

**ENGINEERING PHYSICS EXAMINATIONS  
SYLLABUS**

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**GROUP A**

**COMPULSORY EXAMINATIONS (7 REQUIRED)**

**98-Phys-A1 Classical Mechanics**

Review of fundamental principles; Lagrangian Mechanics; non-conservative and non-holonomic systems; central force problem; motion of a rigid body; variational principles, and an introduction to Hamilton's equations.

*Recommended Texts:*

Hibbeler, R.C., Engineering Mechanics: Dynamics, 7th edition. Prentice-Hall, Englewood Cliffs, N.J., 1995.

**98-Phys-A2 Statistical Physics**

Kinetic theory of gases; Quantum states, temperature, entropy, chemical potential, Boltzmann factor, fermions and bosons. Fermi-Dirac distributions and electrons in metals. Bose-Einstein distributions and photons, Debye theory of phonons.

*Recommended Texts:*

*Prime Text:*

Reif, F., Fundamentals of Statistical and Thermal Physics. McGraw-Hill Inc., 1965.

*Supplementary Text:*

Kittel, C. and Kroemer, H., Thermal Physics, 2<sup>nd</sup> edition. W.H. Freeman, 1980.

**98-Phys-A3 Electromagnetics**

Field concepts. Maxwell's equations. Free space and guided wave propagation, transmission lines. Radiation from current elements.

*Recommended Texts:*

Demarest, Engineering Electromagnetics. Prentice-Hall.

Staelin, D.H., Morgenthaler, A.W. and Kong, J.A., Electromagnetic Waves. Prentice Hall, 1994.

### **98-Phys-A4 Quantum Mechanics**

Breakdown of classical mechanics. Schrodinger equation and elementary systems; one dimensional problems. Postulates and interpretation of quantum mechanics. Algebraic solution of the Schrodinger equation for the harmonic oscillator. Angular momentum and spin. Central force problems; the hydrogenic atom. Concepts and applications of tunneling. Perturbation theory.

*Recommended Texts:*

Kroemer, H., Quantum Mechanics for Engineering, Materials Science & Applied Physics. Prentice Hall, NJ, 1994.

### **98-Phys-A5 Semiconductor Devices and Circuits**

Semiconductor physics; band theory, drift and diffusion. Semiconductor devices; diodes, bipolar and MOS devices. Time and Frequency responded linear circuits. Small signal and operational amplifiers. Digital circuits and logic families; D/A and A/D conversion; instrumentation.

*Recommended Texts:*

Sedra, A.S. and Smith K.C., Microelectronic Circuits, 3<sup>rd</sup> Edition. Saunders College Publishing, 1991.

Streetman, B.G., Solid State Electronic Devices, 4<sup>th</sup> edition. Prentice-Hall, Englewood Cliffs, N.J, 1995.

### **98-Phy-A6 Solid State Physics**

Lattice structure and bonding. Lattice vibrations and phonons. Electrons in solids, band structure of metals, semiconductors and insulators, the Fermi surface. Semiconductors and junctions. Paramagnetism and diamagnetism. Introduction to lattice defects.

*Recommended Texts:*

*Prime Text:*

Kittel, C., Introduction to Solid State Physics, 6<sup>th</sup> edition. John Wiley and Sons, 1986.

*Supplementary Text:*

Ashcroft, N.W and Mermin, N.D., Solid State Physics. Saunders College, 1976.

**98-Phys-A7 Optics**

Gaussian optics, optical instruments, matrix analysis of lens systems, aberrations, polarization: double and multiple-beam interference. Fraunhofer and Fresnel diffraction, fibre optics, contemporary optics design.

*Recommended Texts:*

Hecht E. and Zajac, A., Optics, 2<sup>nd</sup> edition. Addison-Wesley, 1987.

## GROUP B

### ELECTIVE EXAMINATIONS (3 REQUIRED)

#### **98-Phys-B1 Radiation Physics**

Atomic and nuclear structure, isotopes, radioactivity, X-rays, attenuation and absorption in matter, detection of radiation, radiation instrumentation, dosimetry, radiation protection, radiation safety and standards, non-ionizing radiation.

*Recommended Texts:*

Camber, H., Introduction to Health Physics, 3<sup>rd</sup> edition. McGraw-Hill, NY, 1996.

#### **98-Phys-B2 Electro-Optical Engineering**

Optical transmission: waveguide modes, fibre optic propagation characteristics. Optoelectronics: lasers, sources and detectors, couplers, modulators, guided wave devices. Applications.

*Recommended Texts:*

Yariv, Optical Electronics. Saunders College Publishing.

#### **98-Phys-B3 Digital Systems and Computers**

Combinatorial and sequential switching circuits. Register level design of digital systems. Computer memories. Computer architecture, assembly language programming, interrupts, and interfacing.

*Recommended Texts:*

Brey, The Motorola Microprocessor Family. Saunders College Publishing.

#### **98-Phys-B4 Communications**

Amplitude and frequency modulation systems: signals, spectra, implementation. Sampling of continuous signals and the Nyquist sampling theorem. Fourier series and transforms, spectral concepts. Discrete signals and systems: the sampling theorem, time and frequency response, the Z-transform. PCM and simple baseband pulse code modulation systems.

*Recommended Texts:*

Oppenheimer, Signals and Systems, 2nd edition. Prentice-Hall.

### **98-Phys-B5 Control**

Models, transfer functions, and system response. Root locus analysis and design. Feedback and stability: Bodes diagrams. Nyquist criterion, frequency domain design. State variable representation. Simple PID control systems.

*Recommended Texts:*

Dorf, Modern Control Systems, 8th edition. Addison-Wesley.

### **98-Phys-B6 Applied Thermodynamics and Heat Transfer**

Applied Thermodynamics: Review of fundamental laws and their applications to closed and open systems. Vapour cycles for power and refrigeration; cycle modifications including reheat, regeneration. Gas cycles; spark ignition and compression ignition cycles. Gas turbine cycles, including modifications such as regeneration and intercooling; effects of component efficiency on performance.

Heat Transfer: Conduction in one and two-dimensional systems; steady state and transient regimes. Natural- and forced-convection problems. Radiation heat exchange between black, gray, and real surfaces. Thermal design of heat exchangers.

*Recommended Texts:*

F.P. Incropera & David, DeWitt, Introduction to Heat Transfer, latest edition, John Wiley & Sons.

Y. Cengel & M. Boles, Thermodynamics An Engineering Approach, 2<sup>nd</sup> edition, McGraw-Hill.

### **98-Phys-B7 Structure of Materials**

Atomic and molecular structure. Metallic, ionic, covalent and Van der Waals, Crystal structure, space lattices and Miller indices. Crystalline and non-crystalline (amorphous). Solidification (crystallisation) and associated microstructures of cast metals and phenomena of grain boundaries. Observations of material structure (X-ray techniques, metallography, optical and electron microscopy). Defects in solids, dislocation and slip, vacancies and diffusion. Basic mechanisms of deformation processes of materials. Phase diagrams (solid solution systems, eutectic and eutectoid systems, peritectic reaction, intermetallic compounds). Application of lever rule to phase proportions in common single- and binary-phase systems.

**The Association of  
PROFESSIONAL ENGINEERS AND GEOSCIENTISTS  
of British Columbia**

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1998 ENGINEERING PHYSICS SYLLABUS  
Checklist for Self Evaluation  
(Not required for candidates who are assigned  
confirmatory exams)

Name: \_\_\_\_\_

Exam Number	Exam Name	Applicant=s Self-Evaluation - Course Equivalent	For Office Use Only
<i>Basic Studies (6 Required)</i>			
98-BS-1	Mathematics		
98-BS-2	Probability and Statistics		
98-BS-3	Statics and Dynamics		
98-BS-4	Electric Circuits and Power		
98-BS-5	Advanced Mathematics		
98-BS-9	Basic Electromagnetics		
<i>Basic Studies (2 required)</i>			
98-BS-6	Mechanics of Materials		
98-BS-7	Mechanics of Fluids		
98-BS-8	Digital Logic Circuits		
98-BS-10	Thermodynamics		
98-BS-11	Properties of Materials		
98-BS-12	Organic Chemistry		

<b>Group A (7 required)</b>			
98-Phys-A1	Classical Mechanics		
98-Phys-A2	Statistical Physics		
98-Phys-A3	Electromagnetics		
98-Phys-A4	Quantum Mechanics		
98-Phys-A5	Semiconductor Devices and Circuits		
98-Phys-A6	Solid State Physics		
98-Phys-A7	Optics		
<b>Group B (3 Required)</b>			
98-Phys-B1	Radiation Physics		
98-Phys-B2	Electro-Optical Engineering		
98-Phys-B3	Digital Systems and Computers		
98-Phys-B4	Communications		
98-Phys-B5	Control		
98-Phys-B6	Applied Thermodynamics and Heat Transfer		
98-Phys-B7	Structure of Materials		
<b>Complementary Studies (All Required)</b>			
11-CS-1	Engineering Economics		
11-CS-2	Engineering in Society – Health and Safety		
11-CS-3	Sustainability, Engineering and the Environment		
11-CS-4	Engineering Management		