in biological oxidation.
CO2.	Explain metabolism and regulation of carbohydrate, lipids and proteins
CO3.	Analyze the integration of carbohydrate, lipid and protein metabolism
CO4.	Comprehend the significance of recent biochemical concepts namely xenobiotics, recombinant DNA technology and Nutrigenomics.
CO5.	Discuss the structure and functions of nucleic acids

Mapping with Programme Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	L	M	S	M
CO 2	S	M	L	S	M
CO 3	S	M	M	S	S
CO 4	S	M	M	S	M
CO 5	S	S	M	S	S

***S-Strong 3 ; M-Medium 2 ; L-Low 1**

COURSE CODE – 23UC1CT301

KINESIOLOGY

Learning Objectives:

1 List and describe five career options available in the field of kinesiology.

2 Describe and critically analyze the role of physical activity and its impact on health, society and quality of life.

3 Discuss the history and broad content within the discipline of kinesiology and develop skills to enable the synthesis of concepts across disciplines.

4 Identify the skeletal and muscular structures of the human body.

UNIT I

List and describe five career options available in the field of kinesiology.

Describe and critically analyze the role of physical activity and its impact on health, society and quality of life.

Discuss the history and broad content within the discipline of kinesiology and develop skills to enable the synthesis of concepts across disciplines.

Identify the skeletal and muscular structures of the human body.

Kinesiology: Kinesiology: Meaning and Definition of kinesiology – Need and importance of kinesiology - Terminology of types of Joints movements: Flexion, extension, abduction, adduction, rotation, and circumduction. Planes: Sagittal plane, Frontal plane, transverse plane. Axis: Sagittal axis, Lateral axis, vertical axis.

UNIT II Kinematics - Planes of Motion: Sagittal plane, Frontal plane, transverse plane. Axis of Rotation, Degrees of freedom, Anatomical movements of human body, Movements at Specific Joints-Shoulder and Shoulder Girdle - Elbow and Forearm-Wrist and Hand-Trunk and Spine-Hip -Knee-Ankle Movement.

UNIT III Muscles: Structural Classification – Functions – Types of Muscle Fibres – Functional Classification – structural classification - Location, origin, insertion and action of the following muscles: Supraspinatus, Infraspinatus, Teres minor, Subscapularis, Teres major, Serratus anterior, Pectoralis major, Pectoralis minor, Deltoid, Latissimus dorsi, Biceps brachii, Coraco Brachialis, Triceps brachii

UNIT IV Muscles: Structural Classification – Functions – Types of Muscle Fibres – Functional Classification – structural classification - Location, origin, insertion and action of the following muscles: Lower Limb - iliacus, psoas major, Sartorius – vastus lateralis, vastus intermedius, vastus medialis, and rectus femoris. adductor longus, adductor brevis, adductor magnus, and gracillis semitendinosus, semimembranosus, and long and short heads of the biceps Trunk : Muscles of the Abdomen rectus abdominis, pyramidalis, external abdominal oblique, internal abdominal oblique and transversus abdominis.

UNIT V Posture - definition - static and dynamic posture - importance and benefits of good posture - causes of poor posture poor posture, compensatory posture. Vertebral alignment - development of postural curves - Standing posture - lateral view, anterior view, and posterior view. Fundamentals of gait - Meaning of gait, gait cycle divisions, Rancho Los Amigos gait terminology.

Reference book

1. Bruce Abernethy. (2005). The Biophysical Foundation of Human Movement. Human

Kinetics

2. Nancy Hamilton. (2002). Kinesiology - Scientific Basis of Human Motion. New York:

McGraw - Hill Companies, Inc.

3. NichdasStergiou. (2004). Innovative Analysis of Human Movement. USA: Human Kinetics.

4. Shirl, J, Hoffman. (2005). Introduction to Kinesiology. USA: Human Kinetics.

5. Thomas. (2001). Manual of Structural Kinesiology. New York: Me Graw - Hill cornparues.

6. Uppal A. (2004). Kinesiology in Physical Education and Exercise Science. Delhi:

Friends publications.

Course Outcomes

After successful completion of the course the student will be able to

CO1	Analyze the Classification of Joints Based on Movement Potential
CO2.	Understand the Anatomical movements of human body
CO3.	To understand the Types of bones, Bone growth and development
CO4.	To understand the Upper and Lower body muscles Location, origin, insertion and action
CO5.	To understand the posture and common postural abnormalities

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	**S**	**L**	**M**	**S**	**M**
CO 2	**S**	**M**	**L**	**S**	**M**
CO 3	**S**	**M**	**M**	**S**	**S**
CO 4	**S**	**M**	**M**	**S**	**M**
CO 5	**S**	**S**	**M**	**S**	**S**

***S-Strong 3 ; M-Medium 2 ; L-Low 1**

COURSE CODE – 23PC1DSE003

NUTRITION AND IMMUNE FUNCTION IN SPORTS AND EXERCISE

Course Objectives:

1. To know about the adequate intake of iron, zinc and vitamins for the maintenance of micronutrients.

2. To know about the athlete exercising in carbohydrate-depleted state and IMMUNE function.

Learning Objectives:

1. Students will apply the concept of nutritional intervention to immune system of the athlete in various sports.

2. They will also insist the athlete to maintain the IMMUNE system for better performance.

UNIT – I Immune system: Meaning and Definition of Immune system – Functions of the immune system- Components – Leukocytes – Definition and Types of Neutrophils – Eosinophils – Bosophils – Monocytes - Lymphocytes - function and characteristic - Factors Affecting Immune Function.

UNIT – II Immune response – mechanism of general response – Clonal selection and immunological memory – cellular immune response –Humoral fluid response – Antigen – Antibody reactions – Complement – Disorders of the immune mechanism.

UNIT – III Effect of exercise on the immune system – Acute effect of exercise on immune function – Chronic effect of exercise on immune function – Guidelines for the athlete to reduce the risk of infection – nutritional counter and measures.

UNIT – IV Nutritional Manipulation - immune depression in athletes –nutritional influence on immune function in athletes – Role of carbohydrate, protein and fat in immune function – pre and post exercise.

UNIT – V- Immune function and nutrition of elite athletes -Nutritional influence – role of vitamins and minerals in immune function – Effect of Dietary deficiency and excess - Dietary Sources – RDA – Fluid Concentration.

1. Asker Jeukendrup and Michael Gleeson (2004) “Sports nutrition” Human Kinetics, inc

2. Nieman, D.C., and B.K. Pederson (2000) “Nutrition and Exercise Immunology”. CRC press: Boca Raton, FL.

Reference Book

Journal of sports sciences ISSN 0264 – 04147x online copyright 2004 Taylor & Francis Ltd

Course Outcome:

On successful completion of the course, the students should be able to:

CO1

To understand the functions of the immune system and Factors Affecting

Immune Function.

CO2 Analyzing the Disorders of the Immune Mechanism.

CO3 Gain knowledge on the Effect of Exercise on the immune system

CO4 Gain knowledge on the nutritional influence on immune function in athletes

CO5 Understand the Immune Function and Nutritional needs of athletes

Mapping With Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	L	M	S	M
CO 2	S	M	L	S	M
CO 3	S	M	M	S	S
CO 4	S	M	M	S	M
CO 5	S	S	M	S	S

*S-Strongly correlated 3 ; M- Moderately correlated 2 ; L-Low 1

SEMESTER – VI

COURSE CODE –23UC1CE60I

NUTRITION FOR HEALTH, FITNESS AND SPORT

Learning Objective:

1. To enable the students to understand the nutritional problems of the community and gain skills in planning, executing and evaluating community nutrition services and planning.

2. The students will be proficient in planning menus with macro and micronutrients for various sports.

Unit I Meal Planning and Preparation: Principles of meal planning-Planning and preparation of nutritionally adequate diets for Adult man - Adult woman- Adolescent - School going child - Preschooler- Nutrition for Active Pregnant woman and Lactating woman- Special Nutritional Concerns: Vegetarian diets-The types of vegetarian:FlexitarianLacto-Ovo-Vegetarian-Lacto-Vegetarian-Ovo-Vegetarian-Vegan-Other Styles (Fruitarians)-

Nutrition Challenges for Vegetarians.

Unit II Energy and Sports Performance: Dietary Carbohydrate and Sports PerformanceDietary Fat and Sports Performance-Dietary Protein and Sports Performance-Vitamins and Sports Performance-Minerals and Sports Performance-The Pre-competition MealLiquid Meals-Planning and preparation of Energy dense recipes- High fibre recipes- Low fat recipes- Low sodium recipes- Antioxidants, Exercise and free radicals, Role of antioxidants in preventing damage and recovery time.

Unit III Current Trends in Nutrition: Nutrigenetics – Nutrigenomics - Immunonutrition Nutrition - Immunity Interactions - Antioxidants and Immune Function - Physiological Regulation of Feeding. Appetite and Satiety - Psychology and Nutrition - Nutrition and Sleep - Update on Nutritional Objectives and Recommended Intakes - New Evidence on the Mediterranean Diet

Unit IV - Water Balance and imbalance: Euhydration, Hypohydration, and Hyperhydration-Thermoregulation-Hyponatremia-Dehydration-Rehydration- Fluid balance in sports and exercise, importance, symptoms and prevention of dehydration-Age-Related Fluid Needs -Sports Drink – Hypotonic, Isotonic and Hypertonic drink for hydration/ energy and recovery drink-Other Types of Drinks: Energy Drinks-Oral Rehydration Solutions (ORS)-Sports Waters-Vitamin Waters-Coconut Water-Alcohol-Tea, Coffee and Cola.

Unit V- Paralympic sports: Classification of disabilities - Physiology and metabolismPhysiological responses to exercise-Energy expenditure-Thermoregulation-Body composition-Bone density-Dietary issues for athletes with disabilities: Current dietary intakes-Fiber, timing of food intake and bowel control-Fluid intake-Body composition management-Nutritional supplements-Eating difficulties and behaviors observed in some athletes with disabilities

Reference Books

1. Louise Burke and Vicki Deakin, (2010), Clinical Sports Nutrition, the McGraw-Hill Companies, Sydney New York.

2. Glenn Cardwell, (2012), Gold Medal Nutrition, Fifth Edition, Human Kinetics, 57A Price Avenue, Lower Mitcham, Australia.

3. Natalie DigateMuth, (2015), Sports Nutrition for Health Professionals, F. A. Davis Company, 1915 Arch Street, Philadelphia, USA.

4. Corinne H. Robinson, Emma S. Weigley Donna H. Mueller, Basic Nutrition and Diet Therapy 7 ed, Macmillon Publishing Company

5. L. Anderson Dibble P. R. Turkki H. S. Michael H. J. Ryribergen J. B, Nutrition in Health and Disease 17th ed , Lippincott Company, Philadelphia

6. Sumati R. Mudambi and M. V. Rajagopal , Fundamentals of Food & Nutrition, New Age International (P) Ltd. Bombay.

Course Outcomes

After successful completion of the course the student will be able to

CO1 Explain the physiological basis for nutritional needs through the human lifecycle

CO2.

Identify nutrition related concerns and deficiency disorders at every stage of lifecycle

CO3. Discuss appropriate dietary guidelines for various age groups

CO4. Develop indigenous, value added and low cost complementary feeds

CO5.

Demonstrate skills to plan and prepare appropriate and sustainable diets for deficiency diseases

Mapping with Programme Outcomes:

*S-Strong 3 ; M-Medium 2 ; L-Low 1

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	L	M	S	M
CO 2	S	M	L	S	M
CO 3	S	M	M	S	S
CO 4	S	M	M	S	M
CO 5	S	S	M	S	S

COURSE CODE – 23UC1CE502

SPORTS AND EXERCISE PSYCHOLOGY

This paper aims at imparting and understanding about sports psychology and its relation to different sports

1. Historical development and scope

2. Understanding personality, motivation, emotion and its relationship with performance

UNIT 1: Basics of Sport & Exercise Psychology

Introduction (Meaning, Definition, Historical Development need and scope of Exercise and sports psychology, History of Sports Psychology in India) - Relationship of Sports Psychology with other Sports Sciences. Methods of Psychology (Introspection method, Observation method, Experimental method, Case study method. Questionnaire method, Interview method, Survey method)- Importance of Sport Psychology for Athletes, Coaches and other related to Sport Setting

UNIT II: Personality and Performance

Personality and Performance (Meaning, Definition and Structure of Personality)-Personality theories [Psychoanalysis, Humanistic, Trait Theories and models] - Constitutional theories (Sheldon, Trait) and Social Learning (Bandura) - Personality and Performance in Sports (Ice Berg Profile by Morgan)

UNIT III: Motivation and Performance

Motivation & Goal Setting (Meaning, Definition and Structure of Motivation [Need, Drive, Motive and Motivation Types] - Theories of motivation [Abraham Maslow, Need Achievement by McClelland] Self-Determination model - Techniques for Developing Motivation, Goal Setting – Locke GST. Motivation-Performance Relationship.

UNIT IV: Emotion and Performance

Meaning and Definition of Emotion - Meaning, Definition of Anxiety, Types of Anxiety- Meaning, Definition and Nature of Arousal and Stress, Theories [Drive theory, Inverted – U theory & IZOF]-Emotion Performance Relationship.

UNIT V: Motor Learning and Motor control:

Meaning and Definition of Motor Learning and Motor control – Neuroanatomy: cerebellum, basal ganglia, supplementary motor cortex, premotor cortex, and motor cortex. Peripheral Motor System- General Motor Control Theories: Closed-loop Theory- Open-loop Theory.

Reference Book

1. Ciccarelli, S. K & Meyer, G.E (2008). Psychology (South Asian Edition). New Delhi: Pearson

2. Glassman,W.E.(2000).Approaches to Psychology(3rd Ed.) Buckingham: Open University Press.

3. Passer, M.W., Smith, R.E., Holt, N. and Bremner, A. (2008). Psychology: The Science of Mind and Behaviour.McGraw-Hill Education.UK

4. Weinberg, R. S., & Gould, D. (1995). Foundations of sport and exercise psychology (Vol. 4). Champaign, IL: Human Kinetics.

Course Outcomes

After successful completion of the course the student will be able to

CO1	To understand the concepts of Basics of Sport & Exercise Psychology
CO2.	Analyze the Personality traits of sports Performance enhancement
CO3.	Analyze the Motivation for sports Performance enhancement
CO4.	Gain knowledge on Emotion and sports Performance enhancement
CO5.	To understand the concepts of Motor Learning and Motor control

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	L	M	S	M
CO 2	S	M	L	S	M
CO 3	S	M	M	S	S
CO 4	S	M	M	S	M
CO 5	S	S	M	S	S

***S-Strong 3 ; M-Medium 2 ; L-Low 1**

COURSE CODE – 23UC1CT402

SPORTS BIOMECHANICS

COURSE OUTCOMES:

1 To enable the students to learn the basic concept of biomechanics.

2 Explain the basic mechanical concepts and will be able to interpret its relation to human body movements

3 To make the students to understand kinematic and kinetic concept of human movement. Apply and analyze the factors of mechanical laws involved in human movement.

4 Explain the principles of movement analysis

5 To equip the students to learn the principle of aerodynamic and hydrodynamics.

6 Analyze the mechanical principles of motor skills and sports related skills along with their proper techniques and corrective measures.

7 To enable the students to acquire the skills of qualitative and quantitative of human movement.

UNIT 1

Introduction Meaning, Importance and scope of Sports Biomechanics - Static and Dynamics – Kinematics and Kinetics - Vectors and Scalars - Historical development of Sports Biomechanics - branches of biomechanics - Definition and Meaning of terms: Distance, Displacement, Speed, Velocity, Acceleration, Mass, Weight. Momentum, Impulse, Torque, Newton's Law of Universal Gravity. Linear and angular kinematics – Linear and angular kinetics.

UNIT II Levers; types of levers, anatomical and mechanical levers and Mechanical Advantage – Human body levers - application of levers in sports. Equilibrium - types of equilibrium. Gravity – Definition, centre of gravity and location of centre of gravity, influence of gravity, location of human body centre of gravity - Factor affecting Center of Gravity - stability and balance.

UNIT III Motion and Force Meaning and definition of Motion. Types of Motion: Linear motion, angular motion, uniform and non-uniform motion. Principles of Newton law of Motion -Law of Inertia, Law of acceleration and Law of action and reaction. Meaning and definition of force, Sources of force -Force components, Centripetal force - Centrifugal force. Force applied at an angle – Buoyancy – Friction: static friction, kinetic friction. Aerodynamics: Water resistance - Air resistance. Mechanical loads on the human body;

compression, tension and shear force

UNIT IV Projectile and Lever Freely falling bodies - Projectiles -Equation of projectiles - factors affecting projectile trajectory; influence of air resistance - projection angle, projection speed, relative height of release. Meaning of work, power, energy, kinetic energy and potential energy. Meaning of Spin, Types of Spin, Effect of Spin on angle of rebound, Application of Spin in the Sports, Magnus Effect: Meaning and its application in sports.

UNIT V Posture – definition – static and dynamic posture – importance and benefits of good posture - causes of poor posture poor posture, compensatory posture. Vertebral alignment – development of postural curves - Standing posture – lateral view, anterior view, and posterior view. Fundamentals of gait - Meaning of gait, gait cycle divisions, Rancho Los Amigos gait terminology.

Kinematic concepts for analysing human movement - Kinematics; linear and angular kinematics distance, displacement, speed, velocity and acceleration-forms of motion, linear motion, angular motion and general motion.

References:

1. Paul Grimshaw et al. Sports & Exercise Biomechanics, Taylor & Francis Group, (2007).

2. Susan J. Hall, Basic Biomechanics, McGraw Hill Education, 2004.

3. Peter McGinnis Biomechanics of Sport and Exercise, Human Kinetics, 2005.

4. Kathryn Lutgens et al. Kinesiology (Scientific Basis of Human Motion), Brown and

Bench mark, 1992.

5. Roger Bartlett. Introduction to Sports Biomechanics Analyzing Human Movement

Patterns, Routledge, 2007.

6. Roger Bartlett. Introduction to Sports Biomechanics, Spon Press, 1997

7. Knudson Duane V. Fundamentals of biomechanics, Springer, 2007.

8. Tomothy et al. Applied anatomy and biomechanics in sport (2nd edition), Human

Kinetics, 2009

9. Steven T. McCaw. Biomechanics for dummies, John Wiley, 2014.

10. Anthony J. Blazevich. Sports Biomechanics (2nd edition), Bloomsbury, 2012

Course Outcomes

After successful completion of the course the student will be able to

CO1	To enable the students to learn the basic concept of biomechanics
CO2.	To make the students to understand kinematic and kinetic concept of human movement.
CO3.	Apply and analyze the factors of mechanical laws involved in human movement.
CO4.	Analyze the mechanical principles of motor skills and sports related skills along with their proper techniques and corrective measures.
CO5.	To enable the students to acquire the skills of qualitative and quantitative o human movement.

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	**S**	**L**	**M**	**S**	**M**
CO 2	**S**	**M**	**L**	**S**	**M**
CO 3	**S**	**M**	**M**	**S**	**S**
CO 4	**S**	**M**	**M**	**S**	**M**
CO 5	**S**	**S**	**M**	**S**	**S**

***S-Strong 3 ; M-Medium 2 ; L-Low 1**

COURSE CODE – UEN23CE005

STRENGTH AND CONDITIONING FOR FITNESS

Learning Objectives:

1. This is designed to give opportunity to participate in many different activities to learn the immediate and long term benefits of physical activity

2. To develop personal strength training programme.

3. To Interpret and apply scientific knowledge and literature relating to strength training.

4. Understand the importance of organizations admin distraction and leadership and their importance in the development of a safe and effective training programs.

UNIT – I Introduction to Wellness and Lifestyle Management : Definition and Meaning of Wellness - Dimensions of Wellness: Physical Wellness, Emotional Wellness, Mental Wellness, Social Wellness, Environmental Wellness, Occupational Wellness, and Spiritual Wellness – Wellness issues for diverse populations – Behaviours that contribute to wellness – Wellness and Health – Wellness and Physical Activity – Wellness through Life style management – SelfPlanning for Healthy- Lifestyles Wellness in the digital age

UNIT II Introduction to Fitness and Lifestyle Management : Definition and Meaning of Fitness - Physical Activity and Exercise for Health and Fitness - Physical Activity and Exercise Recommendations for Promoting General Health, Fitness, and Weight ManagementComponents of physical fitness : Health Related fitness components - Cardiorespiratory endurance, Muscular strength, Muscular endurance, Flexibility, Body composition - Skill (Neuromuscular) Related Components of Fitness – Speed, Power, Agility, Balance, Coordination, Reaction and movement time.

UNIT – III Introduction Meaning and Definition of Strength training and conditioning- Brief History of Strength Training and Conditioning - Strength and Conditioning Today - Benefits of resistance training - SAID Principle: Mechanical specificity-Neuromuscular specificity-Metabolic specificity-Progressive Adaptations from Resistance Training: Stabilization-Muscular enduranceMuscular hypertrophy-Strength-Power-Resistance Training Program Design: Exercise SelectionExercise order and Workout Structure-Intensity-Training Volume-Rest Intervals-Repetition Velocity-Frequency.

Unit IV Principles of Physical Training: FITT-VP principle - Physical activity pyramid - Designing Exercise Program - Guidelines for Training - ACSM Exercise Recommendations for

Fitness Development in Healthy Adults - Health and fitness benefits of different amounts of physical activity and exercise - Choosing a Fitness Center. Developing a Personal Fitness Plan: Set Goals - Select Activities - Set a Target Frequency, Intensity, and Time (Duration) for Each Activity - Set Up a System of Mini-Goals and Rewards - Include Lifestyle Physical Activity and Strategies to Reduce Sedentary Time in Your Program - Importance of Reducing Sedentary Time - Develop Tools for Monitoring Progress - Make a Commitment - Exercise Guidelines for Life Stages - Exercise Guidelines for People with Special Health Concerns

UNIT – V Warm-up and cool down: Definition of Warm-up and cool down - Physiology of Warming Up- Flexibility- Flexibility and Injury Prevention- Factors Affecting Flexibility- Types of Stretching: Static Stretching- Dynamic Stretching- Proprioceptive Neuromuscular Facilitation Stretching - Flexibility Training Guidelines - The Cool down

Reference Book

1. Micheal A. Clark, Scott C. Lucett, and Brian G. Sutton,(2012), NASM Essentials of Personal Fitness Training, Fourth Edition, Lippincott Williams & Wilkins, a Wolters Kluwer business, Two Commerce Square, 2001Market Street, Philadelphia, USA.

2. Nicholas Ratamess, (2012), ACSM's Foundations of Strength Training and Conditioning, Lippincott Williams & Wilkins.

3. Thomas R. Baechle, and Roger W. Earl, (2008), Essentials of Strength Training and Conditioning, Human Kinetics, P.O. Box 5076, Champaign, USA.

Course Outcomes

After successful completion of the course the student will be able to

CO1 Explain the physiological basis for Strength training and conditioning

CO2. Identify Competitive forms of Resistance Training

CO3. Discuss appropriate SAID Principle for various age groups

CO4. Discuss appropriate Cardiorespiratory Fitness for various age groups

CO5.

Demonstrate the skills plan and prepare appropriate and sustainable Warming Up and Flexibility various age groups

Mapping with Programme Outcomes:

*S-Strongly correlated 3 ; M- Moderately correlated 2 ; L-Low 1

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	L	M	S	M
CO 2	S	M	L	S	M
CO 3	S	M	M	S	S
CO 4	S	M	M	S	M
CO 5	S	S	M	S	S

COURSE CODE – 23UC1CE301

TRAINING AND PERFORMANCE

OBJECTIVES:

Provide opportunities to the graduates to learn the methods of training for performance.

LEARNING OUTCOMES:

1. To work with higher efficiency as Exercise Physiologist or Exercise Trainers.

2. To constructively apply the acquired scientific findings and methodological

repertoire in practical training under various conditions.

3. To recognize the tendencies of development in their sport and consider them in

their training process.

UNIT – I Definition of training, Sports performance, aerobic training, aerobic system , volume, Intensity, Steps to find intensity (MHR, RHR, HRR, Training Intensity Zone) , frequency- FITT Principle – Factors affect sports performance Training principles – over load , specificity , reversibility – influence of Gender, Initial fitness level and Genetics – components of work session – warm up , work out and cool down - Training to improve aerobic power - Interval training – long slow distance – High Intensity Continuous exercise - Training intensity and improvement in VO2 max- Endurance Training and VO2 max.

UNIT – II Definition of Anaerobic exercise, Anaerobic training , anaerobic system – Anaerobic power and capacity – Training to improve anaerobic system - - ATP – Pc System (Phosphogen system) – Anaerobic Glycolysis – Oxidative system - Methods of Anaerobic training – Explosive training, Speed training , Interval training and various methods of Resistance training - Modes of Anaerobic training – sprinting , Plyometrics , Stair Climbing , Resistance training and weight lifting – Effects of training on Anaerobic system - muscular adaptation – muscle adaptation to anaerobic training - adaptation in a Lactate Threshold.

UNIT – III Definition of strength, Hypertrophy, 1 RM (One Repetition maximum) muscular fitness, muscular strength, muscular endurance, resistance training – classification of strength training – Isometric – Isotonic – Isokinetic – factors involved in muscular adaptation – principles of resistance training- physiological effects of strength training – neural and muscular adaptation to resistance training.

UNIT – IV Definition of Optimum Training, Overtraining , Over reaching – types of

overreaching (Functional and Nonfunctional overreaching - Symptoms of overtraining – effect of overtraining – Risk of overtraining syndrome – Negative effect of Over training - predicting the overtraining syndrome – Prevention of Over Training Syndrome - treating the overtraining syndrome – tapering for peak performance.

UNIT – V Definition of Retraining , Detraining - muscular strength, power, muscular endurance, speed, agility, flexibility and cardio respiratory endurance – Benefits of muscular strength and muscular endurance- Difference between muscular strength and Muscular endurance – Components muscular strength work - speed, Training to improve speed, agility, flexibility and cardio respiratory endurance.

Reference Books:

1. Scott K. Powers Edward T. Howley (2004) "Exercise Physiology- Theory and application to fitness and performance", Brown and Benchmark.

2. Diek, Frank W. (1978) "Sports training principles ", London: Lepus books.

3. E.L.Fox(1979) "Sports Physiology halt: CBS College publishing.

4. Nieman , David C, "The Exercise Health Connection" champaign L: Human

kinetics.

5. .Jack. H Wilmore and David L. Costill (2004) "Physiology of Sports and Exercise",

Human kinetics.

Course Outcomes

After successful completion of the course the student will be able to

CO1	Define, meaning and Understand the basic concepts of Training and performance and training to improve aerobic power.
CO2.	Define and Understand the essentials of Anaerobic power and system.
CO3.	Define, meaning and Application of strength training and its adaptation.
CO4.	Define, meaning and Analyse the symptoms and syndrome of overtraining.
CO5.	Understand acquire deep insight into retraining.

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	L	M	S	M
CO 2	S	M	L	S	M
CO 3	S	M	M	S	S
CO 4	S	M	M	S	M
CO 5	S	S	M	S	S

***S-Strong 3 ; M-Medium 2 ; L-Low 1**

UYO22EC101 - VISITING YOGA EDUCATIONAL INSTITUTION

Teaching practice will be organized for 1 day during IV semester. The assessment of the students is internal for 100 marks. Students should design a programme in yoga and are to teach practice and train in educational institutions for 1 day.

COURSE CODE – 23PC1AE401

YOGA EDUCATION

Learning objectives

Students will be able to:

1. The Students will acquire knowledge and understanding of YOGA.

2. Students become proficient in the knowledge, skill and practical of yoga and tactical efficiency, rules of the game and training related to yoga

UNIT I- Yoga: Meaning and Definition. Origin of Yoga, Historical development of yoga in India - Hatha yoga texts. Systems of Yoga: Karma yoga - Jnana yoga - Bhakthi yoga - Raja yoga. Eight limbs of yoga: Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana and Samadhi. International Yoga Day -Yogic Diet.

UNIT II- Schools of yoga - Effect of yoga on various systems of the body: Muscular system - Circulatory system - Endocrine system - Respiratory system - Nervous system - Digestive system - Yoga for Physical Fitness, Yoga for Health and Wellness. Yoga for Diseases.

UNIT III Loosening the joints - Suryanamaskar (Bihar school of yoga). Meaning of Asana Classification - differences between asanas and physical exercises - Techniques and benefits. Standing Asana: Vrkshasana –Trikonasana - Padhahastasana. Seated Asanas: Siddhasana – Padmasana - Paschimottanasana. Inverted asanas: Sarvangasana - Halasana. Prone position: Mayurasana - Sirsasanana. Back bend asanas: Bujangasana –Salabhasana – Dhanurasana - Ushtrasana. Supine position: Navasana, Suptavajrasana, Twisting: Vakrasana, Ardhamatsyendrasana, and Kukutasana.

UNIT IV Pranayama: Meaning and Definition – Concept of Pranayama – Nadis – Ida nadi – Pingala Nadi – Sushumna nadi – Controlling of breath: Puraka – Kumbhaka – Rechaka – Guidelines for practicing Pranayama – Benefits of Pranayama – Types of Pranayama: Nadi Suddhi – Nadi Shodhana – Surya Bhedana – Kapalabhati – Bhastrika – Sitkari – Sitali – Bhramari – Ujjayi. Bandhas: Meaning and Definition – Types: Jallandra – Uddiyana – Mula.

UNIT V Meditation: Meaning and Definition – Concept of meditation – Types of meditation – Physiological benefits of meditation – yoga and competition – Principles of yogic Diet – Integration of Yoga with modern education – yoga institutions in India and Abroad – General Yogic Schedule.

Text Book

1. George Feuerstein. (1975).Text Book of Yoga. London: Motilal Bansaridass Publishers (P) Ltd.

2. Gore. (1990). Anatomy and Physiology of Yogac Practices. Lonavala: Kanchan Prkashan.

3. Iyengar, B. K. S. (2000). Light on Yoga. New Delhi: Harper Collins Publishers.

4. Swami Satyananda Saraswathi. (1984). Kundalini and Tantra. Bihar: Yoga Publications Trust.

5. Swami Kuvalayananda. (1998). Asanas. Lonavla: Kaivalyadhama. Publication.

Course Outcome

After successful completion of the course the students will be able to

CO1 Understand the basic Concepts of Yoga

CO2. Apply the principles of Yoga to live healthy and active life style.

CO3. Promote the awareness of health through yoga

CO4. Analyze the techniques and of body posture to bring out healthy change.

CO5. Able to execute loosening exercise, Asanas and Pranayama.

Mapping with Programme Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	S	L	M	S	M
CO 2	S	M	L	S	M
CO 3	S	M	M	S	S
CO 4	S	M	M	S	M
CO 5	S	S	M	S	S

*S-Strong 3 ; M-Medium 2 ; L-Low 1