EKLAVYA UNIVERSITY, DAMOH (M.P.)

Scheme of Examination B.Sc III Year

/For batch admitted in Academic Session 2020-21/

Subject wise distribution of marks and corresponding credits

S. No.	Subject Name	Subject Code	Paper Name	Maximum Marks Allotted											Total Marks	Contact Periods Per week			Total Credits
				Theory Slot									Practical Slot						
				Final Yearly				Half Yearly				Quiz/ Assignment/ Attendence	End Sem	Lab Work/ Sessional		L	T	P	
				P1	P2	P3	P4	P1	P2	P3	P4								
1	Common	BPIND20Y301	Summer Project/Industrial Training												150	0	0	0	11
		BSECC20Y301	Skill Enhancement Course (SEC-3)	60				30				10			100	2	0	0	2
		BSECD20Y302	Skill Enhancement Course (SEC-4)	60				30				10			100	4	0	0	4
		BYOGA20Y301	Yoga -3 (University Core)	–	–	–		–	–	–		–	60	40	100	2	0	0	2
2	Physics	BPHYS20Y301	Quantum Mechanics and Spectroscopy, Paper- I (DSE - 3A)	30				15				5			50	3	1	0	4
		BPHYS20Y302	Solid State Physics and Semiconductor Devices, Paper- II (DSE- 3B)		30				15			5			50	3	1	0	4
		BPHYS20Y303	Paper- I & Paper- II, Practical (Practical 3A & 3 B DSE-3C)										30	20	50	0	0	2	2
		BPHYS20Y304	Digital Electronics, Paper- III (DSE - 3D for Honors)			30				15		5			50	3	1	0	4
		BPHYS20Y305	Paper- III, Practical (Practical 3D for Honours, DSE- 3E)										30	20	50	0	0	1	1
3	Common	BASPR20Y301	Assingment Presentation for 3 Discipline Specific Elective											50	50	0	3	0	3

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiencey Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

EKLAVYA UNIVERSITY
ज्ञान प्राप्तये लक्ष्य संधानम्
Estd. by Madhya Pradesh Niji Vishwavidyalaya (Sthapna Avam Sanchalan) Adhiniyam 2020

School of Basic and Applied Sciences

Class				B.Sc. Physics
Semester/Year				III Year
Subject & Subject Code				Physics - BPHYS20Y301
Paper				Quantum Mechanics and Spectroscopy, Paper- I
Max. Marks				30 (ETE) + 20 (IA) = 50
Credit			Total Credits	
L	T	P	4	
3	1	0		

Course Objectives:

• Is to make student study and understand the Quantum Mechanics and Spectroscopy
• Is to make students understand, learn,and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.

Course Outcomes:

The students are expected to acquire the knowledge of the following:
• Aspects of the inadequacies of classical mechanics and historical development of quantum mechanics.
• Wave packets, Phase and Group Velocities and uncertainty principle.
• Effect of magnetic fields on atoms.
• Vibrational and rotational motion of molecule and their energy levels, transition rules, spectrum, etc.
• Properties of nuclei, liquid drop model and nuclear shell model.
• Experiments related to theory course.

Student learning outcomes:

Student will be able to
1. Demonstrate a rigorous understanding of the fundamentals of Quantum Mechanics involved in theories & principles of physics.
2. Understand fundamentals of Spectroscopy and their applications..
3. Sharpen his skill and knowledge and utilize/apply his knowledge in further research and science.

Unit	Syllabus	Periods
Unit - I	**QUANTUM MECHANICS-1** Particles and Waves: Photoelectric effect. Black body radiation. Compton effect. De Broglie hypothesis. Wave particle duality. Davisson-Germer experiment. Wave packets. Concept of phase and group velocity. Two slit experiment with electrons. Probability. Wave amplitude and wave functions. Heisenberg's uncertainty principle with illustrations. Basic postulates and formalism of Schrodinger's equation. Eigenvalues. Probabilistic interpretation of wave function. Equation of continuity. Probability current density. Boundary conditions on the wave function. Normalization of wave function.	15

Shama Mehevan Meghy

Unit	Syllabus	Periods
Unit - II	**QUANTUM MECHANICS-2** Time independent Schrodinger equation: One dimensional potential well and barrier. Boundary conditions. Bound and unbound states. Reflection and transmission coefficients for a rectangular barrier in one dimension. Explanation of alpha decay. Quantum phenomenon of tunneling. Free particle in one-dimensional box, eigen functions and eigen values of a free particle. One-dimensional simple harmonic oscillator, energy eigenvalues from Hermite differential equation, wave function for ground state. Particle in a spherically symmetric potential. Rigid rotator.	15
Unit - III	**ATOMIC SPECTROSCOPY** Atoms in electric and magnetic fields: Quantum numbers, Bohr model and selection rules. Stern-Gerlach experiment. Spin as an intrinsic quantum number. Incompatibility of spin with classical ideas. Orbital angular momentum. Fine structure. Total angular momentum. Pauli exclusion principle. Many particles in one dimensional box. Symmetric and anti-symmetric wave functions. Atomic shell model. Spectral notations for atomic states. Spin-orbit coupling, L-S and J-J coupling. Zeeman effect. Continuous and characteristic X-rays. Mossley's law.	15
Unit - IV	**MOLECULAR SPECTROSCOPY** Spectra: Various types of spectra. Rotational spectra. Intensity of spectral lines and determination of bond distance of diatomic molecules. Isotope effect. Vibrational energies of diatomic molecules. Zero point energy. Anharmonicity. Morse potential. Raman effect, Stokes and anti-Stokes lines and their intensity difference. Electronic spectra. Born-Oppenheimer approximation. Frank- Condon principle, singlet and triplet states. Fluorescence and phosphorescence.	15
Unit - V	**NUCLEAR PHYSICS** Basic properties of nucleus: Shape, Size, Mass and Charge of the nucleus. Stability of the nucleus and Binding energy. Alpha particle spectra – velocity and energy of alpha particles. Geiger-Nuttal law. Nature of beta ray spectra. The neutrino. Energy levels and decay schemes. Positron emission and electron capture. Selection rules. Beta absorption and range of beta particles. Kurie plot. Nuclear reactions, pair production. Q-values and threshold of nuclear reactions. Nuclear reaction cross-sections. Examples of different types of reactions and their characteristics. Compound nucleus, Bohr's postulate of compound nuclear reaction, Semi empirical mass formula, Shell model, Liquid drop model, Nuclear fission and fusion (concepts).	15

Reference Books

1 Quantum Mechanics: V.Devanathan, Narosa Publishing House, New Delhi, 2005.

2 Quantum Mechanics: B.H. Bransden, Pearson Education, Singapore, 2005.

3 Quantum Mechanics: Concepts and Applications, Nouredine Zettili, John Wiley and Sons. Ltd, 2009.

4 Physics of Atoms and Molecules: B.H. Bransden and C.J.Joachaim, Pearson Education, Singapore, 2003.

5 Fundamental of Molecular Spectroscopy: C.M.Banwell and M. McCash, McGraw Hill.

6 Introduction to Atomic Physics: H.E.White.

7 Quantum Mechanics: Schaums Outlines, Y.Peleg, R.Pnini, E.Zaarur, E.Hecht.

Shama Mehwar

EKLAVYA UNIVERSITY

ज्ञान प्राप्तये लक्ष्य संधानम्

Estd. by Madhya Pradesh Niji Vishwavidyalaya (Sthapna Avam Sanchalan) Adhyadesh 2020

School of Basic and Applied Sciences

Class				B.Sc. Physics
Semester/Year				III Year
Subject & Subject Code				Physics - BPHYS20Y302
Paper				Solid State Physics and Semiconductor Devices, Paper- II
Max. Marks				30 (ETE) + 20 (IA) = 50
Credit			Total Credits	
L	T	P	4	
3	1	0		

Course Objectives:

- Is to make student study and understand the concept of Solid state physics, Nano materials and Electronic devices.
- Is to make students understand, learn,and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.

Course Outcomes:

The students are expected to acquire the knowledge of the following:

- Idea about crystalline and amorphous substances, reciprocal lattice, concept of Brillouin zones and diffraction of X-rays by crystalline materials.
- Lattice vibrations, phonons and theories of specific heat of solids.
- Different types of magnetism, hysteresis loops and energy loss.
- Band theory of solids, Basics of Semiconductor and two terminal devices and their applications
- Transistors and FET; configuration in different mode and mode of operation, h-parameter and their application in oscillators and amplifiers.
- Introduction of nanomaterials and nanotechnology, 3D, 2D, 1D and 0D, nanostructured materials and their synthesis techniques, properties and applications.
- Experiments related to theory course.

Student Learning Outcomes:

Student will able to -

1. Demonstrate a rigorous understanding of the fundamentals of Solid state physics.
2. Understand fundamentals of working and functioning of Semiconductor devices.
3. Understand Nano materials, their properties and applications.
4. Sharpen his skill and knowledge and utilize/apply his knowledge in further research and science.

Unit	Syllabus	Periods
Unit - I	**SOLID STATE PHYSICS-1** Crystal Structure and bonding: Crystalline and amorphous solids. Translational symmetry. Lattice and basis. Unit cell. Reciprocal lattice. Fundamental types of lattices (Bravias Lattice). Miller indices Lattice planes. Simple cubic. Face centered cubic. Body centered cubic lattices. Laue and Bragg's equations. Determination of crystal structure with X-rays, X-ray spectrometer. Ionic, covalent, metallic, van der Waals and hydrogen bonding. Band theory of solids. Periodic potential and Bloch theorem. Kronig-Penny model (Qualitative).	15

Shama Mehar Meghy

Unit	Syllabus	Periods
Unit - II	**SOLID STATE PHYSICS-2** Lattice structure and properties: Dulong Petit, Einstein and Debye theories of specific heats of solids. Elastic and atomic force constants. Dynamics of a chain of similar atoms and chain of two types of atoms. Optical and acoustic modes. Electrical resistivity. Specific heat of electron. Wiedemann-Franz law. Hall effect. Response of substances in magnetic field, dia-, para- and ferromagnetic materials. Classical Langevin theory of dia and paramagnetic domains. Curie's law. Weiss' theory of ferromagnetism and ferromagnetic domains. Discussion of BH hysteresis.	15
Unit - III	**SEMICONDUCTOR DEVICES-1** Electronic devices: Types of Semiconductors (p and n). Formation of Energy Bands, Energy level diagram. Conductivity and mobility. Junction formation, Barrier formation in p-n junction diode. Current flow mechanism in forward and reverse biased diode (recombination), drift and saturation of drift velocity. Derivation of mathematical equations for barrier potential, barrier width. Single p-n junction device (physical explanation, current voltage characteristics and one or two applications). Two terminal devices. Rectification. Zener diode. Photo diode. Light emitting diode. Solar cell. Three terminal devices. Junction field effect transistor (JFET). Two junction devices. Transistors as p-n-p and n-p-n. Physical mechanism of current flow and characteristics of transistor.	15
Unit - IV	**SEMICONDUCTOR DEVICES-2** Amplifiers (only bipolar junction transistor). CB, CE and CC configurations. Single stage CE amplifier (biasing and stabilization circuits), Q-point, equivalent circuit, input impedance, output impedance, voltage and current gain. Class A, B, C amplifiers (definitions). RC coupled amplifiers (frequency response). Class B push-pull amplifier. Feedback amplifiers. Voltage feedback and current feedback. Effect of negative voltage series feedback on input impedance. Output impedance and gain. Stability, distortion and noise. Principle of an Oscillator, Barkhausen criterion, Colpitts, RC phase shift oscillators. Basic concepts of amplitude, frequency and phase modulations and demodulation.	15
Unit - V	**NANO MATERIALS** Nanostructures: Introduction to nanotechnology, structure and size dependent properties. 3D, 2D, 1D, 0D nanostructure materials and their density of states, Surface and Interface effects. Modelling of quantum size effect. Synthesis of nanoparticles - Bottom Up and top Down approach, Wet Chemical Method. Nanolithography. Metal and Semiconducting nanomaterials. Essential differences in structural and properties of bulk and nano materials (qualitative description). Naturally occurring nano crystals. Applications of nanomaterials	15

Reference Books

1 Introduction to Solid State Physics: C.Kittel, VIII Edition, John Wiley and Sons, New York, 2005.

2 Intermediate Quantum Theory of Crystalline Solids: A.O.E. Animalu, Prentic-Hall of India Pvt. Ltd., New Delhi, 1977

3 Solid State Electronic Devices: B.G.Streetman, II Edition , Prentic-Hall of India Pvt. Ltd., New Delhi

4 Microelectronics: J.Millman and A. Grabel, McGraw Hill, NewYork

5 The Physics and Chemistry of Nanosolides: Frank J. Owens and Charles P. Pooles Jr., Wiley Inter Science, 2008

6 Physics of Low Dimensional Semiconductors: An introduction, J.H. Davies, Cambridge University Press, UK, 1998

7 Electronic Fundamental and applications, J.D. Ryder, Prentic Hall, India

EKLAVYA UNIVERSITY

ज्ञान प्राप्तये लक्ष्य संधानम्

Estd by Madhya Pradesh Niji Vishwavidyalaya (Sthapna Avam Sanchalan) Adhiniyam, 2020

School of Basic and Applied Sciences

Class	**B.Sc. Physics**
Semester/Year	**III Year**
Subject & Subject Code	**Practical Physics- BPHYS20Y303**
Paper	**Paper- I & Paper- II, Practical**
Max. Marks	50= (30+20) (ETE + IA)

Credit			**Total Credits**
L	**T**	**P**	**2**
0	0	2	

PRACTICALS

1 To determine the value of Planck's constant "h" by solar cell.

2 To determine the energy band gap of a semiconductor by Regnault's apparatus.

3 To plot the characteristic curve of PN Junction Diode in Forward bias condition.

4 To plot the characteristic curve of a Zener Diode in forward and reverse bias condition.

5 To plot the characteristic curve of a Tunnel Diode.

6 To plot the characteristic curve of different colour LEDs.

7 To study the characteristic curve of JFET.

8 To study the characteristic curves of a transistor in CE mode.

9 To study the characteristic curves of a transistor in CB mode.

10 To study the half wave, full wave and bridge rectifier and the effect of different filter circuits on ac-ripple factor.

11 To study the frequency response curve of single stage RC-coupled amplifier and to calculate the band width.

12 To determine energy band gap of germanium crystal using four probe method.

13 To study Hartley oscillator/ Colpitts oscillator.

14 To study RC phase shift oscillator.

15 To study Hall Effect.

16 To study Hysteresis Loss.

17 To study modulation /demodulation.

18 To determine the capacitance by Schering Bridge.

19 To determine the unknown frequency by Lissajous Figures.

EKLAVYA UNIVERSITY
ज्ञान प्राप्ये लक्ष्य संधानम्
Estd. by Madhya Pradesh Niji Vishwavidyalaya (Sthapna Avam Sanchalan) Adhiniyam, 2020

School of Basic and Applied Sciences

Class				B.Sc. Physics (Honours)
Semester/Year				III Year
Subject & Subject Code				Physics Honours - BPHYS20Y304
Paper				Digital Electronics, Paper- III
Max. Marks				30 (ETE) + 20 (IA) = 50
Credit			Total Credits	
L	T	P	4	
3	1	0		

Course Objectives:

- Is to make student study and understand digital electronics.
- Is to make students understand, learn,and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.

Course Outcomes:

The students are expected to acquire the knowledge of the following:

- Pulse-Modulation Systems in Digital Communication
- Noise in pulse code and Delta modulation systems and Computer communication systems
- Introduction to Mobile radio and satellites
- Introduction to 8086, Microprocessor chip, Internal Architecture, Introduction (Basics of) to Programming of 8086 and Assembly language
- Assembly Language Programming Technique
- 8086 System Connection Timings and Interrupts
- Digital and Analog Interfacing of 8086
- Elementary Idea about 80816, 80286, 80386 to Pentium processors

Student Learning Outcomes:

Student will able to-

1. Demonstrate a understanding of the fundamentals of digital electronics.
2. Understand fundamentals of working and functioning of microprocessor chip.
3. Understand about different modulations and learn their process, working and applications.
4. Sharpen his skill and knowledge and utilize/apply his knowledge in further research and science.

Unit	Syllabus	Periods
Unit - I	**Digital Communication** Pulse-Modulation Systems: Sampling theorem- Low pass and Band pass Signals, PAM, Channel Bandwidth for a PAM signal, Natural sampling, Flat-Top sampling, Signal recovery through Holding, Quantization of signal, Quantization, Differential PCM, delta Modulation, Adaptive Delta Modulation, CVSD. Digital Modulation techniques: BPSK, DPSK, QPSK, PSK, QASK, BFSK, FSK, MSK.	15

Shama

Unit	Syllabus	Periods
Unit - II	**Noise in pulse code and Delta modulation systems:** PCM transmission, calculation of Quantization noise, output-signal power, Effect of thermal noise, Output signal to noise ratio in PCM,DM, Quantization noise in DM, output signal power, DM output-signal –to Quantization- noise ratio. Effect of thermal noise in Delta modulation, output signal-noise ratio in DM. **Computer communication systems:** Types of networks, Design of a communication network, examples TYMNET, ARPANET, ISDN, LAN. Introduction to Mobile radio and satellites: Time division multiple Access (TDMA), Frequency Division Multiple Access (FDMA), ALOHA, Slotted ALOHA, Carrier Sense Multiple Access (CSMA) Poisson distribution, protocols.	15
Unit - III	Introduction to 8086, Microprocessor chip, Internal Architecture, Introduction (Basics of) to Programming of 8086 and Assembly language. Programme development steps. Construction of machine code for 8086 Instructions, writing a programme for use with assembler, Assembly language program development tools. Assembly Language Programming Technique: Simple sequence programmes. Basic idea of flags and jumps, While – Do, IF- THEN, IF –THEN-ELSE structure based simple programs. Writing and using Assembler Macros.	15
Unit - IV	**8086 System Connection Timings** : 8086 Hardware Review, Addressing Memory and ports in microcomputer system , Basic Idea about Timing parameters, Minimum mode waveform and calculation for access time. Interrupts : 8086 Interrupts and Interrupts response with some hardware applications.	15
Unit - V	**Digital and Analog Interfacing of 8086** : Methods of parallel data transfer, single Handshake I/O , Double Handshake Data transfer. 8255 Handshake applications : Lathe control and speech synthesizer. Display and keyboard interfacing with 8279, D/A interfacing with microcompiler, A/D interfacing (introduction) Elementary Idea about 80816, 80286, 80386 to Pentium processors.	15

Reference Books

1 Principles of communication system : Taub & Schilling (1994) II Edition

2 Communication systems : Simon Haylein III Ed.

3 Microprocessors and Interfacing : Douglas Hall 2nd Ed. (1992)

4 Programming and Hardware

5 The Intel Microprocessor : Brey & Brey

6 Pentium and Pentium ProProcessor Architecture Programming and Interfacing

Shama Mehwar

EKLAVYA UNIVERSITY
ज्ञान प्राप्तये लक्ष्य संधानम्
Estd. by Madhya Pradesh Niji Vishwavidyalaya (Sthapana Avam Sanchalan) Adhiniyam, 2020

School of Basic and Applied Sciences

Class				B.Sc. Physics (Honours)
Semester/Year				III Year
Subject & Subject Code				Practical Physics Honours- BPHYS20Y305
Paper				Paper- III, Practical
Max. Marks				50= (30+20) (ETE+ IA)
Credit			Total Credits	
L	T	P	1	
0	0	1		

PRACTICALS

1 Study of PCM circuit and quantization

2 Study of PAM, PWM and PPM circuits and detection of these signals

3 Study of a Delta modulator

4 Study of a DBPSK communication system

5 Study of an adaptive Delta modulator

6 Study of a convolutional encoder

7 study of a PN sequence generator

8 Study of a spread spectrum direct sequence communication system

Shama