INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF CENTRE: Centre for Space Science and Technology

Subject Code: SSC-501 **Course Title:** Introduction to Space Sciences

L-T-P: 3-0-2 **Credits:** 4 **Subject Area:** PCC

Course Outlines: Planetary atmosphere and ionosphere, plasma, ionosphere, measurement techniques, solar radiation & space weather, solar wind, parker solar wind theory, planetary processes in the solar system, formation models, evidence of early solar system evolution from meteorites, asteroids and comets

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF CENTRE: Centre for Space Science and Technology

Subject Code: SSC-503 **Course Title:** Experimental Techniques for Space Exploration

L-T-P: 3-0-2 **Credits:** 4 **Subject Area:** PCC

Course Outlines: Interaction of radiation with matter, Principles and applications of different types of spectroscopic methods for the analysis of molecules. Spectrometers used in space exploration, Spectral Database, Nuclear radiation in space, Effect of radiation on materials, Different types of detectors for space radiation, Shielding of radiation.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF CENTRE: Centre for Space Science and Technology

Subject Code: SSC-505 **Course Title:** Launch Vehicle Technology

L-T-P: 3-1-0 **Credits:** 4 **Subject Area:** PCC

Course Outlines: Introduction to Space Technology, Basics of Rocketry, Propulsion, Aerodynamics, Telemetry and Telecommand, Ground based Support Systems, Selection Criteria for Materials for Space Applications, High Temperature Materials, Additive and Near Net Manufacturing, Mechanical Structures and Systems, SATCOM Concept and Basics, Communication between Ground Station and LV, Tracking and Control, Radiometers

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPARTMENT/CENTRE/SCHOOL: Centre for Space Science and Technology

Subject Code: SSC-507 **Course Title:** Satellite System Technology

L-T-P: 3-0-2 **Credits:** 4 **Subject Area:** PCC

Course Outlines: Basics of satellite communications; Classes of satellites; Satellite subsystems; Telemetry, tracking, and command; Geometry of geostationary and non-geostationary orbit; Earth-satellitegeometry; Launch vehicles; Orbital effects in communication system performance; Satellite links: Up and down; Basic RF link; Link budget; Propagation factors; Modulation and multiplexing techniques; Analog and digital transmission systems; Multiple access techniques;Satellite services

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF CENTRE: Centre for Space Science and Technology

Subject Code: SSL-502 **Course Title:** Antennas for Space Applications

L-T-P: 3-1-0 **Credits:** 4 **Subject Area:** PEC

Course Outlines: Antenna performance parameters, Radiation pattern and coverage, Antennas for space applications, Effects of antennas in the space environment, Operation principle and performance of deployable reflector antennas, Large unfurlable antennas, Shaped reflectors, Microstrip antennas, and arrays, Conformal arrays, Passive and active arrays, Printed reflect arrays, Antennas for telecommunication and broadcasting satellite applications, Design requirements for satellite communication antennas.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF CENTRE: Centre for Space Science and Technology

Subject Code: SSL-506 **Course Title:** Terrestrial Planets & Their Climate

L-T-P: 3-1-0 **Credits:** 4 **Subject Area:** PEC

Course Outlines: Structure and Composition of planetary atmospheres, thermodynamics of atmospheres, Equation of state for dry and moist air, lapse rate, adiabatic and isothermal processes, Planck's law, irradiance spectrum and flux of solar radiation, atmospheric dynamics, mass conservation, material derivative, continuity equation, electrical properties of atmospheres, fair weather electricity, modelling of Planetary atmospheres, remote sensing of atmosphere, hierarchy of models.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF CENTRE: Centre for Space Science and Technology

Subject Code: SSL-510 **Course Title:** Space Economics and Policy

L-T-P: 3-1-0 **Credits:** 4 **Subject Area:** PEC

Course Outlines: Space economy satellite, LEO economy; space exploration and economic growth; direct, indirect, and induced impacts of space activities; technology transfer and non-market effects of space activities; space related institutional mechanisms; reforms in space sector; Space policy 2023, space governance and sustainability; Kessler syndrome; Space debris management, policy aspects for sustainability of outer space.

INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF CENTRE: Centre for Space Science and Technology

Subject Code: SSL-511 **Course Title:** Exploration of Planetary Interiors

L-T-P: 3-1-0 **Credits:** 4 **Subject Area:** PEC

Course Outlines: Geological and geophysical techniques for exploring planetary interiors, mineralogy of meteorites and asteroids, experimental methods for planetary materials under extreme conditions, thermochemical evolution of planets, geochemistry of planetary bodies, exoplanet detection techniques, habitability criteria, and exploration of Earth-like planets.