

# 2016 FYS3410 Lectures and Exam (based on C.Kittel's Introduction to SSP, Chapters 1-9, 17,18,20)

## Module I – Periodic Structures and Defects (Chapters 1-3, 20)

<b>M18/1</b> 09-12 am	Introduction. Crystal bonding. Periodicity and lattices, reciprocal space	3h
<i>W 20/1 canceled</i>		
<b>M25/1</b> 09-12 am	Laue condition, Ewald construction, interpretation of a diffraction experiment, Brag planes and Brillouin zones	3h
<i>W27/1 canceled</i>		
<b>M01/2</b> 10-12 am	Elastic strain and structural defects in crystals	2h
<b>W03/2</b> 09-10 am	Atomic diffusion in solids	1h
<b>M08/2</b> 10-12 am	Summary of Module I	2h

## Module II – Phonons (Chapters 4 and 5)

<b>W10/2</b> 09-10 am	Vibrations in monoatomic and diatomic chains of atoms	1h
<b>M15/2</b> 10-12 am	Periodic boundary conditions, phonons and density of states (DOS)	2h
<b>W17/2</b> 09-10 am	Planck distribution	1h
<b>M22/2</b> 10-12 am	Lattice heat capacity: Dulong-Petit, Einstein, and Debye models	3h
<i>W24/2 canceled</i>		
<b>M29/2</b> 09-12 am	Comparison of different models; Thermal conductivity	3h
<b>W02/3</b> 09-10 am	Thermal expansion	1h
<b>M07/3</b> 10-12 am	Summary of Module II.	2h

## Module III – Electrons (Chapters 6, 7, 18 - pp.528-530, and Appendix D)

<b>W09/3</b> 09-10 am	Free electron gas (FEG) versus free electron Fermi gas (FEFG)	1h
<b>M14/3</b> 10-12 am	DOS of FEFG in 3D. Effect of temperature – Fermi-Dirac distribution	2h
<b>W16/3</b> 09-10 am	Heat capacity of FEFG in 3D	1h
<b>W30/3</b> 09-10 am	DOS in 2D - quantum wells	1h
<b>M04/4</b> 10-12 am	DOS in 1D – quantum wires, 0D – quantum dots, transport properties of electrons	2h
<b>W06/4</b> 09-10 am	Origin of the band gap	1h
<b>M11/4</b> 10-12 am	Nearly free electron model. Kronig-Penney model. Empty lattice approximation	2h
<b>W13/4</b> 09-10 am	Number of orbitals in a band	1h
<b>M18/4</b> 09-12 am	Summary of Module III.	2h

## Module IV – Semiconductors and interfaces (Chapters 8, 9-pp 223-231, 17)

<b>W20/4</b> 09-10 am	Metals versus semiconductors. Surfaces and interfaces	1h
<b>M25/4</b> 09-12 am	Effective mass method	3h
<b>W27/4</b> 09-10 am	Intrinsic carrier generation – electrons and holes	1h
<b>M02/5</b> 09-12 am	Localized levels for hydrogen-like impurities – donors and acceptors. Doping.	3h
<b>W04/5</b> 09-10 am	Carrier statistics in semiconductors.	1h
<b>M09/5</b> 09-12 am	p-n junctions.	3h
<b>W11/5</b> 09-10 am	Optoelectronic semiconductor properties and devices with Randi Haakenaasen	1h
<b>W18/5</b> 09-10 am	Demonstration of optoelectronic device with Randi Haakenaasen	1h

## Summary and repetition

<b>M23/5</b> 09-12 am	Summary of Module IV. Repetition - the course in a nutshell	3h
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## Exam

30-31/5 your presence is required for 1 h – please book your time in advance