

MPEC – 105:
Course Title: SPORTS ENGINEERING

Credit			Teaching Hours		
Lecture/Tutorials	Practical/Internship	Total	Lecture/Tutorials	Practical/Internship	Total
3	1	4	48	32	80

COURSE OBJECTIVES:

1. Define the relationship between Sports and Engineering.
2. To apprise different materials used in Sports.
3. To explain concept related to sports dynamics and facility management.
4. Describe the importance of ethics within both sports and manufacturing.
5. Identify technologies and sustainable solutions to manufacturing apparel.
6. Assess and understand the manufacturing techniques within two companies.
7. Relate the non-engineering sports world to the knowledge and technologies that engineering has developed.

STUDENT LEARNING OUTCOMES:

1. Apply the concept of Engineering and Technology in sports.
2. Differentiate different materials used in sports.
3. Demonstrate and prepare programmes related to sports dynamics and facility management.

UNIT I: Introduction to Sports Engineering

- Meaning of Sports Engineering,
- Equipment and Facility Designing and Sports Related Instrumentation and Measurement
- Materials of Protection – discussion of the materials that are used for sports gear and Protection
- Performance of Surface Materials – Discussion of the Different Surfaces that Sports are played on and why; how can these materials make a difference from Sport to Sport.
- Shoe Materials – discuss the design necessities that go into shoe materials and manufacturing and how that differs from Sport to Sport
- Balls and Ballistics – discuss the difference of the Equipment that is used for Specific sports and basic Aerodynamic principles
- Performance of Surface Materials – Discussion of the different Surfaces that Sports are played on and why; how can these materials make a difference from sport to sport.

UNIT II: Sports Dynamics

- Concepts of Internal force, Axial force, Shear force, Bending movement, Torsion, energy method to find displacement of Structure, Strain energy.
- Biomechanics of daily and common activities –Gait, Posture, and Body levers, ergonomics,
- Mechanical principles in movements such as lifting, Walking, Running, Throwing, Jumping, pulling, pushing etc., Motion coordinate system, Kinetics of particles Newton’s laws of Motion, Work, Energy, Impulse and momentum

UNIT III: Building and Maintenance:

- Sports Infrastructure: Gymnasium, Pavilion, Swimming Pool, Indoor Stadium, Out-door
- Stadium, Play Park, Academic Block, Administrative Block, Research Block, Library, Sports Hostels, etc. Requirements: Air ventilation, Day light, Lighting arrangement, Galleries, Store rooms
- Office, Toilet Blocks (M/F), Drinking Water, Sewage and Waste Water disposal system,
- Changing Rooms (M/F), Sound System (echo-free),
- Internal arrangement accords to need and nature of activity to be performed, Corridors and Gates for free movement of people, Emergency provisions of lighting, fire and exits, Eco-friendly outer surrounding, Maintenance staff, Financial consideration

UNIT IV:

- Understanding the process of Construction & Requirements there of Building process: - design phase (including brief documentation), Construction phase, functional (occupational) life, re-evaluation, refurbish, Demolish.
- Maintenance policy, preventive maintenance, Corrective maintenance, Record and register
- Gymnasium, Pavilion, Swimming Pool, Indoor Stadium, Out-door designs, Development & maintenance.

TEACHING LEARNING STRATEGIES: The class will be taught by using lectures and demonstration, Seminars, classroom discussion, Videos, charts and presentations method.

ACTIVITIES: Lecture//Laboratory Work/ Field Work/ Outreach Activities/ Project Work/ Vocational Training/Viva/ Seminars/ Term Papers/Assignments/ Presentations/ Self-Study etc.

ASSESSMENT RUBRIC: Classroom Test, Project Work, Assignments, Presentations, Practical Work

Text & Reference:

- Subic, A., & Haake, S. (2000). The engineering of sport research, development and innovation. Malden, Mass.: Blackwell Science. ISBN-10: 0632055634 ISBN-13: 978-0632055630
 - Franz K. F. et. al., Editor, Routledge Handbook of Sports Technology and Engineering (Routledge, 2013)
 - Steve Hake, Editor, The Engineering of Sport (CRC Press, 1996)
 - Franz K. F. etc. al., Editor The Impact of Technology on Sports II (CRC Press, 2007)
 - Helge N., Sports Aerodynamics (Springer Science & Business Media, 2009)
 - Youlin Hong, Editor Routledge Handbook of Ergonomics in Sport and Exercise (Routledge, 2013)
 - Jenkins M., Editor Materials in Sports Equipment, Volume I (Elsevier, 2003)
 - Colin White, Projectile Dynamics in Sport: Principles and Applications
- Eric C. et al., Editor Sports Facility Operations Management (Routledge, 2010).