MECHANISM AND ROBOT KINEMATICS

SWAYAM Prabha Course Code- M22

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COURSE OUTLINE	This course will be a foundation course in analysis of mechanisms and robots. After a brief introduction to the subject matter and terms, the audience will be taken from kinematic analysis of planar closed-loop chains to open loop chains. Under spatial kinematic chains, the analysis will cover closed-loop mechanisms, serial manipulators, and parallel manipulators. The course will dwell upon coordinate frames, Denavit-Hartenberg parametrization, coordinate transformations, direct and inverse kinematics, velocity and acceleration analysis, kinematic motion planning, singularities in kinematic chains, principle of virtual work and force analysis. The course will demonstrate various concepts by working out problems and exercises relevant to real life applications involving innovative mechanisms and robotic chains. The course is expected to help students and researchers in their basic understanding and use of kinematic analysis. This course will also pave way for more advanced courses on mechanism and robot dynamics and design

COURSE DETAILS

S. No	Module ID/ Lecture ID	Lecture Title/Topic
1	Intro	Intro
2	M1L1	Lecture 1 Introduction
3	M1L2	Lecture 2 Nomenclature
4	M1L3	Lecture 3 Kinematic Diagram
5	M1L4	Lecture 4 Degree of Freedom â€“ I
6	M1L5	Lecture 5 Degree of Freedom â€“ II

7	**M2L1**	Lecture 6 Degree of Freedom â€“ Failure
8	**M2L2**	Lecture 7 Grashof Criteria â€“ I
9	**M2L3**	Lecture 8 Grashof Criteria â€“ II
10	**M2L4**	Lecture 9 Geometry and Representation of Vectors
11	**M2L5**	Lecture 10: Displacement Analysis: constrained mechanism â€“ I
12	**M3L1**	Lecture 11 : Displacement Analysis: constrained mechanism â€“ II
13	**M3L2**	Lecture 12 : Displacement Analysis: constrained mechanism â€“ III
14	**M3L3**	Lecture 13 : Displacement Analysis: constrained mechanism â€“ IV
15	**M3L4**	Lecture 14 : Displacement Analysis: open chain robot â€“ I
16	**M3L5**	Lecture 15 : Displacement Analysis: open chain robot â€“ II
17	**M4L1**	Lecture 16 : Displacement Analysis: open chain robot â€“ III
18	**M4L2**	Lecture 17 : Displacement Analysis: open chain robot â€“ IV
19	**M4L3**	Lecture 18 : Displacement Analysis: closed chain robot â€“ I
20	**M4L4**	Lecture 19 : Displacement Analysis: closed chain robot â€“ II
21	**M5L1**	Lecture 20 : Velocity Analysis: geometric concepts â€“ I
22	**M5L2**	Lecture 21 : Velocity Analysis: geometric concepts â€“ II
23	**M5L3**	Lecture 22 : Velocity Analysis: geometric concepts â€“ III
24	**M5L4**	Lecture 23 : Velocity Analysis: application of geometric concepts â€“ I
25	**M5L5**	Lecture 24 : Velocity Analysis: application of geometric concepts â€“ II
26	**M5L6**	Lecture 25: Velocity Analysis: application of geometric concepts â€“ III
27	**M6L1**	Lecture 26 : Velocity Analysis: analytical approach â€“ I

28	**M6L2**	Lecture 27 : Velocity Analysis: analytical approach â€“ II
29	**M6L3**	Lecture 28 : Velocity Analysis: analytical approach â€“ III
30	**M6L4**	Lecture 29 : Serial Manipulator Velocity Analysis â€“ I
31	**M6L5**	Lecture 30 : Serial Manipulator Velocity Analysis â€“ II
32	**M7L1**	Lecture 31 : Serial Manipulator Velocity Analysis â€“ III
33	**M7L2**	Lecture 32 : Parallel Manipulator Velocity Analysis
34	**M7L3**	Lecture 33 : Path Generation Problem
35	**M7L4**	Lecture 34 : Acceleration Analysis â€“ I
36	**M7L5**	Lecture 35 : Acceleration Analysis â€“ II
37	**M8L1**	Lecture 36 : Force Analysis â€“ I
38	**M8L2**	Lecture 37 : Force Analysis â€“ II
39	**M8L3**	Lecture 38 : Coordinate transformation â€“ I
40	**M8L4**	Lecture 39 : Coordinate transformation â€“ II
41	**M8L5**	Lecture 40 : Coordinate transformation â€“ III

References if Any: