JABALPUR ENGINEERING COLLEGE, JABALPUR (M.P.)
(Rajiv Gandhi Proudyogiki Vishwavidyalaya, Madhya Pradesh, Bhopal)

Scheme of M.Sc. Examination in Applied Physics

THIRD SEMESTER (M.Sc. Applied Physics)
Effective from session 2018-19 onwards

S.NO.	SUBJECT CODE	SUBJECT	Periods Per Week				Maximum Marks (Theory Slots)			Maximum marks (Practical Slots)		Total Marks	Remarks
			L	T	P	TOTAL Credits	End Sem. Exam	Mid Sem Exam	Assignment/ Quiz	End Semester Practical/ Viva	Practical Record/ Assignment/ Quiz/ Presentation		
1	AP3001	Nanophysics & Nanotechnology-II	4	1	...	5	70	20	10	...	.....	100	
2	AP3002	Communication Electronics-I	4	1	...	5	70	20	10	...	...	100	
3	AP3003	Applied Optics and Laser Physics	4	1	...	5	70	20	10	...	.....	100	
4	AP3004	Applied Nuclear Physics	4	1	...	5	70	20	10	...	.....	100	
5	AP3005	LAB-I (Electronics lab)	....	...	5	5	...	...	...	60	40	100	
6	AP3006	LAB-II (Nano Science lab)	...	...	5	5	...	...	...	60	40	100	
7	AP3007	Industrial Training /Seminar			2	2					50	50	
		TOTAL	**16**	**4**	**12**	**32**	**280**	**80**	**40**	**120**	**130**	**650**	

L-Lecture T-Tutorial P-Practical

Dr. S. K. Tiwary
Prof. & Head
Deptt. of App. Phy.
JEC, Jabalpur (M.P.)

Department of Applied Physics, Jabalpur Engineering College, Jabalpur (MP)

M.SC. APPLIED PHYSICS

AP-3001

THIRD SEMESTER

Nanophysics & Nanotechnology-II

Max Mks Theory: 70 Min Pass Mks: 28

UNIT - I

Carbon Nano Tubes: Basic concepts of carbon Nano Tubes (CNT); Types of CNT: Single Walled and Multiwalled nanotubes. Synthesis of CNT: Electric Arc Discharge, Chemical vapor Deposition (CVD). Characterization techniques in CNT: X Ray diffraction Fluorescent Photoluminescence, Electron Microscopy, AFM.

UNIT – II

Properties of CNT: Electrical, Vibrational and Mechanical properties of CNT. Applications of CNT: Field Emission and Shielding, Computers, Fuel Cells, Chemical sensors and catalysis and Mechanical Reinforcements

UNIT – III

Electrons in Traditional Low dimensional structures: Electrons in Quantum Wells, Electrons in Quantum Wires. Quantum Dots. Preparation of Quantum Nanostructures. Size and Dimensionality effect.

UNIT – IV

Nanomagetism: Basic concepts of magnetism and magnetic materials. Magnetic structures, Magnetism of Nanosized Materials. Synthesis of magnetic nanoparticles. Applications of Nanomagnetic materials

UNIT – V

Nanoelectronics: Concept of Coulomb Blockade, Coulomb blockade in a Nanocapacitor. The Single Electron Transistor. Lithography: Concept and definition. Photolithography, Charge Particle based lithography

Dr. S. K. Tiwary
Prof. & Head
Deptt. of App. Phy.
JEC, Jabalpur (M.P.)

Department of Applied Physics, Jabalpur Engineering College, Jabalpur (MP)

M.SC. APPLIED PHYSICS

AP-3002

THIRD SEMESTER

COMMUNICATION ELECTRONICS – 1

Max Mks Theory: 70 Min Pass Mks: 28

UNIT-1

Ionosphere: Ionospheric structure, Propagation of e.m. wave through Conductivity in ionized media. Derivation for ionosphere, Measurement of height & ion Intensity of Ionospheric layer, Appleton & Hartree Magneto ionic formula, skip distance, Maximum usable frequency (MUF), Optimum working frequency and Principle of Satellite communication.

UNIT-2

Microwave Generator: Barkhausen Kurtz Oscillator, Klystron Oscillator, Reflex Klystron, Magnetron, Split anode magnetron, Cavity magnetron, Gunn diode, IMPATT diode, TRAPATT Diode.

UNIT-3

Modulation: Need of modulation, Amplitude, Frequency & phase modulation, Square law modulation, Balanced modulator, Linear diode modulation method, Plate & grid modulation, Reactance tube modulation, Single side band transmission method.

Demodulation: Square law detector, Linear diode detector, FM detectors, Foster-Seeley discrimination, Ratio detectors, Quadrature detector.

UNIT-4

Radio Transmitters : Carrier frequency requirements of a ratio transmitter, Cause of frequency drift & scintillation & their remedies, Constituents of AM transmitter- Master oscillator, Buffer amplifier, Harmonic generator, Power amplifier, Circuit for improving performance, FM transmitter using reactance tube, Phase modulated (Armetrong), FM transmitter, Pre-Emphasis, Comparison of FM & AM system.

UNIT-5

Principle of superhetrodyne reception: Block diagram of superhetrodyne receiver

Frequency conversion : Mixer and frequency converter circuits, IF amplifiers, Choice of intermediate frequency, Image rejection, Adjacent channel selectivity, simple AVC delayed AVC, amplified & delayed AVC, Volume control, Bank spread tuning, Tone control circuit.

FM Receivers: Block Diagram, De-Emphasis Circuit, Superiority of FM over AM.

Communication receivers: Single signal receivers, Noise limiter, AFC, Inter channel suppresser, single side band receiver, Volume Expander, Diversity reception, Frequency diversity reception, MUSA system.

Reference books –

1. Electronic and Radio Engineering – Terman.
2. Microwave and Waveguides – Barlow.
3. Satellite Communication – D.C. Agrawal.
4. Communication Electronics – Kennedy

Dr. S. K. Tiwary
Prof. & Head
Deptt. of App. Phy.
JEC, Jabalpur (M.P.)

Department of Applied Physics, Jabalpur Engineering College, Jabalpur (MP)

M.SC. APPLIED PHYSICS

AP-3003

THIRD SEMESTER

APPLIED OPTICS AND LASER PHYSICS

Max Mks Theory: 70 Min Pass Mks: 28

UNIT – I

Multiple Beam Interferometry: Fabry Perot Interferometer, Intensity Distribution in the interference pattern of Fabry Perot Interferometer, Resolving Power, Evaluation of exact order, Lummer Gehrcke Interferometer, Its resolving power.

UNIT – II

Introduction to Laser, Spontaneous & Stimulated emission, Einstein Coefficients, Role of Active medium, Conditions for Light Amplification, Population Inversion, Negative absorption, Pumping, 3 & 4 level Pumping schemes, Optical Resonators, Its action, Laser Beam Characteristics, Temporal & Spatial Coherence., Laser Spiking.

UNIT – III

Classification of Lasers: Solid State Laser, Ruby Laser, Nd-YAG Laser, Their construction & working. Gas Laser: He – Ne Laser, Carbon Dioxide Laser, Liquid Dye Laser, Semi Conductor Diode Laser, Application of Lasers. Elements of Holography: Recording & Reconstruction of a Hologram, Spekling in Hologram, Applications of Holography.

UNIT – IV

FIBER OPTICS 1: Structure of Optical Fiber, Delay Distortion , Propagation of Light in Cladded Optical Fiber, Semi Acceptance Angle, Numerical Aperture, Single & Multimode Fibers, Step Index & Graded Index Fibers, Optical Attenuation in Optical Fibers, Energy Losses in Optical Fibers.

UNIT - V

FIBER OPTICS 2: Manufacturing methods of Optical Fibers, LED & Laser sources for Optical Fiber, Principle & working of Avalanche Photo Diode and PIN Detectors, Fiber Connectors, Fiber Optic Devices like Endoscope, Intrascope, Fibroscope, Application of Fiber Optics.

Reference Books:

1. Principles of Optics: B.K.Mathur;
2.Fiber Optics: D.A. Hill;

..Tiwary
Prof. & Head
Deptt. of App. Phy.
JEC, Jabalpur (M.P.)

Department of Applied Physics, Jabalpur Engineering College, Jabalpur (MP)

M.SC. APPLIED PHYSICS

AP-3004

THIRD SEMESTER

APPLIED NUCLEAR PHYSICS

Max Mks Theory: 70 Min Pass Mks: 28

UNIT-1

General properties of atomic nucleus and Mass spectrograph , Nuclear charge and constitution , Nuclear stability and binding energy, Semi-empirical mass formula, Nuclear spin and nuclear moment. Particle accelerators - The linear accelerator, Synchrocyclotron, Electron synchrotron, Betatron. Nuclear Detectors: Ionisation chamber, Proportional counter. Geiger Muller Counter, Scintillation counter. Semiconductor detector, Nuclear emulsion, Cloud chamber & Bubble Chamber, Solid nuclear detectors.

UNIT 2

Alpha decay : The velocity & entity of Alpha particles, the absorption of Alpha particle, range, ionization and stopping power, alpha particle spectra, Nuclear energy levels, Gammow's theory of alpha-decay. Beta decay – The velocity & energy of Beta particles, the absorption of beta particles range, Ionisation & energy loss, beta particles spectra, Theory of beta decay, violation of parity conservation of beta decay.

UNIT 3

Gamma rays & raysγ rays by matter and the interaction of γGamma decay: Absorption of with mater, Electron Positron pair formation. Measurement of gamma ray energies, Gamma decay and nuclear energy levels, theory of the Mossbauer Effect. Nuclear Forces & Nuclear Structure –Nuclear binding energies & saturation of nuclear force nuclear radius, Fermi gas model, Liquid drop model, Magic numbers Nuclear shell model spin orbit interactions, Nuclear magnetic moments, The collective model.

UNIT 4

Neutron physics : Production of neutrons, Detection of neutrons, thermal neutrons, Neutron induced reaction, Neutron cross section, Neutron monochromators, Energy loss of neutrons by collision, Slowing down power & slowing down time. Nuclear Fission :- The fission process, Neutron induced fission, Chain reaction, The multiplication & criticality factors.

UNIT 5

Discovery of light mesons, K-mesons, hyperons & resonant states, Properties of Leptons & Hadrons, Elementary idea of Quarks, Quantum numbers of fundamental particles, Particle interaction, Symmetry & Conservation law.

Reference Books:

Introduction of Nuclear Physics by Halliday, David.
Nuclear Physics by Ervin Kaplan;
1.Source Book on Atomic Energy by Samuel Glasstone.
2.Nuclear Physics by Tayal;
3. Modern Physics by Arthur Beiser;
4. Atomic Physics: J.B. Rajam
5.Nuclear Physics :Pandya and Yadav

Dr. S. K. Tiwary
Prof. & Head
Deptt. of App. Phy.
JEC, Jabalpur (M.P.)