# SOS IN ELECTRONICS & PHOTONICS

## PT. RAVISHANKAR SHUKLA UNIVERSITY RAIPUR (C.G.)

### M TECH IN OPTOELECTRONICS & LASER TECHNOLOGY

**ELIGIBILITY**

A person will be eligible for admission if he/she holds M.Sc (Electronics/ Electronic Science/ Physics/ Applied Physics) or B.Tech or B.E. or equivalent degree AMIE or AMIETE in Electronics and Tele communication Engg or Electronics Engg or Electrical Engg from any recognized University or institution with least 55% marks or CGPA of 6.25 on a 10-point scale.

**SYLLABUS/COURSE CONTENTS FOR M TECH ENTRANCE TEST 2018:**

**Engineering Mathematics (10%)**
Linear Algebra, Calculus: vector algebra and vector calculus, Linear differential Equations, Elementary complex analysis, Fourier Analysis.

**Electromagnetics (10%)**
Electrostatics, Magnetostatics, Electromagnetic waves: reflection and refraction, dispersion, interference, coherence, diffraction, polarization. Waveguides: modes in rectangular waveguides, dispersion relations.

**Thermodynamics and Statistical Physics (10%)**
Laws of Thermodynamics, Thermodynamic potentials and Maxwell's relations. Phase space, Microstates and Macrostates. Black Body radiation & Plank's distribution law, Bose-Eienstein condensation.

**Optoelectronics (10%)**
Maxwell's Equations, The planar slab waveguide, Dispersion in waveguides, Graded index waveguides, Dispersion and Graded Index fibers, Attenuation, Nonlinear effects in waveguides, Rectangular Dielectric waveguides, The beam propagation Method for analyzing optical waveguides, Coupling and Numeric analysis, Coupled Mode Theory and Application, Coupling between optical sources and waveguides, Noise in optical detectors, Optical radiation.

**Optics and Lasers (20%)**

26/6/2018
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Fermat's Principle and its applications, Refraction and reflection by Spherical Surfaces, Matrix Method in Paraxial Optics, Aberrations, General concepts of Interference, Diffraction, Polarization, Holography, Lasers : Optical resonators, spontaneous and stimulated emission, Optical pumping, population inversion, Coherence, Simple description of Ruby Laser and He-Ne Laser. Defects and color center lasers, Elementary idea of Nano optics, Magnetic Resonance Imaging (MRI), Computer Tomography.

**Electronics : (10%)**

Physics of p-n junction, Diode as a circuit element, clipping, clamping, Rectification, Zener regulated power supply; Transistor as a circuit element: CC, CB and CE configuration. Transistor as a switch, OR, AND, NOT gates. Feedback in Amplifiers.

Operational amplifier and its applications: inverting, non-inverting amplifier, adder, integrator, differentiator, wave form generator, comparator & Schmidt trigger. Digital integrated circuits-NAND & NOR gates as building blocks, X-Or Gate, simple combinational circuits. Half & Full adder, Flip-flop, shift register, counters. Basic principles of A/D & D/A converters; Simple applications of A/D & D/A converters.

**Electronics Devices (10%)**

Energy bands in silicon, intrinsic and extrinsic silicon, Carrier transport in silicon: diffusion current, drift current, mobility and resistivity. Generation and recombination of carriers, p-n junction diode, Zener diode, Tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, p-i-n and avalanche photo diode. Device technology: integrated circuits fabrication process, oxidation, diffusion, ion implanation, photolithograpohy, n-tub , p-tub and twin-tub CMOS process.

**Applied Optics (20%)**

Applied Optics, Holography, Fourier-Transform Optics, Spatial Filtering, Speckle Interferometry, Birefringence, Electro-optics, Magneto-optics and Acousto-optics, Kerr Effect, Optical Integrated Circuits. Fiber Optics, The optical fiber, comparison of optical fiber with other interconnectors, concept of an optical waveguide, rays and modes, principle of light guidance in optical wave guides, Application of fiber optics. nonlinear optics, nonlinear optical susceptibility, second and third order optical susceptibilities, harmonic generation, phase matching, optical mixing, parametric generation of light, self-focusing of light, optical bistability, optical phase conjugation.

REFRENCES Books :

1. Optical Electronics: A. Ghatak & K. Thyagarajan
2. Quantum Electronics: A. Yariv

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