Syllabus

M.Sc. Physics (One Year)

Part A Introduction				
Program: PG Degree	**Class: M.Sc**	**Year: I (I Sem)**	**Session:2025-2026**	
Subject: Physics				
1	**Course Code**	**.....**		
2	**Course Title**	**Nuclear, Atomic and Molecular Physics**		
3	**Course Type (Core Course/ Discipline Specific Elective/)**	**Core Course (CC-31)**		
4	**Pre-requisite (if any)**	**To Study this course a student must have graduation with physics as major or minor subject.**		
5	**Course Learning outcomes (CLO)**	**On successful completion of this course, thestudents will be able to:** 1. Understand the historical background and contributions of renowned discoveries in Nuclear physics. 2. Understand the concepts of Nuclear Fission and Fusion 3. Understand the concepts Elementary particles 4. Understand atomic and molecular spectra, including selection rules for transitions. 5. Understand various spectroscopic methods.		
6	**Credit Value**	**6**		
7	**Total Marks**	Max. Marks: 40+60 =100	Min. Passing Marks:16+24= 40	

Part B- Content of the Course		
Total No. of Lectures (in hours): 90		
Unit	**Topics**	**No. of Lectures**
I	Historical background and contributions of Dr. Vikram Sarabhai, Dr. Homi Jehangir Bhabha and Dr. Raja Ramanna in Nuclear physics and Atomic Theory of Vaiśeṣika Concept of Nuclear Fission and Fusion, Liquid Drop, Shell and collective models of Nucleus, Scintillation and Solid-State Detectors, Cerenkov Detectors ***Activities :*** 1. *Ask to make a poster "From Paramanu to Proton – An Indian Journey Through Matter"* 2. *Organize a debate on nuclear fission and fusion.* 3. *Arrange a group discussion on"Are ancient ideas of paramanu compatible with modern atomic theory?"*	**18**
II	Elementary particles,Classification of Particles, Interactions, Symmetries and Conservation laws, the quark model, Baryon and Lepton numbers, Iso-spin, hypercharge, Strangeness, Parity, Quark Model, Charm, Beauty and Truth.	**18**
III	LS coupling and JJ coupling schemes, Fine structure of hydrogen-like atoms, Hyperfine structure and isotope shifts, Selection rules for optical transitions, Zeeman effect: Normal and anomalous, Basics of ESR (Electron Spin Resonance) and NMR (Nuclear Magnetic Resonance)	**18**

IV	Born-Oppenheimer approximation, Electronic, vibrational, and rotational energy levels of molecules, Rotational spectra of diatomic molecules (rigid and non-rigid rotator models), Vibrational spectra (harmonic and anharmonic oscillators), Vibrational-Rotational spectra,Electronic spectra of diatomic molecules (Franck-Condon principle), Morse potential energy curve; Molecules as vibrating rotator; Vibration spectrum of diatomic molecule.	**18**
V	Raman Effect: Classical and quantum theories, Raman spectroscopy and its applications in determination of molecular structure,Molecular polarizability, Pure Vibrational and Rotaltional spectra of diatomic molecules, Experimental setup of Raman effect.	**18**

Keywords/Tags: Nuclear Fission and Fusion, Molecular Orbitals, Selection Rules, Zeeman Effect, Raman Spectroscopy

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

1. Atomic Theory of Vaiśeṣika — Shashi Prabha Kumar
2. Introductory Nuclear Physics — K. S. Krane
3. Introduction to Nuclear Physics — H. A. Enge
4. Physics of the Nucleus — M. A. Preston
5. Nuclear Physics – An Introduction. — S. B. Patel
6. Introduction to Molecular Spectroscopy G. M. Barrow
7. Spectra of diatomic molecules Herzberg
8. Molecular Spectroscopy J. M. Brown
9. Spectra of Atoms and MoleculesP. F. Bemath
10. Modern Spectroscopy J. M. Holias

Suggested equivalent online courses:

1. **https://www.youtube.com/watch?v=TqGJGFBq3Yg**
2. **http://digimat.in/nptel/courses/video/115103101/L18.html**
3. https://archive.nptel.ac.in/courses/115/105/115105100/
4. https://www.classcentral.com/classroom/youtube-atomic-and-molecular-physics-47826
5. **https://ocw.mit.edu/courses/8-421-atomic-and-optical-physics-i-spring-2014/video_galleries/video-lectures/**

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks :100

Continuous Comprehensive Evaluation (CCE) :40 Marks University Exam (UE): 60 Marks

Internal Assessment : Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	20 20
External Assessment : University Exam Section Time :.03:00 Hours	**Section(A)** : Very Short Questions **Section (B) :** Short Questions **Section (C) :** Long Questions	5x1=5 5x4=20 5x7=35 Total= 60

Any remarks/ suggestions:

Part A Introduction			
Program: PG Degree	**Class : M.Sc.**	**Year: I (I Sem)**	**Session: 2025-26**
Subject: Physics			

1	**Course Code**	**.....**	
2	**Course Title**	**Material Science**	
3	**Course Type (Core Course/ Discipline Specific Elective/)**	**Core Course (CC-32)**	
4	**Pre-requisite (if any)**	**To Study this course a student must have graduation With physics as major or minor subject.**	
5	**Course Learning outcomes (CLO)**	**On successful completion of this course, the students will be able to:** 1. Understand the historical background of Indian Metallurgy. 2. Understand the phenomena of nuclear kinetics and diffusion. 3. Calculate the lattice parameters using XRD. 4. Understand the concepts and applications of Nanomaterials. 5. Utilize various tools and techniques to investigate microstructure of material.	
6	**Credit Value**	**6**	
7	**Total Marks**	Max. Marks: 40+60=100	Min. Passing Marks: 16+24=40

Part B- Content of the Course

Total No. of Lectures (in hours): 90

Unit	Topics	No. of Lectures
I	**Phase Transition:** Ancient Indian Metallurgy: Copper metallurgy, Ferrous metallurgy, Relative stability of phase and phase rule, Single component and binary phase diagrams, Microstructural changes during cooling, Lever rule. Order, Disorder Transition ***Activities:*** *1. Organize a group discussion on different types of metals exported by India.* *2. Prepare a chart on which metals are mined in India.* 3. *Prepare a Poster on Single component and binary phase diagrams*.	**18**
II	**Kinetics and Diffusion** Nucleation Kinetics, Growth and transformation Kinetics, Application in transformation in steel, solidification and crystal growth; Diffusion in solids, Fick's law, Solution to Fick's second law, Kirkendal effect.	**18**
III	**X-Ray Diffraction** X-ray Diffraction process and Diffractometer, applications of XRD, Principle of powder diffraction method, Interpretation of XRD data, accurate determination of lattice parameters; least-square method	**18**

	(Rietveld Analysis)	
IV	**Nanomaterials** Basic concepts and applications, Types of Carbon based nanomaterials, Fullerenes, Carbon nanotubes, Single wall and multi-wall carbon tubes, Synthesis of carbon nanomaterials, Electronic and mechanical properties of nano-materials.	**18**
V	**Microscopy Techniques** Microstructure of materials, Scanning and Transmission Electron Microscopy techniques, compositional analysis by energy dispersive spectroscopy; surface analysis by Scanning Tunneling and Atomic Force Microscopy	**18**

Keywords/Tags: Microstructure, nano materials, spectroscopy, Diffractometer, phase diagrams

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

1. Ancient Indian Metallurgy	Ashoka K. Mishra
2. X-Ray Crystallography	Azaroff
3. Crystallography for Solid State Physics	A. R. Verma, O. N. Shrivastava
4. The Powder method	Azaroff and Buerger
5. Crystal Structure Analysis	Buerger
6. Materials Science and Engineering	V. Raghavan

Suggested equivalent online courses:

1. https://archive.nptel.ac.in/courses/113/102/113102080/
2. http://www.digimat.in/nptel/courses/video/122102008/L01.html
3. https://archive.nptel.ac.in/courses/113/107/113107078/
4. https://www.youtube.com/watch?v=z0zfJHLGJBc&list=PLL0SWcFqypCm4xCn64xO7RS62PPzy-oP8

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks : 100
Continuous Comprehensive Evaluation (CCE) : 40 Marks University Exam (UE): 60 Marks

Internal Assessment : Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	20 20
External Assessment : University Exam Section Time : 03:00 Hours	**Section(A)** : Very Short Questions **Section (B) :** Short Questions **Section (C) :** Long Questions	5x1=5 5x4=20 5x7=35 Total= 60

Any remarks/ suggestions:

Part A – Introduction				
Program: PG Degree		**Class: M.Sc.**	**Year: I (I Sem)**	**Session: 2025-2026**
Subject: Physics				
1.	**Course Code**			
2.	**Course Title**	**Lab-I**		
3.	**Course Type (Core/Discipline Specific Elective/Generic Elective/Vocationa)**	**Core Course (PC-31)**		
4.	**Pre- requisite (If any)**	**To Study this course a student must have UG degree in physics.**		
5.	**Course Learning Outcomes (CLO)**	On completion of the course, the students will be able to: 1. Understand the quantum mechanical basis of spin and magnetic moments. 2. Understand the dependence of stopping potential on frequency of incident light. 3. Study monostable and astable multivibrator. 4. Study the line emission spectra. 5. Understand the principles of Phase shift Oscillator.		
6.	**Credit Value**	4		
7.	**Total Marks**	Max. Marks: 100	Min. Passing Marks:40	

Part B - Content of the Course		
Total numbers of Lectures - Practical (in hours per week): 02 hours per credit per week		
S.N.	**List of experiments**	**No. of Lectures (per week)**
1.	To Study of ESR.	**02 hours per credit per week**
2.	Measurement of stopping potential and determination of Planck's constant.	
3.	Determine e/m by helical method.	
4.	To study astable multivibrator.	
5.	Hall Effect Experiment to determine charge carrier concentration and mobility.	
6.	To study Monostable multivibrator.	

7.	Identification of unknown element from line emission spectra.	
8.	Determination of e/m of Electron by Thomson's Method.	
9.	To study Phase shift Oscillator.	
10.	To study Wein Bridge Oscillator.	

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

1. "Experiments in Modern Physics" – Adrian C. Melissinos & Jim Napolitano
2. "Practical Physics" – G.L. Squires
3. "Atomic Physics" – J.B. Rajam
4. "Physics Lab Manual" – C.L. Arora
5. "Solid State Physics" – S.O. Pillai
6. "Electronic Instrumentation and Measurement" – H.S. Kalsi
7. "Op-Amps and Linear Integrated Circuits" – Ramakant A. Gayakwad

Suggested web links

https://ep2-iitb.vlabs.ac.in/exp/planck-constant/index.html
https://ae-iitr.vlabs.ac.in/exp/wein-bridge-oscillator/index.html
https://www.youtube.com/watch?v=3XJez8bzU34
https://vlab.amrita.edu/index.php?sub=1&brch=195&sim=359&cnt=1
https://ph1-nitk.vlabs.ac.in/exp/phase-shift-oscillator/theory.html

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Internal Assessment	Marks	External Assessment	Marks
Lab Record/Class Interaction /Quiz	15	Viva Voce on Practical	30
Attendance in the lab	10		
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)	15	Table work / Experiments	30
TOTAL	**40**		**60**

Any remarks/ suggestions:

Part A – Introduction			
Program: PG Degree	**Class: M.Sc.**	**Year: I (I Sem)**	**Session: 2025-2026**
Subject: Physics			

1.	**Course Code**		
2.	**Course Title**	**Lab-II**	
3.	**Course Type (Core/Discipline Specific Elective/Generic Elective/Vocational/…)**	**Core Course (PC-32)**	
4.	**Pre- requisite (If any)**	**To Study this course a student must have UG degree in physics.**	
5.	**Course Learning Outcomes (CLO)**	On completion of the course, the students will be able to: 1. Understand concept of quantization of energy levels. 2. Understand temperature dependence of resistivity. 3. Understand the working principle of a GM counter. 4. Study dielectric constant of semiconductor materials. 5. Study of Splitting of Spectral Lines in magnetic field.	
6.	**Credit Value**	**4**	
7.	**Total Marks**	Max. Marks: 100	Min. Passing Marks: 40

Part B - Content of the Course

Total numbers of Lectures - Practical (in hours per week): 02 hours per credit per week

S.N.	List of experiments	No. of Lectures (per week)
1.	To experimentally demonstrate the concept of quantization of energy levels by Franck-Hertz Experiment.	**02 hours per credit per week**
2.	To determine band gap by four probe method.	
3.	To determine the resistivity of semiconductors by Four probe Method.	
4.	Study of GM Counter.	
5.	Determining the plateau and optimal operating voltage of Geiger-Muller Counter.	
6.	To determine dielectric constant of Semiconductor material.	
7.	To determine the Hall voltage developed across the sample material.	
8.	Zeeman Effect – Study of Splitting of Spectral Lines.	
9.	To study of characteristics of SCR.	
10.	Study of characteristics of LDR.	

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

1. "Material Science Laboratory Manual" – R.K. Rajput
2. "Experiments in Modern Physics" – Adrian C. Melissinos & Jim Napolitano
3. "Atomic Physics" – J.B. Rajam
4. "Fundamentals of Molecular Spectroscopy" – C.N. Banwell& E.M. McCash
5. "Solid State Physics" – S.O. Pillai
6. "Electronic Principles" – Albert Malvino& David Bates
7. "Nuclear Physics: Principles and Applications" – John Lilley

Suggested web links

https://ep-iitb.vlabs.ac.in/exp/geiger-muller-counter/index.html
https://mintapps.org/html/mint-franckhertz.html
https://ph1-nitk.vlabs.ac.in/exp/zeeman-effect/simulation.html
https://everycircuit.com/circuit/5222043451129856/scr-simulation
https://www.youtube.com/watch?v=MIfsV765eOs

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Internal Assessment	Marks	External Assessment	Marks
Lab Record/Class Interaction /Quiz	15	Viva Voce on Practical	30
Attendance in the lab	10		
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)	15	Table work / Experiments	30
TOTAL	**40**		**60**

Any remarks/ suggestions:

Part A Introduction				
Program: PG Degree	**Class: M.Sc**	**Year: I (II Sem)**	**Session:2025-26**	
Subject: Physics				
1	**Course Code**	**.....**		
2	**Course Title**	**Laser and Fiber Optical Communication**		
3	**Course Type (Core Course/ Discipline Specific Elective/)**	**Core Course (CC-41)**		
4	**Pre-requisite (if any)**	**To Study this course a student must have graduation with physics as major or minor subject.**		
5	**Course Learning outcomes (CLO)**	**On successful completion of this course, the students will be able to:** 1. Concept of ancient Indian theory of light. 2. Learn about different types of lasers (e.g., He-Ne, Ruby, and Semiconductor) and their key characteristics. 3. Understand the Optical Fiber, its types and basic structure. 4. Study different optical fiber sources. 5. Understand fiber fabrication methods.		
6	**Credit Value**	**6**		
7	**Total Marks**	Max. Marks:40+60 =100	Min. Passing Marks:16+24= 40	

Part B- Content of the Course		
Total No. of Lectures (in hours):90		
Unit	**Topics**	**No. of Lectures**
I	Conceptual Ancient Indian Understanding of Light (Tejas) and compare it to modern laser principles. Overviews on Indian Institutes of LASER and fiber optical communication. Introduction Characteristics (Monochromaticity, Directionality, Brightness, Coherence) of a LASER beam, Interaction of radiation with matter(Induced Absorption, Spontaneous Emission, Stimulated Emission), Einstein's A and B coefficients and expression for energy density, LASER Action and the Conditions for LASER action (Population Inversion and Pumping, metastable state), Requisites of a LASER system(Energy Source or Pumping Mechanism, Active medium and Resonant cavity (or) LASER cavity), three and four level Lasers. ***Activity:*** *1. PrepareaPoster or "From Tejas to Technology: How Ancient India Saw Light".* *2. Organize a debate on "Compare laser principles (e.g., coherence, stimulated emission) with yogic/dharmic concepts (e.g., dharana, karma, prana)"* *3. Arrange group discussions on"The Role of Indian Institutes in Advancing Laser Technology.*	18

II	Line shape broadening, Optical Resonance, Longitudinal and transverse modes in laser cavity,Oscillation gain and power output, Q-Switching, Mode locking, pulse shortening. Types and Applications of Lasers: Principles of Ruby, Nd: YAG, He-Ne, CO2, Semiconductor and dye Laser, Holography and its applications.	18
III	Optical Fiber, types of optical fibre, Propagation of light in optical Fiber, basic structure and optical path of an Optical Fiber, Acceptance Angle, Numerical Aperture, Modes of Propagation, Attenuation in Optical Fiber, Absorption losses, Bending Losses, Radiation Losses, Pulse Dispersion, Materials Dispersion.	18
IV	Optical Fiber sources: Light Emitting Diode (LED) as a source; Fiber-LED coupling; Bandwidth and Spectral Emission of LED. LASER. Optical fiber cable, fiber joints, splices, couplers and connectors, measurement in optical fibers, attenuation measurement, dispersion measurement, refractive index profile measurement.	18
V	Fabrication Methods for Fiber fabrication, Outside Vapour Phase Oxidation, Vapour Phase Axial Deposition, Double crucible method, Modified Chemical Vapour deposition, Signal Modulation & Demodulation in Optical Fiber Communication: Intensity Modulation of the Analog & Digital Signal, Frequency Modulation (FM), Pulse Width Modulation, Sensitivity of Fiber optic link.	18

Keywords/Tags: LASER, Monochromaticity, Optical Fiber, Bandwidth, Radiation loss

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

1. Concept of Light in classical Shastras of India with comparative review with modern science	Achutha B S, Dr. Vinay P
2. Laser Theory and Applications	A. K. Ghatak&Tyagarajan
3. Laser Fundamentals	William T. Silfvast
4. Introduction to Laser Physics	K. Shrimoda
5. Laser and Nonlinear Optics	B. B. Laud
6. Optical Fiber Communication:	B. Keiser, MGH

Suggested equivalent online courses:

1. **https://onlinecourses.nptel.ac.in/noc25_ph03/preview.**
2. **https://www.youtube.com/watch?v=FNp81kkxj5c**
3. **https://archive.nptel.ac.in/courses/115/102/115102124/**
4. **https://archive.nptel.ac.in/courses/108/106/108106167/**
5. https://onlinecourses.nptel.ac.in/noc20_ee79/preview

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) : 40 Marks University Exam (UE):60 Marks

Internal Assessment : Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	20 20
External Assessment : University Exam Section Time :03:00 Hours	**Section(A)** : Very Short Questions **Section (B)** : Short Questions **Section (C)**:Long Questions	5x1=5 5x4=20 5x7=35 Total= 60
Any remarks/ suggestions:		

Part A Introduction				
Program: PG Degree		**Class: M.Sc.**	**Year: I (II SEM)**	**Session: 2025-26**
Subject: Physics				
1	**Course Code**	**.....**		
2	**Course Title**	**Digital Electronics and Microprocessor**		
3	**Course Type (Core Course/ Discipline Specific Elective/)**	**Core Course (CC-42)**		
4	**Pre-requisite (if any)**	**To Study this course a student must have graduation with physics as major or minor subject.**		
5	**Course Learning outcomes (CLO)**	**On successful completion of this course, the students will be able to:** 1. Understand the historical contributions of Dr. B. S. Sonde in digital electronics. 2. Understanding Number systems and their inter-conversions. 3. Understand the characteristics of the ideal OP-Amp. 4. Understand the basics of 8085 microprocessor systems. 5. Understand the requirements to interface 8085 microprocessors to various peripherals.		
6	**Credit Value**	**6**		
7	**Total Marks**	Max. Marks:60+40=100	Min. Passing Marks:16+24=40	

Part B- Content of the Course		
Total No. of Lectures (in hours):90		
Unit	**Topics**	**No. of Lectures**
I	**Digital Electronics:** 1. Indian pioneer of digital electronics :(Dr. B.S. Sonde), Overview of Indian research Institutes in digital electronics. 2. Number systems and their inter-conversions, binary addition and subtraction using 2's complement, Codes: BCD (8421), 2412, excess-3, Gray, ASCII, alphanumeric codes, Parity generator and checker. 3. Logic gates:Logic gates and De-Morgan'n theorems, Boolean laws, simplification of logic circuits. Fundamental Products: SOP, POS and Karnaugh Maps. Adder,Subtractor, multiplexer and de-multiplexer.Flip flops: RS, D, JK, JK master slave flip-flops. Clocked level and edge triggered Flip-flop. ***Activities:*** 1. *Prepare a poster on " Ancient Indian literature Linked to Digital Electronics: Pingala's Binary System ".* 2. *Arrange group discussion on "Indian manufacturers and exporter of basic digital components "* 3. *Prepare a chart on " Number system and their inter conversion"*	18

II	Block diagram of OP-Amp, characteristics of the ideal OP-Amp, OP-Amp Parameters: Input offset voltage, input offset current, Input bias current, CMRR, SVRR, large signal voltage gain, Slew rate, gain band width product, Output resistance, Open loop and closed loop OP-Amp configurations, differential, inverting and non – inverting amplifiers, voltage series feedback amplifier, effect of feedback on closed loop gain, Input and output resistance, bandwidth, total output voltage. Application of OP-Amp: Adder, Subtractor, Integrator and differentiator	18
III	Signal processing elements, DAC weighted resistor network, R-2R ladder network, ADC- Simultaneous, Counter type, Successive Approximation, single and dual slope; ADC and DAC specifications.	18
IV	**Microprocessor:** Introduction to microprocessor systems, Architecture of 8085, Buses, Registers, Arithmetic logic unit, Trends in microprocessor developments. **Microprocessor programming:** Assembly and higher level languages, Addressing schemes, Instruction set for 8085, Assembly language programming using data transfer, Arithmetic and logic instructions, Stack and subroutine, Assemblers, Interpreters and Compilers, debugging.	18
V	**Microprocessor Interfacing:** Interfacing, Dip switches, Seven segment display to 8085, General purpose programmable peripheral IC. 8255, Temperature controller, 8085 Interrupts, Simple examples using SIM and RIM instructions. **Data Communication:** Basic concepts transmission format, Error Checks, Data Communication over telephone line), Standards in serial I/O. Software controlled serial I/O. 8085 SID and SOD lines.	18

Keywords/Tags: Diodes, Number system, Solar cells, LED, Flipflop.

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

1. Introduction to System Design Using Integrated Circuits B.S. Sonde
2. Electronic devices and circuit theory Robert Boylested& Louis
3. Op-Amps and Linear integrated circuits Ramakant Gaikwad
4. Digital Principle and Application A. P. Malvino& D. P. Leach
5. Semiconductor Devices- Physics and Technology S. M. Sze
6. Introduction to Semiconductor Devices M. S. Tyagi
7. Optical Electronics Ajay Ghatak and K. Tyagarajan
8. Microprocessors Ramesh Gaonkar
9. Microprocessors and Interfacing Douglas V. Hall

Suggested equivalent online courses:

1. https://www.youtube.com/watch?v=pHNbm-4reIc
2. https://www.youtube.com/playlist?list=PL803563859BF7ED8C
3. https://archive.nptel.ac.in/courses/108/105/108105132/
4. https://onlinecourses.nptel.ac.in/noc25_ee48/preview
6. https://www.youtube.com/watch?v=wUmi3roAqmk
7. http://digimat.in/nptel/courses/video/108105102/L21.html

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks : 100

Continuous Comprehensive Evaluation (CCE) :40 . Marks University Exam (UE): 60 Marks

Internal Assessment : Continuous Comprehensive Evaluation (CCE)	Class Test Assignment/Presentation	20 20
External Assessment : University Exam Section Time : 03:00 Hours	**Section(A)** :Very Short Questions **Section (B) :** Short Questions **Section (C)** : Long Questions	5x1=5 5x4=20 5x7=35 Total= 60

Any remarks/ suggestions:

Part A – Introduction			
Program: PG Degree	**Class: M.Sc.**	**Year: I (II Sem)**	**Session: 2025-2026**
Subject: Physics			

1.	**Course Code**		
2.	**Course Title**	**Lab-I**	
3.	**Course Type (Core/Discipline Specific Elective/Generic Elective/Vocational/…)**	**Core Course (PC-41)**	
4.	**Pre- requisite (If any)**	**To Study this course a student must have UG degree in physics.**	
5.	**Course Learning Outcomes (CLO)**	On completion of the course, the students will be able to 1. Determine wavelength of He-Ne laser. 2. Understand the concept of quantization of charge and measure the e/m by Millikan oil drop method. 3. Determine wavelength of LASER beam by diffraction grating using spectrometer. 4. Study the principles of amplitude and Frequency modulation. 5. Study the characteristics of loudspeaker system.	
6.	**Credit Value**	**4**	
7.	**Total Marks**	Max. Marks: 100	Min. Passing Marks: 40

Part B - Content of the Course

Total numbers of Lectures - Practical (in hours per week): 02 hours per credit per week (per week)

S.N.	List of experiments	No. of Lectures (per week)
2.	To determine the wavelength of He-Ne laser light using single slit diffraction	**02 hours per credit per week**
2.	To Determine e/m by Millikan oil drop method.	
3.	Using Michelson Interferometer, one can determine the wavelength of light from a monochromatic source.	

4.	To obtain velocity profile of flow in a pipe and verify Poiseuille Formula using He-Ne LASER.	
5.	To determine wavelength of LASER beam by diffraction grating using spectrometer.	
6.	Study of Amplitude Modulation & Demodulation.	
7.	Study of Frequency Modulation & Demodulation	
8.	Measurement of optical power using optical power meter.	
9.	To study the characteristics of loudspeaker system.	
10.	To determine the numerical aperture (NE) of optical fibres.	

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

8. "Advanced Practical Physics for Students" By B.L. Worsnop and H.T. Flint
9. "Practical Physics for B.Sc. and M.Sc." by K. S. Mani
10. "Practical Physics" By G. L. Squires
11. "B.Sc. Practical Physics" By C.L. Arora.
12. "Optics" By Eugene Hecht.
13. "Introduction to Modern Optics" By Grant R. Fowles
14. "Electronic Communication Systems"By George Kennedy & Bernard Davis
15. "Electroacoustics" By M. E. Egan
16. "Fluid Mechanics" By Frank M. White"
17. Practical Physics by H. C. Verma

Suggested web links:

https://bop2-iitk.vlabs.ac.in/exp/single-slit-diffraction/simulation.html
https://vlab.amrita.edu/index.php?sub=1&brch=195&sim=357&cnt=4
https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=1106&cnt=4
https://kcgcollege.ac.in/Virtual-Lab/Electronics-and-Communication-Engineering/index.html
https://oc-iitr.vlabs.ac.in/exp/optical-power-measurements/simulation.html

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Internal Assessment	Marks	External Assessment	Marks
Lab Record/Class Interaction /Quiz	15	Viva Voce on Practical	30
Attendance in the lab	10		
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)	15	Table work / Experiments	30
TOTAL	**40**		**60**

Any remarks/ suggestions:

Part A – Introduction			
Program: PG Degree	**Class: M.Sc.**	**Year: I (II Sem)**	**Session: 2025-2026**
Subject: Physics			

1.	**Course Code**		
2.	**Course Title**	**Lab-II**	
3.	**Course Type (Core/Discipline Specific Elective/Generic Elective/Vocational/…)**	**Core Course (PC-42)**	
4.	**Pre- requisite (If any)**	**To Study this course a student must have UG degree in physics.**	
5.	**Course Learning Outcomes (CLO)**	On completion of the course, the students will be able to 1. Understand the principle and circuit operation of a zero crossing detector. 2. Learn how an op-amp with positive feedback functions as a Schmitt Trigger. 3. Analyze Op-Amp as Integrator and Differentiator using 741 IC. 4. Write assembly language program using 8085 for 8 bit numbers. 5. Write assembly language program using 8085 for 16 bit numbers.	
6.	**Credit Value**	**4**	
7.	**Total Marks**	Max. Marks: 100	Min. Passing Marks: 40

Part B - Content of the Course		
Total numbers of Lectures - Practical (in hours per week): 02 hours per credit per week		
S.N.	**List of experiments**	**No. of Lectures per week**
1.	To study Op-Amp as Zero crossing Detector using 741 IC	**02 hours per credit per week**
2.	To Study Op-Amp as Schmitt Trigger using 741 IC	
3.	To study Op-Amp as Comparator using 741 IC	
4.	Study of OP-AMP as voltage follower using 741 IC	
5.	Study of OP-AMP as Integrator and Differentiator using 741 IC	
6.	To draw a flow chart & write assembly language program for Addition and Subtraction of two 8-bit numbers using 8085	
7.	To draw a flow chart & write assembly language program to find sum of first 10 natural numbers using 8085 Microprocessor	

8.	To draw a flow chart & write assembly language program to add two 16 bit numbers with carry using 8085 Microprocessor	
9.	To draw a flow chart & write assembly language program to find the smaller number of two given numbers using 8085	
10.	To draw a flow chart & write assembly language program to find greater number from array using 8085 Microprocessor.	

Part C-Learning Resources

Text Books, Reference Books, Other resources

Suggested Readings:

1. "Op-Amps and Linear Integrated Circuits"By Ramakant A. Gayakwad.
2. "Linear Integrated Circuits" By Roy Choudhury & Shail Jain.
3. "Operational Amplifiers and Linear Integrated Circuits" By Coughlin & Driscoll
4. "Microprocessor Architecture, Programming and Applications with the 8085"By Ramesh S. Gaonkar
5. "Fundamentals of Microprocessors and Microcontrollers" By B. Ram.
6. "Advanced Microprocessors and Peripherals" By A.K. Ray & K.M. Bhurchandi

Suggested web links

https://www.youtube.com/watch?v=k0LzxGMJpBg
https://www.youtube.com/watch?v=gFp9vttbFLQ
https://ae-iitr.vlabs.ac.in/exp/voltage-regulator/simulation.html
https://be-iitkgp.vlabs.ac.in/exp/operational-amplifier/simulation/rcdifferentiator_opamp.html
https://www.youtube.com/watch?v=NRdmIe9Afcs
https://www.youtube.com/watch?v=9zXvFPufgpU

Part D-Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Internal Assessment	Marks	External Assessment	Marks
Lab Record/Class Interaction /Quiz	15	Viva Voce on Practical	30
Attendance in the lab	10		
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)	15	Table work / Experiments	30
TOTAL	**40**		**60**

Any remarks/ suggestions: