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| <b>DEPARTMENT</b>       | Department of Aerospace Engineering  |
| <b>INSTITUTE</b>        | IIT Kanpur   |
| <b>COURSE OUTLINE</b>   | This course is designed to understand stability and control aspects of an airplane. This course will also help in creating a background to design an airplane from stability and control aspects |
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## COURSE DETAILS

| S. No | Module ID/ Lecture ID | Lecture Title/Topic                                  |
|-------|-----------------------|--|
| 1     | M1L1                  | Introduction   |
| 2     | M1L2                  | Introduction to Static Stability                     |
| 3     | M1L3                  | Stability and Trim                                   |
| 4     | M1L4                  | Stability: Wing Contribution                         |
| 5     | M1L5                  | Stability: Tail Contribution and Static Margin       |
| 6     | M2L1                  | Problems : Stability and Wing Contribution Completed |
| 7     | M2L2                  | Problems : Stability Tail Contribution Completed     |
| 8     | M2L3                  | Neutral Point and Fuselage Contribution Completed    |
| 9     | M2L4                  | Longitudinal Control Completed                       |
| 10    | M2L5                  | Longitudinal Control continued....                   |
| 11    | M3L1                  | Control: Elevator                                    |
| 12    | M3L2                  | CL_trim Vs e_trim                                    |

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|----|------|---|
| 13 | M3L3 | Neutral Point: A Closer Look  |
| 14 | M3L4 | Contribution of Engine towards Stability                                  |
| 15 | M3L5 | Revision  |
| 16 | M4L1 | Trim:Cruse,Climb and Landing  |
| 17 | M4L2 | Trim: Maneuver  |
| 18 | M4L3 | Maneuvering Point: Stick Fixed  |
| 19 | M4L4 | Numerical: Stick Fixed Maneuvering Point and Flight Demonstration         |
| 20 | M4L5 | Revision(Lecture20)   |
| 21 | M5L1 | Directional Stability   |
| 22 | M5L2 | Directional Control   |
| 23 | M5L3 | Lateral Stability and Control   |
| 24 | M5L4 | Numericals : Directional, Lateral Stability and Control                   |
| 25 | M5L5 | Lecture - 25 Revision   |
| 26 | M6L1 | Stick Free Stability  |
| 27 | M6L2 | Stick Free Stability continued...   |
| 28 | M6L3 | Hinge Moment and Hinge Moment Derivative                                  |
| 29 | M6L4 | Aircraft Handling Qualities   |
| 30 | M6L5 | Aircraft Handling Qualities continued...                                  |
| 31 | M7L1 | Reversible Control: Stick Free and Trim Tabs                              |
| 32 | M7L2 | Numericals: Stick Free  |
| 33 | M7L3 | Numericals: Stick Free Continued...                                       |
| 34 | M7L4 | Handling Qualities: Maneuvering Flight                                    |
| 35 | M7L5 | Determination of Neutral Point and Maneuvering Point by Flight Experiment |

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| 36 | M8L1  | Ponit Mass Equation of Motion                    |
| 37 | M8L2  | Forces and Moments                               |
| 38 | M8L3  | Aircraft Equations of Motion                     |
| 39 | M8L4  | Six Degrees of Freedom of an Aircraft            |
| 40 | M8L5  | 6 DoF : Angular Momentum Components              |
| 41 | M9L1  | Vector in a Rotating Frame                       |
| 42 | M9L2  | Euler Angles                                     |
| 43 | M9L3  | Small Perturbation Theory                        |
| 44 | M9L4  | Small Perturbation Theory Continued...           |
| 45 | M9L5  | Perturbed Equations of Motion: Longitudinal Case |
| 46 | M10L1 | Perturbed Force : fz                             |
| 47 | M10L2 | Perturbed Force : fz Continued...                |
| 48 | M10L3 | Perturbed Pitching Moment                        |
| 49 | M10L4 | Longitudinal Dimensional Stability Derivatives   |
| 50 | M10L5 | Dynamic Stability                                |
| 51 | M11L1 | Longitudinal Modes                               |
| 52 | M11L2 | Short Period and Phugoid Approximations          |
| 53 | M11L3 | Pure Pitching Motion                             |
| 54 | M11L4 | Stability Augmentation System (SAS)              |
| 55 | M11L5 | Lateral-Directional Motion                       |
| 56 | M12L1 | Tutorial - 1                                     |
| 57 | M12L2 | Tutorial - 2                                     |
| 58 | M12L3 | Tutorial - 3                                     |

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|-----------|-------|---------------------|
| <b>59</b> | M12L4 | Tutorial - 4        |
| <b>60</b> | M12L5 | History of Aviation |

**References if Any:**