

Date	Topic	Main topics, concepts and tools	Assignment out	Assignment due	Reading	Notes
1/27/2016	Introduction	Overview of course, space mission engineering, logistics, projects			SMAD ch 1-3	
1/29/2016	The Space Mission Engineering Process	Mission design process, phases, concept and architecture exploration and selection			SMAD ch 4-5	
2/1/2016	Mission Requirements	Types of requirements, guidelines for writing requirements, requirement allocation and budgeting		Project preferences	SMAD ch6	
2/3/2016	Review of orbit attitude dynamics and control	Two-body problem, orbits, spacecraft attitude dynamics			SMAD ch8-ch9	P:Peck
2/5/2016	Space Environment	Radiation, magnetic field, microgravity, space debris	HW1 out		SMAD ch7	
2/8/2016	Orbit design	Kepler's laws, orbit perturbations, orbital decay, maneuvers, Hohmann transfers, deorbiting, types of orbits			SMAD ch9-10	
2/10/2016	Constellation design and interplanetary orbits	Coverage figures of merit, access to ground stations, Walker constellations, constellation design, interplanetary orbits			SMAD ch9-10	
2/12/2016	STK exercise	Exercise to compute contact times, coverage figures of merit, orbital decay, satellite lifetime	HW2 out	HW1 due	STK user manual	(P:Hitomi)
2/15/2016						February Break
2/17/2016	ADCS, GN&C subsystems	Characteristics of sensors and actuators for attitude and orbit determination and control. Basic sizing of reaction wheels, thrusters, magnetic torquers.			SMAD ch 19	
2/19/2016	Propulsion	Rocket equation, staging, chemical propulsion, electric propulsion			SMAD ch 18	P:Krejci, MIT
2/22/2016	Overview of payloads	Types of payloads, EM spectrum, review of Fourier analysis		HW2 due	SMAD ch 15	
2/24/2016	Communications subsystem I	A/D conversion, modulations, coding schemes			SMAD ch 16	
2/26/2016	Communications subsystem II	RF and optical comms, link budgets	HW3 out		SMAD ch 21	
2/29/2016	Microwave remote sensing	Planck's law, blackbody radiation, emissivity, passive MW radiometers			SMAD ch 17	
3/2/2016	Microwave payload technologies	Antennas, filters, radar equation, synthetic aperture processing		SRR document	SMAD ch 17	
3/4/2016	Optical remote sensing	Types of optical payloads, remote sensing principles, technologies for VNIR solid surface sensing, TIR solid surface sensing		HW3 due	SMAD ch 17	
3/7/2016	Optical payload technologies	Types of optical payloads, remote sensing principles, technologies for atmospheric sounding			SMAD ch 17	
3/9/2016	Review for quiz					(P:Hitomi)
3/11/2016	Quiz 1	Up to comms (HW3)				
3/14/2016	Power and thermal subsystems	Illumination, solar array and battery sizing, power budgets, alternative power generation methods, radiators, louvers	HW4 out		SMAD ch 21	
3/16/2016	Avionics	On-board computers, data protocols, radiation, avionics architectures			SMAD ch 20	
3/18/2016	Launch vehicles	Launch vehicle selection, launch environment, launch configurations, operations, launch vehicle availability and reliability			SMAD ch26	
3/21/2016	Structures, mechanisms and configuration	Loads, vibrations, modes, sizing and configurations, mechanisms	HW5 out	HW4 due	SMAD ch 22.1 and 14.3	P:Golkar, Skoltech
3/23/2016	Life Control Systems	Atmosphere control, food and water, closed-loop systems			TBD	P:Diaz Artilles
3/25/2016	Humans in Space	Human deconditioning in space, biomechanics, cardiovascular system			TBD	P:Diaz Artilles
3/28/2016						Spring Break
3/30/2016						Spring Break
4/1/2016						Spring Break
4/4/2016	Communications missions	TBD		HW5 due		P:Lohmeyer, OneWeb (TBC)
4/6/2016	Ground segment and mission operations	Communications, navigation, tracking services, antennas, data distribution			SMAD ch 27, 28, 29	
4/8/2016	Cost estimation	Parametric methods, cost estimating relationships, bottom-up estimates, analogy-based estimates, software cost, complexity corrections		SDR document	SMAD ch 11	
4/11/2016	Risk and reliability	Risk matrix, failure mode analysis, basic reliability calculations, Weibull distribution, min cut sets	HW6 out		SMAD ch 24	
4/13/2016	Astrophysics missions	TBD				P:Savransky
4/15/2016	Entry Descent and Landing	TBD			Griffin and French, ch 6	P:Benito, JPL
4/18/2016	Earth Science missions	TBD		HW6 due		
4/20/2016	CubeSats and SmallSats	Capabilities and technologies of CubeSats and small sats, trends, limitations, mission examples			SMAD ch 25.3, 25.4	
4/22/2016	Spacecraft charging and mission assurance	TBD				P:De Soria, JPL (TBC)
4/25/2016	Space policy, industry and organizations	Space actors, funding sources, regulations, policy considerations			SMAD ch 2, 12	
4/27/2016	Quiz 2	Everything up to risk and reliability (HW6)				
4/29/2016	Planetary exploration missions	TBD				P:Battat, SpaceX (TBC)
5/2/2016	Wrap-up					
5/4/2016	PDR presentations					
5/6/2016	PDR presentations					
5/9/2016	PDR presentations					
5/11/2016	PDR presentations					
5/18/2016				Design document due CDR plan due		