2024 FYS3400 Lecture Plan (based on C.Kittel's Introduction to Solid State Physics, Chapters 1-9, 17-20)

		calender week
Module I – Periodity and Disorder (Chapters 1-3, 19, 20)		
Mo 15/1 10-12	Introduction. Crystal bonding. Periodicity and lattices. Lattice planes and Miller indices. Reciprocal space.	3
Th 18/1 10-11	Bragg diffraction and Laue condition	
Mo 22/1 10-12	Ewald construction, interpretation of a diffraction experiment, Bragg planes and Brillouin zones	4
Th 25/1 10-11	Surfaces and interfaces. Disorder. Defects crystals. Equilibrium concentration of vacancies	
Mo 29/1 10-12	Mechanical properties of solids. Diffusion phenomena in solids	5
Th 1/2 10-11	Summary of Module I	
Module II – Phonons (Chapters 4, 5, and 18 pp.557-561)		
Mo 5/2 10-12	Vibrations in monoatomic and diatomic chains of atoms; examples of dispersion relations in 3D	6
Th 8/2 10-11	Periodic boundary conditions (Born – von Karman); phonons and its density of states (DOS)	
Mo 12/2 10-12	Effect of temperature - Planck distribution; Lattice heat capacity: Dulong-Petit, Einstein, and Debye models	7
Th 15/2 10-11	Comparison of different lattice heat capacity models	
Mo 19/2 10-12	Thermal conductivity and thermal expansion	8
Th 22/2 12-13	Summary of Module II	
Module III – Electrons (Chapters 6, 7, 11 - pp 315-317, 18 - pp.528-530, 19, and Appendix D)		
Mo 26/2 10-12	Free electron gas (FEG) versus free electron Fermi gas (FEFG); DOS of FEFG in 3D	9
Th 29/2 10-11	Effect of temperature – Fermi-Dirac distribution; Heat capacity of FEFG in 3D	
Mo 4/3 10-12	DOS of FEFG in 2D - quantum wells, DOS in 1D – quantum wires, and in 0D – quantum dots	10
Th 7/3 10-11	Transport properties of electrons	
Module IV – Disordered systems (guest lecture slides - Joakim Bergli)		
Mo 11/3 10-12	Thermal properties of glasses: Model of two level systems	11
Th 14/3 10-11	Electron transport in disordered solids: wave localization and hopping	
Mo 18/3 10-12	Advanced theory of disordered systems	12
Th 21/3 10-11	Summary of Module IV	
Easter		
Module V – Semiconductors (Chapters 8, 9 pp 223-231, and 17, 19)		
Th 4/4 10-11	Recap of Module III	14
Mo 8/4 10-12	Origin of the band gap; Nearly free electron model; Kronig-Penney model	15
Th 11/4 10-11	Effective mass method for calculating localized energy levels for defects in crystals	
Mo 15/4 10-12	Intrinsic and extrinsic electrons and holes in semiconductors	16
Th 18/4 10-11	Carrier statistics in semiconductors	
Mo 22/4 10-12	p-n junctions	17
Th 25/5 10-11	Optical properties of semiconductors	
Mo 29/4 10-12	Advanced photonic devices including quantum tech	18
Th 2/5 10-11	Summary of Module V	
Summary and repetition		
Mo 6/5 10-12	Repetition - course in a nutshell	19
Exam: oral examination		**tentatively during week 20 or 21**