SYLLABUS

FOR

SEM I & II

Program: M.Sc.

Course: Physics

From

Academic year

2023-24

Board of studies in Physics

Post graduate

	Name	Designation	Institute/Industry
Head of the Department			
1	Dr. Deepak More	Chairman	K. J. Somaiya college of science and commerce
Subject Expert nominated by Vice-Chancellor			
1	Dr. Anita Kanwar	Principal	VES college, Chembur
Subject experts			
1	Dr. Nigvendra Sharma	Head of the Department	Maharashtra College of Arts, Science & Commerce
2	Dr Dinesh Kala	Head of the Department	G N Khalsa College of Arts, Science & Commerce
3	Dr. Paresh Joshi	Chairman, BASE	HBCSE
Representative from Industry/corporate sector/allied area			
1	R. Venkataraman	Director –Vision & Robotics	Tej Control System PVT LTD. Thane 400064
Meritorious Alumnus			
1	Vikrant Jadhav	Start-up	Panacea Intech PVT LTD
2			
Two experts from other than the parent University			
1	Raghunath Chelakkot	Associate Professor	Department of Physics, IITB, Mumbai
2	R. R. Deshmukh	Professor	Department of physics, ICT, Mumbai
Faculty of the specialisation			
1	Dr. Deepak More	Associate Professor	K. J. Somaiya college of science and commerce
2	Dr. Geeta Nair	Assistant Professor	K. J. Somaiya college of science and commerce
3	Mr. A M Shaker	Assistant Professor	K. J. Somaiya college of science and commerce
4	Dr. Jitendra Pendharkar	Assistant Professor	K. J. Somaiya college of science and commerce

5	Dr. Smita Survase	Assistant Professor	K. J. Somaiya college of science and commerce
6	Mr. Anshul Gupta	Assistant Professor	K. J. Somaiya college of science and commerce
7	Mr. Deepak Jalla	Assistant Professor	K. J. Somaiya college of science and commerce
8	Mr. Amit More	Assistant Professor	K. J. Somaiya college of science and commerce
9	Dr. Pallavi Raote	Assistant Professor	K. J. Somaiya college of science and commerce
10	Mr. Ketankumar Gayakwad	Assistant Professor	K. J. Somaiya college of science and commerce
11	Dr. Rucha Naik	Assistant Professor	K. J. Somaiya college of science and commerce
12	Dr. Shruti Barve	Assistant Professor	K. J. Somaiya college of science and commerce
13	Mr. Ranjit Yadav	Assistant Professor	K. J. Somaiya college of science and commerce

Acknowledgement

At the outset, I would like to thank our, Principal Dr. Pradnya Prabhu for her guidance and support during the curriculum restructuring process. I am also grateful to all the esteemed members of the Board of Studies, for their constructive suggestions and contributions.

Above all, I am deeply indebted to all the young and vibrant colleagues in the Department of Physics for the long and arduous work they have put in during the compiling of the restructured syllabus.

Dr. Deepak More

Chairperson

Board of Studies in Physics

Graduate Attributes

After the successful completion of modules in different courses of B.Sc. PHYSICS, the learner will be able to:

GA 1: Apply physics concepts and acquired skill sets to novel and unknown problems in order to establish an effective approach or strategy for dealing with them.

GA 2: Explore and derive quantitative data in the realms of physics.

GA 3: Collect, analyze, and interpret scientific data in the realms of physics using modern experimental apparatus and research methods.

GA 4: Develop Psycho-motive, analytical, observation skills through lab work

GA 5: Approach any real life problem with proper assumption, logic and constraints.

GA 6: Prepare for jobs, career development, and lifelong learning in Physics, by using acquired ICT skills, physics practical skills, and mathematical skills.

Programme Learning outcomes

After the successful completion of modules in different courses of B.Sc. physics the learner will be able to:

PLO I: Apply principles of physics on various physical phenomenon.

PLO II: Calculate physical parameters from the available data.

PLO III: Analyse and interpret the data in various forms (numerical/graphical)

PLO IV: Development of Psycho-motive, analytical, observation skills through lab work.

PLO V: Approach any real life problem with proper assumption, logic and constraints.

PLO VI: Compete and succeed in various qualifying examinations in various related fields. (Higher education/software/industry)

Content

Sr.No	Semester	Course number	Course Code	Course title
Core Course (CC)				

1	I	CCI	23PSPH1CC1MTM	MATHEMATICAL METHODS
2		CCII	23PSPH1CC2CM	CLASSICAL MECHANICS
3		CCIII	23PSPH1CC3QMI	QUANTUM MECHANICS - I
4		CCIV	23PSPH1CC4CMP	CONDENSED MATTER PHYSICS
5	III	CCI	23PSPH2CC1AEL	APPLIED ELECTRONICS
6		CCII	23PSPH2CC2CED	CLASSICAL ELECTRODYNAMICS
7		CCIII	23PSPH2CC3QMII	QUANTUM MECHANICS - II
8		CCIV	23PSPH2CC4AMP	ATOMIC AND MOLECULAR PHYSICS
	Discipline Specific Electives (DSE)			
1	I	DSE I	23PSPH1DS1MIP	8086 MICROPROCESSORS
2		DSE II	23PSPH1DS2ScL	SCILAB
3	II	DSE I	23PSPH2DS1MIC	8051 MICROCONTROLLER
4		DSE II	23PSPH2DS2PYP	PYTHON PROGRAMMING

Course No.	Course Title	Course Code	Credits	Hour	Periods (1 Hour)	Module	Lectures per module (60 minutes)	Examination		
								Internal Marks	External Marks	Total Marks
SEMESTER I										
Core courses THEORY										
I	MATHEMATICAL METHODS	23PSPH1CC1MTM	2	30	2	2	15	40	60	100
II	CLASSICAL MECHANICS	23PSPH1CC2CM	2	30	2	2	15	40	60	100
III	QUANTUM MECHANICS - I	23PSPH1CC3QMI	2	30	2	2	15	40	60	100
IV	CONDENSED MATTER PHYSICS	23PSPH1CC4CMP	2	30	2	2	15	40	60	100
Core courses PRACTICAL										
CCPI	PRACTICAL 1	**23PSPH1PR1**	1.5	75	3			40	60	100
CCPII	PRACTICAL 2	**23PSPH1PR2**	1.5	75	3			40	60	100
Discipline Specific Electives (DSE)-Theory										
DSEI	8086 MICROPROCESSORS	23PSPH1DS1MIP	2	30	4	2	15	40	60	100
DSEII	SCILAB	23PSPH1DS2ScL	2	30	4	2	15	40	60	100

Discipline Specific Electives (DSE)-PRACTICAL										
DSEI	8086 MICROPROCESSORS	**23PSPHP1DS1**	2	30	4			40	60	100
DSEII	SCiLab	**23PSPHP1DS2**	2	30	4			40	60	100

SEMESTER II										
Core courses THEORY										
I	APPLIED ELECTRONICS	23PSPH2CC1AEL	2	30	2	2	15	40	60	100
II	CLASSICAL ELECTRODYNAMICS	23PSPH2CC2CED	2	30	2	2	15	40	60	100
III	QUANTUM MECHANICS - II	23PSPH2CC3QMII	2	30	2	2	15	40	60	100
IV	ATOMIC AND MOLECULAR PHYSICS	23PSPH2CC4AMP	2	30	2	2	15	40	60	100
Core courses PRACTICAL										
CCPI	PRACTICAL I	**23PSPH2PR1**	1.5	75	3			40	60	100
CCPII	PRACTICAL II	**23PSPH2PR2**	1.5	75	3			40	60	100
Discipline Specific Electives (DSE)-Theory										
DSEI	8051 MICROCONTROLLER	23PSPH2DS1MIC	2	30	4	2	15	40	60	100
DSEII	PYTHON PROGRAMMING	23PSPH2DS2PYP	2	30	4	2	15	40	60	100

Discipline Specific Electives (DSE) - Practical										
DSEI	8051 MICROCONTROLLER	**23PSPH2PDS1**	2	30	4			40	60	100

DSEII	PYTHON PROGRAMMING	**23PSPH2PDS2**	2	30	4			40	60	100

M. Sc. (PHYSICS) SEMESTER I
Core course - I
COURSE TITLE: Mathematical Methods

COURSE CODE: 23PSPH1CC1MTM [CREDITS - 02]

Course Learning Outcome		
After the successful completion of the Course, the learner will be able to: 1. Understand applications of Complex variable 2. Understand Complex integrals 3. Understand Special functions 4. Understand Tensor analysis		
Module 1		**[15L]**
Learning Objectives: This module is intended to 1. To establish the mathematical background to understand core areas of physics. 2. To create a solid foundation for theoretical and experimental research in Physics.		
Learning Outcome: After the successful completion of the module, the learner will be able to 1. Analyze complex variables and their applications. 2. Calculate complex integral.		
1.1	Complex Variables, Cauchy-Riemann Equations, Analytic functions, Harmonic functions,	4L
1.2	Elementary functions: Exponential and Trigonometric, Taylor and Laurent series, Solution of differential equation using power series Frobenius method., Residues, Residue theorem, Principal part of the functions, Residues at poles, zeroes and poles of order m	6L
1.3	Contour Integrals, Evaluation of improper real integrals, improper integral involving Sines and Cosines, Definite integrals involving sine and cosine functions.	5L
Module 2		**[15L]**
Learning Objectives: This module is intended to 1. Understand the concept of Special functions		

2. Understand Tensor Analysis		
Learning Outcome: After the successful completion of the module, the learner will be able to 1. Evaluate Special Functions 2. Perform Tensor Analysis		
2.1	**Legendre functions:** Legendre polynomials, Rodrigue's formula; generating function and recursion relations; Orthogonality and normalization; associated Legendre function, special harmonics. **Bessel functions:** Bessel functions of the first kind, recursion relations and orthogonality. **Hermite functions:** Hermite polynomials, generating function, recursion relations; Orthogonality.	7L
2.2	**Laguerre functions:** Laguerre & associated Lauguerre polynomials,recursion relations, Orthogonality. **Tensor Analysis:** Introduction to Tensor Analysis, Addition and Subtraction of Tensors, summation convention, Contraction, Direct Product, Levi-Civita Symbol.	8L
References:	1. Mathematical Physics, H.K.Dass, S.Chand and Company Ltd.,2010. 2. Mathematical Methods for Physicists, G. Arfken: Mathematical Methods for Physicists, Academic Press Academic Press. 3. Schaum's Outline of Complex Variables, 2ed 4. Mathematical Methods for Physicists (4th edition): George Arfken& Hans J. Weber, Academic Press, San Diego (1995). 5. Mathematical Methods in Physical Sciences (2nd edition): Mary L. Boas, John Wiley & Sons, New York (1983). 6. Mathematical Physics: P. K. Chattopadhyay, Wiley Eastern Ltd., New Delhi (1990). 7. Introduction to Mathematical Physics: Charlie Harper, Prentice Hall of India Pvt. Ltd., New Delhi (1995). 8. Mathematical Methods for Physicists (4th edition): George Arfken& Hans J. Weber, Academic Press, San Diego (1995). 9. Mathematical Methods in Physical Sciences (2nd edition): Mary L. Boas, John Wiley & Sons, New York (1983).	

	10. Mathematical Physics: P. K. Chattopadhyay, Wiley Eastern Ltd., New Delhi (1990). 11. Introduction to Mathematical Physics: Charlie Harper, Prentice Hall of India Pvt. Ltd., New Delhi (1995). 12. Matrices and Tensors in Physics (3rd edition): A.W. Joshi, New Age International (P) Ltd. Publishers, New Delhi (2000). 13. Mathematical Physics, H.K.Dass, S.Chand and Company Ltd.,2010.	

M. Sc. (PHYSICS) SEMESTER I
Core course - II
COURSE TITLE: Classical Mechanics
COURSE CODE: **23PSPH1CC2CM [CREDITS - 02]**

Course Learning Outcome		
After the successful completion of the Course, the learner will be able to: 1. To establish new mechanics to overcome the difficulties in applying Newtonian Mechanics. 2. To introduce the concept of Lagrangian and Hamiltonian mechanics. 3. To learn to compare coordinate transformation amongst all the above mechanics.		
Module 1	**Lagrangian dynamics & calculus of variations**	**[15L]**
Learning Objectives: This module is intended to 1. Introduce the concepts of Hamiltonian and Lagrangian mechanics 2. Familiarize learner with the calculus of variations		
Learning Outcome: After the successful completion of the module, the learner will be able to 1. Apply the calculus of variations to Physics problems, Apply Lagrangian dynamics to Physics problems 2. Establish connection between ignorable coordinates and laws of conservations.		
1.1	Hamilton's principle, Calculus of variations, Derivation of Lagrange's equations from Hamilton's principle	6
1.2	Lagrange Multipliers and constraint extremization Problems, Extension of Hamilton's principle to nonholonomic systems	5
1.3	Advantages of a variational principle formulation, Cyclic coordinates and conservation theorems.	4

Module 2	Hamiltonian dynamics and canonical transformations	[15L]
Learning Objectives: This module is intended to 1. Introduce and apply Hamilitonian equations of motion. 2. Introduce the concept of canonical transformations		
Learning Outcome: After the successful completion of the module, the learner will be able to 1. To apply canonical transforms to simplify Physics problems 2. Use canonical invariants to determine if a coordinate transformation is canonical		
2.1	Derivation of Hamilton's equations from a variational principle.	3
2.2	Canonical Transformations, Examples of canonical transformations, The symplectic approach to canonical transformations, Poisson brackets and other canonical invariants	7
2.3	Equations of motion, infinitesimal canonical transformations and conservation theorems in the Poisson bracket formulation, The angular momentum Poisson bracket relations.	5
References:	1.Classical Mechanics, H. Goldstein, Poole and Safko, 3rd Edition, Narosa Publication (2001) 2. N. C. Rana and P. S. Joag., Classical Mechanics, Tata McGraw Hill Publication. 3. S. N. Biswas, Classical Mechanics, Allied Publishers (Calcutta). 4. V. B. Bhatia, Classical Mechanics, Narosa Publishing (1997). 5. Landau and Lifshitz, Butterworth, Heinemann, Mechanics. 6. R. V. Kamat, The Action Principle in Physics, New Age Intl. (1995). 7. E. A. Deslougue, Classical Mechanics, Vol I and II, John Wiley (1982).	

Paper III

M. Sc. (PHYSICS) SEMESTER I

COURSE TITLE: QUANTUM MECHANICS - I

COURSE CODE: 23PSPH1CC3QM1 [CREDITS - 02]

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: 1. Understand basic principles of quantum mechanics and applications. 2. Apply commutation relations in uncertainty principles 3. After completing this module, the learners will understand the basic principles of

quantum mechanics.

4. Apply Schrodinger equation in one dimensional potential barrier.

Module 1	Introduction to Quantum mechanics	[15L]

Learning Objectives:

This module is intended to

1. Explain the basic principles of quantum mechanics and solution to initial value problem
2. Describe the commutation relationship and its application in uncertainty principle.

Learning Outcome:

After the successful completion of the module, the learner will be able to

1. Understand basic principles of quantum mechanics and applications.
2. Apply commutation relations in uncertainty principles.

1.1	Postulates of QM: Observables and operators; measurements; the state function and expectation values; the time-dependent Schrodinger equation; time development of state functions; solution to the initial value problem. Problem solving	08L
1.2	Superposition and Commutation: The superposition principle; Commutator relations; their connection to the uncertainty principle; degeneracy; complete sets of commuting observables. Time development of state functions and expectation values. Problem solving	07L

References:

- Richard Liboff, Introductory Quantum Mechanics, 4thed., 2003. (RL
- DJ Griffiths, Introduction to Quantum Mechanics, 3rd Edition 2018. (DG)
- Nouredine Zettili, Quantum Mechanics- Concepts and Applications, 2nd edition, 2009, Wiley (NZ)

Module 2	Matrix Formalism	[15L]

Learning Objectives:

This module is intended to

1. Develop matrix formulation for Quantum Mechanics.
2. Explain concept of tunneling in potential barrier.

Learning Outcome:

After the successful completion of the module, the learner will be able to

1. After completing this module, the learners will understand the basic principles of

	quantum mechanics. 2. Apply Schrodinger equation in one dimensional potential barrier.	
2.1	Dirac notation; Hilbert space; Dirac Notation, Operators: Uncertainty relations between operators, Hermitian operators and their properties. Matrix mechanics: Basis and representations; matrix properties; unitary transformations. Symmetries and conservation laws. Poisson's bracket and commutators	10L
2.2	Particle in a box, Harmonic oscillator, Unbound states, Rectangular potential barrier-tunnelling	05L

References:

- Richard Liboff, Introductory Quantum Mechanics, 4thed., 2003. (RL
- D. J. Griffiths, Introduction to Quantum Mechanics, 3rd Edition 2018. (DG)
- Nouredine Zettili, Quantum Mechanics- Concepts and Applications, 2nd edition, 2009, Wiley (NZ)

Additional References:

1.W Greiner, Quantum Mechanics: An Introduction, 4th. ed., 2004.

2. R Shankar, Principles of Quantum Mechanics, 2nded., 1994.3SN Biswas, Quantum Mechanics, 1998.

3. A Ghatak & S Lokanathan, Quantum Mechanics: Theory &Applications. 5thed., 2004.

Paper IV
M. Sc. (PHYSICS) SEMESTER I

COURSE TITLE: Condensed Matter physics

COURSE CODE: 23PSPH1CC4CMP [CREDITS - 02]

Course Learning Outcome		
After the successful completion of the Course, the learner will be able to: 1. Understand fabrication techniques for p-n junctions and various concepts related to semiconductor devices. 2. Explain the crystal structure and several ways of analyzing it and develop theories to describe various kinds of magnetism in materials.		
Module 1	Semiconductor Devices	**[15L]**

Learning Objectives:

This module is intended to

1. Explain the techniques used for fabrication of p-n junction and its characteristics.
2. Explain the metal semiconductor contacts and various properties related to it.

Learning Outcome:

After the successful completion of the module, the learner will be able to

1. Describe various p-n junction fabrication methods.
2. Derive the IV and CV characteristics of a diode.
3. Explain metal semiconductor contacts and various concepts related to it.

1.1	p-n junction: Fabrication of p-n junction by diffusion and ion-implantation; Abrupt and linearly graded junctions; Thermal equilibrium conditions; Depletion regions; Depletion capacitance, Capacitance – voltage (C-V) characteristics, Evaluation of impurity distribution, Ideal and Practical Current-voltage (I-V) characteristics; Tunneling and avalanche reverse junction break down mechanisms; Minority carrier storage, diffusion capacitance. Carrier lifetime measurement by reverse recovery of junction diode. Tunnel diode.	08L
1.2	Metal – Semiconductor Contacts: Schottky barrier – Energy band relation, Capacitance-voltage (C-V) characteristics, Current-voltage (I-V) characteristics; Ideality factor, Barrier height and carrier concentration measurements; Ohmic contacts functions and expectation values.	07L

References:

- S.M. Sze; Semiconductor Devices: Physics and Technology, 2nd edition, John Wiley, New York, 2002.
- B.G. Streetman and S. Banerjee; Solid State Electronic Devices, 5th edition, Prentice Hall of India, NJ, 2000.
- W.R. Runyan, Semiconductor Measurements and Instrumentation, McGraw Hill, Tokyo, 1975. 4. Adir Bar-Lev: Semiconductors and Electronic devices, 2nd edition, Prentice Hall, Englewood Cliffs, N.J., 1984.

Module 2	Crystal Physics and Magnetism	**[15L]**

Learning Objectives:

This module is intended to

1. Explain concepts of reciprocal lattices and structure factors. 2. Explain the theory of magnetism.		
Learning Outcome: After the successful completion of the module, the learner will be able to 1. Explain reciprocal lattice and scattering from surfaces. 2. Understand the theory of magnetism and equations related to it.		
2.1	Reciprocal Lattice and Brillouin Zones. Reciprocal Lattice to sc, bcc, fcc, Scattered wave amplitude, Fourier analysis of the basis; Structure Factor of lattices (sc, bcc, fcc); Atomic Form Factor; Temperature dependence of reflection lines. Elastic scattering from Surfaces; Elastic scattering from amorphous solids.	10L
2.2	Langevin's diamagnetic equation, diamagnetic response, Quantum mechanical formulation, core diamagnetism. Langevin's Theory of Para magnetism, Rare Earth Ions, Hund's Rule.	05L
References: • Charles Kittel "Introduction to Solid State Physics," 7th edition John Wiley & Sons. • J.Richard Christman "Fundamentals of Solid State Physics" John Wiley & sons • M.A.Wahab "Solid State Physics –Structure and properties of Materials" Narosa Publications 1999. • M. Ali Omar "Elementary Solid State Physics" Addison Wesley (LPE)		

M. Sc. (PHYSICS) SEMESTER I

COURSE TITLE: DSE 1: 8086 MICROPROCESSORS

COURSE CODE: 23PSPH1DS1MIP [CREDITS - 02]

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: 1. To know the architecture of 8086 Microprocessor 2. To understand the Programming of 8086 3. To understand The Instruction set of x86 Processor

4. To understand the Interrupt mechanism of x86
5. Interfacing with PPI & Keyboard and Display Controllers

Module 1	THE 8086 MICROPROCESSOR	[15L]

Learning Objectives:

This module is intended to

Understand the Architecture, addressing modes and instruction sets of 8086 Microprocessor.

Learning Outcome:

After the successful completion of the module, the learner will be able to
Understand the block diagram and architecture of 8086
Understand various instruction sets of 8086

1.1	Role of Microprocessor in Micro Computer – Brief history of Microprocessors (with specific insight into x86 family), Features of 8086 Internal Block Diagram of 8086, Execution Unit, Bus Interface Unit,Addressing Modes Hardware structure of 8086- Pin Configuration, Clock, Processor activities (Interrupt, DMA, etc.), Maximum mode, Instruction cycle Assembly process, Assemblers for x86 , Instruction Design	08L
1.2	Data transfer Instructions, Branch instructions, Arithmetic instructions, Shift and Rotate Instructions, String Instructions, Procedures, Macros, Number Format Conversions, ASCII operations	07L

References:

Module 2	Interrupt mechanism of x86 & Interfacing of chips	[15L]

Learning Objectives:

This module is intended to

Explain Interfacing with PPI & Keyboard and Display Controllers

Learning Outcome: After the successful completion of the module, the learner will be able to 1. Understand interrupts and their types 2. Explain interfacing of PPI and Keyboard and Display Controllers		
2	Interrupts of 8086, Dedicated Interrupt types, Software interrupts,Hardware interrupts, Priority of interrupts, Programmable Interrupt Controller (8259) Organization and Interfacing of PPI (8255) and Keyboard and display Interface (8279).	15 L
References: 1. A. K.Ray , K M Bhurchandi, “Advanced Microprocessor & Peripherals”, Tata McGraw Hill,3rd Edition,2013 1. 2. Douglas V Hall, “Microprocessor & Interfacing: Programming and Hardware”, Tata McGraw Hill, 2nd Edition,2006. 3. BARRY B. BREY, " THE INTEL MICROPROCESSORS-Architecture, Programming, and Interfacing", Pearson Education India. Eighth Edition		

M. Sc. (PHYSICS) SEMESTER I
COURSE TITLE: DSE II: SCiLab

COURSE CODE: 23PSPH1DS2ScL [CREDITS - 02]

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: 1. Understand free simulation softwares

2. Code and simulate Physics equations in second order ODE

Module 1	Elements of SciLab	[15L]
Learning Objectives: This module is intended to 1. Make learner able to understand elementary functioning of scilab environment.		
Learning Outcome: After the successful completion of the module, the learner will be able to learn: 1. Program simple physics plotting		
1.1	Scilab , a freeware numerical computation software, The general environment and the console, Scilab as an interactive calculator, Scilab workspace and working directory. Plotting graphs. Simple numerical calculations, Variables, assignment and display.	08L
1.2	Scilab workspace and working directory. Plotting graphs. Simple numerical calculations, Variables, assignment and display.	07L
References:		

Module 2	ODE Programming	[15L]
Learning Objectives: This module is intended to 1. This module is intended to let the learner code second order ODE.		
Learning Outcome: After the successful completion of the module, the learner will be able to 1. After the successful completion of the module, the learner will be able to code , run and simulate second order Physics equations		
2.1	Working with polynomials, Solving ODE using SciLAb.	07L
2.2	Probability and statistics, Useful SciLAb functions, Other	08L

	application to real Physics Problems.	

References:

1. Scilab for very beginners Scilab Enterprises Versailles (France) - www.scilab-enterprises.com
2. Programming with SCILAB By Gilberto E. Urroz, Ph.D Distributed by infoClearinghouse.com

M. Sc. (PHYSICS) SEMESTER I

COURSE TITLE: LAB COURSE

Course Learning Outcome

After the successful completion of the Course, the learner will be able to:

1. Make layout and adjustments of the equipment.
2. Record observations and plot graphs.
3. Estimate possible errors in the observation of results.
4. Design simple experiments

PRACTICAL I (COURSE CODE: 23PSPH1PR1)

1	Analysis of sodium spectrum
2	h/e by vacuum photocell
3	Absorption spectrum of specific liquids
4	Coupled Oscillations
5	Resistivity by four probe method
6	DC Hall effect
7	Temperature dependence of avalanche and Zener breakdown diodes
8	Carrier lifetime by pulsed reverse method

- **MINIMUM SIX EXPERIMENTS NEED TO BE DONE AND REPORTED IN JOURNAL**

PRACTICAL II (COURSE CODE: 23PSPH1PR2)

1	Delayed linear sweep using IC 555
2	Regulated power supply using IC LM 317 as voltage regulator
3	Regulated dual power supply using IC LM 317 & LM 337 voltage

		regulator
	4	Constant current supply using IC 741 and LM 317
	5	Active filter circuits (second order)
	6	Waveform Generator using ICs
	7	Instrumentation amplifier and its applications
	8	Study of 8-bit DAC

- **MINIMUM SIX EXPERIMENTS NEED TO BE DONE AND REPORTED IN JOURNAL**

References:

1. Advanced Practical Physics -Worsnop and Flint
2. Atomic spectra- H.E. White
3. Electronic Principles - A. P. Malvino
4. Operational amplifiers and linear Integrated circuits - Coughlin & Driscoll
5. Op-amps and linear integrated circuit technology- R. Gayakwad
6. Semiconductor electronics by Gibson
7. Semiconductor measurements by Runyan
8. Electronic devices & circuits - Millman and Halkias
9. Digital principles and applications by Malvino and Leach

M. Sc. (PHYSICS) SEMESTER I

COURSE TITLE: DSE 1 LAB COURSE

Course Learning Outcome

After the successful completion of the Course, the learner will be able to:
Write simple programmes (8086) and execute them

8086 Microprocessor based experiments (**COURSE CODE: 23PSPHP1DS1**)

	1	8/16-bit addition and subtraction
	2	Multiplication & Division of 8-bit numbers
	3	8/16-bit data transfer
	4	To find greatest/smallest number from a list of numbers
	5	To find positive/negative numbers from a list of numbers

	6	To find odd/even numbers, ascending/descending of numbers

- **MINIMUM FOUR EXPERIMENTS NEED TO BE DONE AND REPORTED IN JOURNAL**

M. Sc. (PHYSICS) SEMESTER I

COURSE TITLE: DSE 1I LAB COURSE

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: Write simple programs to simulate physics events and solving second order ODEs

SciLab (**COURSE CODE: 23PSPHP1DS2)**

1	To solve the differential equation dy/dx=-x with x(0)=0. y(0)=-2 from x=0 to 10 with interval =1.	
2	To solve the differential equation using Euler's Method with given initial value condition.	
3	Determination of Kinetic energy to be imparted to recoil electron using Scilab.	
4	Determination of barrier tunneling probability.	

- **MINIMUM FOUR EXPERIMENTS NEED TO BE DONE AND REPORTED IN JOURNAL**

SEMESTER II

M. Sc. (PHYSICS) SEMESTER II

COURSE TITLE: Paper 1: Applied Electronics

COURSE CODE: 23PSPH2CC1AEL [CREDITS - 02]

Paper I Applied Electronics

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: 1] To understand the concept of various circuits used in power electronics. 2] To understand the working and applications of photonic devices.

Module 1	Photonic devices	[15L]

Learning Objectives:

This module is intended to

1] Understand and compare different types of Optical Sources and Detectors.

2] Analyse working and characteristics of LEDs, Laser Diodes and Solar cells.

Learning Outcome:

After the successful completion of the module, the learner will be able to

1. Explain various optical sources and detectors.
2. Describe working principles and characteristics of optical sources and detectors.

1.1	Optical Sources and Detectors: Radiative transitions and optical absorption, Coherent and Non- Coherent sources, quantum efficiency, modulation capability of optical sources. PIN, APD, noise analysis in detectors.	05 L
1.2	LEDs: Working principle and characteristics. Different types of LEDS: homo junction and heterojunction LEDS, surface emitting and edge emitting LEDs, OLED, white LED. Laser Diodes: Working principle and characteristics. Solar cells: working principle and characteristics (as PV devices)	10L

References:

- Keiser, G. Optical Fiber Communications, Mcgraw Hill, Int. Student Ed.
- B.G. Streetman and S. Banerjee; Solid State Electronic Devices, 5th edition, Prentice Hall of India, NJ, 2000.

Module 2	Power Electronics	[15L]
Learning Objectives: This module is intended to 1. Understand the power electronics system and its applications. 2. Analyse working different types of DC-DC converters. 3. Describe applications of DC-Dc converters.		
Learning Outcome: After the successful completion of the module, the learner will be able to 3. Describe and distinguish between varous power electronics system and their components. 4. Illustrate DC-DC converters and desribe their working.		
2.1	Power Electronics: Introduction to Power electronic systems, Power electronics versus linear electronics, Classification power processors and converters, scope and applications. Semiconductor Power Switches: General properties of semiconductor power switches, Power electronic devices such as diode, thyristor, GTO, IGBT and MOSFET. Comparison of semiconductor power switches	05L
2.2	DC – DC Converters: Types, Analysis, Control of converters: time ratio and current limit control. Principles of Step up and Step-down Switching Voltage converters. Analysis of buck, boost, buck-boost converters, Cuk converters. Application of DC – DC converters. switch-mode power supplies, uninterruptible power supplies (UPS)	10L
References: 1. Dr. P. S.Bimbhra" Power Electronics" Khanna Publishers 5th edition 2. M. D. Singh,K. B. KHanchandani "Power Electronics"Mc Graw Hill 7 Th Reprint 2010 3. Alok Jain, Power Electronics and its applications, 2nd Edition, Penram International India.		

Paper II

M. Sc. (PHYSICS) SEMESTER II

COURSE TITLE: Classical Electrodynamics

COURSE CODE: 23PSPH2CC2CED [CREDITS - 02]

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: 1. To apply the concept of electro -magnetic waves to vacuum, matter and waveguides. 2. To study retarded potentials and radiation from charged particles

Module 1	Waves in Conducting media and waveguides	[15L]

Learning Objectives:

This module is intended to

1. Explain the concept of waves in conducting medium.
2. Derive the frequency dependence of various wave properties.
3. Analyze the propagation of electromagnetic waves through waveguides

Learning Outcome:

After the successful completion of the module, the learner will be able to

1. Derive frequency dependence of various wave properties like refractive index, conductivity and polarizability.
2. Describe the propagation of electromagnetic waves through waveguides

1.1	Plane waves in conducting media, skin effect and skin depth, frequency dependence of conductivity, frequency dependence of polarizability, frequency dependence of refractive index.	08L
1.2	Wave guides, Propagation of waves between conducting planes, waves in hollow conductors, TE and TM waves, rectangular waveguides, phase velocity and group velocity, resonant cavities, introduction to transmission lines.	07L

References:

1. Classical Electrodynamics, J.D. Jackson, 4th edition, (John Wiley and Sons.)2005.
2. Introduction to Electrodynamics, D.J. Griffith, 2nd edition, (Prentice Hall)1989.
3. Classical Electromagnetic Radiation, Heald and Marion, 2nd (1980) Academic Press
4. W.Greiner, Classical Electrodynamics (Springer- Verlag, 2000) (WG).
5. Electromagnetics: B.B. Laud. Wiley Eastern Ltd., Bangalore (1987)
6. Classical Electrodynamics; S P Puri, Tata McGraw Hill Publishing Company Ltd., New Delhi, (1990).

Module 2	Retarded Potentials and Radiation	**[15L]**

Learning Objectives:

This module is intended to

1. Explain the concept of retarded potentials and fields
2. Study the power radiated from accelerating charges.
3. Explain application of concept of radiation to antennas

Learning Outcome:

After the successful completion of the module, the learner will be able to

1. Explain the retarded potentials and fields
2. Derive the expression for power radiated from charges.
3. Summarize the working principle of antennas.

2.1	Retarded potentials, The Lienard- Wiechert potentials, Field produced by charged particle in uniform motion, radiation from accelerated charge at low velocities, radiation from charged particle with colinear velocity and acceleration.	08L
2.2	Antennas, antenna characteristics, Electric dipole radiation,	07L

	Hertzian Dipole, linear antennas, center tap antenna, Magnetic dipole radiation.	

References:

1. Classical Electromagnetic Radiation, Heald and Marion, 2nd (1980) Academic Press
2. W.Greiner, Classical Electrodynamics (Springer- Verlag, 2000) (WG).

Paper III

M. Sc. (PHYSICS) SEMESTER II

COURSE TITLE: QUANTUM MECHANICS - II

COURSE CODE: 23PSPH2CC3QMII [CREDITS - 02]

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: 1. Solve problems in angular momentum and ladder operators, Understands Pauli's spin matrices and their commutations. 2. Understands Time dependent and time independent perturbation and its applications

Module 1	**Angular Momentum**	**[15L]**
Learning Objectives: This module is intended to 1. Introduce the concepts of ladder operator and Pauli's matrices. 2. Familiarize learner with various operations pertaining to spin		
Learning Outcome: After the successful completion of the module, the learner will be able to 1. Perform commutation operations among angular momenta.		

2. Use Pauli's matrices properties.		
1.1	Ladder operators, eigenvalues and eigen functions of L^2 and L_z using spherical harmonics	04L
1.2	Addition of angular momentum, Clebsch Gordon coefficients for j1=j2=1/2 and j1= 1, j2 =1/2, coupled and uncoupled representation of eigenfunctions	05L
1.3	Angular momentum matrices; Pauli spin matrices; spin eigen functions; free particle wave functions including spin, addition of two spins	06

References:

- Richard Liboff, Introductory Quantum Mechanics, 4thed., 2003. (RL
- DJ Griffiths, Introduction to Quantum Mechanics, 3rd Edition 2018. (DG)
- Nouredine Zettili, Quantum Mechanics- Concepts and Applications, 2nd edition, 2009, Wiley (NZ)

Module 2	Perturbation Theory	[15L]

Learning Objectives:

This module is intended to

1. Introduce the concept of Perturbation.
2. Understand the applications of Perturbation.

Learning Outcome:

After the successful completion of the module, the learner will be able to

1. To apply time dependent perturbation to Quantum Mechanics Problems.
2. To apply time independent perturbation to Quantum Mechanics Problems

2.1	Perturbation Theory: 1. Time-independent perturbation theory: First-order and second-order corrections to non- degenerate perturbation theory.	06
2.2	Degenerate perturbation theory - First order energies and secular equation. Time-dependent perturbation theory and applications.	06
2.3	RITZ Variational method	03

References:

- Richard Liboff, Introductory Quantum Mechanics, 4thed., 2003. (RL
- D. J. Griffiths, Introduction to Quantum Mechanics, 3rd Edition 2018. (DG)
- Nouredine Zettili, Quantum Mechanics- Concepts and Applications, 2nd edition, 2009,

Wiley (NZ)
Additional References: 1.W Greiner, Quantum Mechanics: An Introduction, 4th. ed., 2004. 2. R Shankar, Principles of Quantum Mechanics, 2nded., 1994.3SN Biswas, Quantum Mechanics, 1998. 3. A Ghatak & S Lokanathan, Quantum Mechanics: Theory &Applications. 5thed., 2004.

Paper IV

M. Sc. (PHYSICS) SEMESTER II

Core course - IV

COURSE TITLE: Atomic and Molecular Physics

COURSE CODE: 23PSPH2CC4AMP [CREDITS - 02]

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: 1. Study the fine structure of the hydrogen atom 2. Apply Schrodinger equation to two electron systems 3. Acquire the knowledge of various types of couplings in atomic system 4. Study the general theory of advanced spectroscopy and spectrometers

Module 1	ATOMIC PHYSICS	**[15L]**
Learning Objectives: This module is intended to		

1. Understand the fine structure of hydrogen atom and apply Schrodinger equation to multi-electron system
2. Compare the fine structure spectrum with hyperfine spectrum.
3. Study general theory of NMR spectroscopy
4. Acquire the knowledge of various types of coupling

Learning Outcome:

After the successful completion of the module, the learner will be able to

1. Evaluate energy splitting under magnetic field
2. Analyse hyperfine spectrum and corelate with isotope effect
3. Describe principle and working of NMR and IR spectroscopy
4. Calculate number of energy levels in various types of couplings

1.1	(Review: Atomic spectrum, Spectroscopic terms, Quantum numbers, Total angular momentum, The magnetic moment of atom, Lande g factor) Fine structure of hydrogenic atoms - Zeeman effect in strong and weak field, Paschen Back effect	5L
1.2	Stark Effect, Nuclear spin and Hyperfine structure, isotope effect, NMR spectroscopy: principle, working, applications	5L
1.3	Term symbols, Selection rules, Exchange symmetry of wave functions, Pauli's exclusion principle, L-S and j-j coupling schemes, allowed terms in the coupling, The central field, ground and excited state of two-electron atoms	5L
Module 2	**Molecular Spectroscopy**	**[15L]**

Learning Objectives:

This module is intended to

1. Explain the theory of electronic spectrum
2. Acquire the knowledge of different molecular rotational and vibrational spectrums.
3. Study general theory of Microwave spectroscopy
4. Acquire the knowledge of basics of IR spectroscopy

Learning Outcome:

After the successful completion of the module, the learner will be able to

1. Describe the principle and working of UV/ VIS spectroscopy

2. Evaluate wavenumbers for the spectrum of rotating linear diatomic molecule 3. Derive the expression for energy levels of molecular vibrational for diatomic molecules 4. Summarize the working principle of Microwave spectroscopy 5. Describe the principle and working of IR spectroscopy		
2.1	**Electronic Spectroscopy:** Molecular orbital approximation theory, Vibrational and rotational structure of electronic spectra, example: UV / Visible spectroscopy: principle, working, applications	4L
2.2	**Molecular rotational spectroscopy:** Classification of molecules: linear, spherical, symmetric and asymmetric tops, rotational energy levels of rigid and non-rigid diatomic molecules, isotope effect and intensity of rotational lines, example: Microwave spectroscopy: principle, working, applications	6L
2.3	**Molecular vibrational spectroscopy**: Vibration of molecules: vibrational energy levels of diatomic molecules, simple harmonic and anharmonic oscillators, diatomic vibrating rotator and vibrational-rotational spectra. Example: IR spectroscopy: principle, working, applications	5L
References:	1. Robert Eisberg and Robert Resnick, Quantum physics of Atoms, Molecules, Solids, Nuclei and Particles, John Wiley & Sons, 2nd ed, (ER) 2. B.H. Bransden and G. J. Joachain, Physics of atoms and molecules, Pearson Education 2nd ed, 2004 (BJ) 3. C. N. Banwell, Fundamentals of molecular spectroscopy, Tata McGraw-Hill, 3rd ed 4. G. K. Woodgate, Elementary Atomic Structure, Oxford university press, 2nd ed, (GW). 5. G. Aruldhas, Molecular structure and spectroscopy, Prentice Hall of India 2nd ed, 2002 (GA) 6. Ira N. Levine, Quantum Chemistry, Pearson Education, 5th edition, 2003 (IL)	

DSE II

M. Sc. (PHYSICS) SEMESTER II

DSE II

COURSE TITLE: 8051 Microcontroller

COURSE CODE: 23PSPH2DS1MIC [CREDITS - 02]

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: 1. Develop an in-depth understanding of the operation of microcontrollers. 2. Get the knowledge about assembly language programming 3. Understand the concept of interrupts and interfacing. 4. Acquire the knowledge about the architecture of microcontroller 5. Study the programming model of microcontroller 6. Be able to write an assembly program for specified applications.

Module 1	**Introduction to 8051**	**[15L]**
Learning Objectives: This module is intended to 1. Compare microprocessor and microcontroller 3. Understand various types of controllers and their specific applications 4. Study architecture of 8051 microcontroller 5. Acquire the knowledge about basics of assembly language 6. Study various instructions available in 8051 assembly programming 7. Understand various addressing modes present in 8051 instructions set		
Learning Outcome: After the successful completion of the module, the learner will be able to 1. Differentiate between microprocessor and microcontrollers 2. Analyse types of microcontrollers and their suitability for different applications		

3. Describe in detail pins available, their functions and architecture of 8051 microcontroller 4. Understand the concepts of assembly language programming 5. List and compare different groups of instructions in 8051 assembly 6. Explain different types of addressing modes present in 8051 assembly.		
1.1	**Introduction:** Difference between microprocessor and microcontroller, types of microcontrollers and architectures, Overview of 8051 family, Applications of Microcontrollers.	2L
1.2	**8051 Architecture**: 8051 pin description, oscillator and clock, Registers, role of PC and DPTR, PSW, Internal Memory Organization, Special function registers, External memory interfacing,	7L
1.3	I/O Ports and serial port, timers and counters, Basics of Assembly programming, Addressing Modes, Instruction set, Assembly programs for data management and manipulation in different types of memories	6L
Module 2	**Programming in 8051**	**[15L]**
Learning Objectives: This module is intended to 1. Study jumping and branching instructions in 8051 assembly 2. Understand port programming for communication purpose 3. Explain data manipulation by using arithmetic and logical instructions 4. Acquire the knowledge of timer and counter programming 3. Explain the interfacing of 8051 with electrical components		
Learning Outcome: After the successful completion of the module, the learner will be able to 1. Analyse logic behind different assembly programs and write the efficient one using branching of code 2. Describe different types of ports, their special functions and use for communicating with external connected devices 3. Evaluate outputs of small codes with arithmetic and logical instructions 4. Calculate the time required for the execution of the loop in assembly 5. Study the interfacing of electrical and electronic components like LED, keyboard, DC motor etc.		
2.1	**Assembly Language Programming for 8051**: Braching:	4L

	Jump Loop and Call Instructions, I/O Port Programming, Arithmetical and Logical Instructions, Coding for serial communication	
2.2	**Timer and Interrupt programming**: Programming 8051 Timers, Counter Programming, Programming Timer Interrupts, Programming External hardware Interrupts	5L
2.3	**I/O Interfacing**: Interfacing with Light Emitting Diodes (LEDs), Push Buttons, Relays and Latch Connections and Keyboard; Interfacing 7-Segment Displays, LCD, ADC and DAC etc. with 89C51 Microcontroller IC. Interfacing and operating DC motor	6L
References:	1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, „The 8051 Microcontroller and Embedded Systems", Second Edition, Pearson Prentice Hall. 2. Kenneth J. Ayala, „The 8051 microcontroller", Cengage Learning, 2004 3. RSG: - Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh S. Gaonkar, Fifth Edition Penram International Publication (India) 4. AB: - Advanced Microprocessors and Peripherals by a K Ray and K M Bhurchandi Second Edition Tata McGraw–Hill Publishing Company ltd.	
Additional References:	1. Douglas V. Hall, Microprocessors and interfacing, programming and hardware, (TMH) 2. Dr. Rajiv Kapadia (Jaico Pub.House) The 8051 Microcontroller & Embedded Systems 3. K.J.Ayala, Penram International 8086 Microprocessor: Programming and Interfacing 4. Design with PIC microcontrollers by John B. Peatman, Pearson Education Asia. 5. Programming & customizing the 8051 microcontroller By Myke Predko, TMH	

[**Microcontroller 8031/8051 based experiments:** (**Experiment no. 1 is compulsory and any two experiments from 2, 3 & 4**)

1. 8031/51 C-assembly language programming

Simple data manipulation programs.(8/16-bit addition, subtraction, multiplication, division, 8/16 bit data transfer, cubes of nos., to rotate a 32- bit number, *finding greatest/smallest number from a block of data, decimal / hexadecimal counter)*

2. Study of IN and OUT port of 8031/51 by Interfacing switches, LEDs and Relays*: to display bit pattern on LED's, to count the number of "ON" switches and display on*

LED's, to trip a relay depending on the logic condition of switches, event counter(using LDR and light source)
3. Study of external interrupts (INT0/INT1) of 8031/51.
4. Study of internal timer and counter in 8031/51.

A2: Interfacing 8031/8051 based experiments:
(Any two experiments from 1, 2 & 3)
1. Interfacing 8 bit DAC with 8031/51 to generate waveforms: *square, saw tooth, triangular.*
2. Interfacing stepper motor with 8031/51: t*o control direction, speed and number of steps.*
3. Interface 8-bit ADC (0804) with 8031/51: *to convert an analog signal into its binary equivalent.*

M. Sc. (PHYSICS) SEMESTER II

DSE II

COURSE TITLE: Python Programming

COURSE CODE: 23PSPH2DS2PYP [CREDITS - 02]

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: 1. Write Python code , compile, debug and run. 2. Apply various data types and control structures in Python programming. 3. Construct python conditional and looping statements 4. Understand class inheritance and poly

Module 1	Basic Python Programming	**[15L]**
Learning Objectives: This module is intended to 1. Learn syntax of Python programming language. 2. Learn core Python scripting elements such as variables, expression and operators		
Learning Outcome: After the successful completion of the module, the learner will be able to 1. Understand basic concepts in python.		

2. Explore contents of files, directories and text processing with python		
1.1	Introduction to Python, Interpreter v/s compiler Installing Anaconda, Python IDEs.	3L
1.2	Python simple coding statements, Print statement and print formats, Data types and Data structures, Python Operators (Mathematical and Logical), Assignment statements, Input Output statements.	12L
Module 2	Python Programming with functions and class	**[15L]**
Learning Objectives: 1. This module is intended to Learn how to write loops and decision statements in Python. 2. Learn how to write functions and pass arguments in Python		
Learning Outcome: After the successful completion of the module, the learner will be able to 1. Learn loops and decision statements in Python. 2. Learn write functions and pass arguments in Python		
2.1	Conditional statements, Looping statements.	6L
2.2	Python namespaces and scopes, Packages and modules, imports, User defined function, Introduction to OOP, Classes, Objects, Interfaces, Inheritance.	9L
References:	1. Python in easy steps(2018) : Mike McGrath, BPB publications 2. Python made simple(2019) : Rydhm Beri, BPB publications 3. Let us Python, 5th Edition(2019) : Yashwant Kanetkar and Aditya Kanetkar, BPB publications	

[**Python based experiments: (Experiment no. 1 is compulsory and any two experiments from 2 & 3)**

1. Basics python programming using various data types and control statements.
2. Python program using functions.
3. Python program with class and object.

M. Sc. (PHYSICS) SEMESTER II
COURSE TITLE: Physics Practical Course

Course Learning Outcome

After the successful completion of the Course, the learner will be able to:

1. Make layout and adjustments of the equipment.
2. Record observations and plot graphs.
3. Estimate possible errors in the observation of results.
4. Design simple experiments

PRACTICAL I (COURSE CODE: 23PSPH2PR1)

1	Characteristics of a Geiger Muller counter and measurement of dead time
2	Ultrasonic Interferometry- Velocity measurements in different Fluids
3	Double slit- Fraunhofer diffraction (missing order etc.)
4	Barrier capacitance of a junction diode
5	Dielectric constant of liquid
6	Energy Band gap by four probe method
7	Double slit- Fraunhofer diffraction (Determination of slit width)

- **MINIMUM SIX EXPERIMENTS NEED TO BE DONE AND REPORTED IN JOURNAL**

PRACTICAL II (COURSE CODE: 23PSPH2PR2)

1	Adder-subtractor circuits using ICs
2	Study of Presettable counters - 74190 and 74193
3	TTL characteristics of totem pole, open collector and tristate devices
4	Shift registers
5	Interfacing TTL with buzzers, relays, motors and solenoids.
6	Study of sample and hold circuit
7	16 channel digital multiplexer

- **MINIMUM SIX EXPERIMENTS NEED TO BE DONE AND REPORTED IN JOURNAL**

References:

1. Experiments in modern physics- Mellissions
2. Manual of experimental physics -EV-Smith
3. Advance practical physics - Worsnop and Flint
4. Digital principles and applications -Malvino and Leach
5. Digital circuits practice - R.P. Jain
6. Semiconductor measurements by Runyan
7. Integrated Circuits - K. R. Botkar
8. Electronic instrumentation & measurement - W. D. Cooper

M. Sc. (PHYSICS) SEMESTER II

COURSE TITLE: DSE 1 LAB COURSE

COURSE CODE: 23PSPH2PDS1

Course Learning Outcome
After the successful completion of the Course, the learner will be able to:

8051 based experiments (COURSE CODE: 23PSPHP2DSE1)	
1	Simple data manipulation programs.(8/16-bit addition, subtraction, multiplication, division, 8/16 bit data transfer, cubes of nos., to rotate a 32- bit number, finding greatest/smallest number from a block of data, decimal / hexadecimal counter)

	2	Study of IN and OUT port of 8031/51 by Interfacing switches, LEDs and Relays: to display bit pattern on LED's, to count the number of "ON" switches and display on LED's, to trip a relay depending on the logic condition of switches, event counter(using LDR and light source)
	3	Study of external interrupts (INT0/INT1) of 8031/51.
	4	Study of internal timer and counter in 8031/51.
		Interfacing 8031/8051 based experiments: (**Any two experiments from 1, 2 & 3)** 1. Interfacing 8 bit DAC with 8031/51 to generate waveforms: square, saw tooth, triangular. 2. Interfacing stepper motor with 8031/51: to control direction, speed and number of steps. 3. Interface 8-bit ADC (0804) with 8031/51: to convert an analog signal into its binary equivalent.

- **MINIMUM FOUR EXPERIMENTS NEED TO BE DONE AND REPORTED IN JOURNAL**

M. Sc. (PHYSICS) SEMESTER II

COURSE TITLE: DSE 2 LAB COURSE

COURSE CODE: 23PSPH2PDS2

Course Learning Outcome
After the successful completion of the Course, the learner will be able to: • Write python code for given problem statements

Programming with Python (COURSE CODE: 23PSPHP2DSE2)		
	1	Basics python programming using various data types and control statements
	2	Python program using functions,

3	Python program with class and object.

- **MINIMUM THREE EXPERIMENTS NEED TO BE DONE AND REPORTED IN JOURNAL**