M.Sc. PHYSICS

Programme Outcomes of M.Sc.

- ➢ Acquire interdisciplinary knowledge and the skill of designing and conducting experiments independently in collaboration and interpreting scientific data.
- ➢ Communicate effectively, analyze critically and learn to adapt to the socio technological changes.
- □ Face competitive examinations that offer challenging and rewarding careers in science and education.
- □ Identify, formulate and critically analyze various scientific problems and design/develop solutions by applying the knowledge to different domains.

Programme Specific outcome

No	Students will be able to	**PSO NO**
1	Have well-defined knowledge on theoretical concepts and experimental methods of advanced physics (Classical mechanics, Mathematical physics, Integrated electronics, Astrophysics, Nanophysics, Microprocessor etc.)	PSO-1
2	Acquire skills in performing advanced physics experiments and projects using modern technology and numerical simulations.	PSO-2
3	Develop and communicate analytical skills ranging from nuclear to cosmology to progress in the expanding frontiers of physics	PSO-3
4	Apply and interpret physics principles in various physical observations	PSO-4
5	Become a complete professional with high integrity and ethics.	PSO-5
6	Prepare for deeper research experiences in an area of emphasis.	PSO-6

Semester III
Core VII: Integrated Electronics
Subject Code: PP1731

Number of hours per week	No of credits	Total number of hours	Marks
6	4	90	100

Objectives: 1. To provide knowledge in the basic structure and working concepts of electronic devices.
2.To acquire application skills involving digital integrated circuit.

Course Outcomes

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO- 1	Understand the basic operation ,features and parameters related to diodes,transistor, switching devices and interpret their applications (FET,JFET,D-MOSFET,EMOSFET,SCR,DIAC,TRIAC)	PSO-1	U
CO- 2	Explain about the internal circuitry and logic behind any digital system (AND,OR,NOT,NAND,NOR,RTL,TTL,I^2L).	PSO-2	U
CO- 3	Assess the working of combinational circuits.(flipflops , counters)	PSO-3	E
CO -4	Design various synchronous and asynchronous sequential circuits.	PSO-6	C
CO- 5	Understand the characteristics of op-amps and the applications of op-amps	PSO-2	U
CO -6	Analyse the behaviourof active filters and IC555	PSO-4	C

Teaching Plan

Credit:5 **Total Hours: 90 (Incl. Seminar & Test)**

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Devices and Applications**					
	1	FET – Types, Principle and working, Salient features and Important Terms / parameters, Practical JFET and FET applications	4	Understand the concepts and salient features of FET and JFET	Illustration, Descriptive lecture	Evaluation through: quiz, Problem solving short questions Descriptive answers Formative assessment (I)
	2	MOSFET – Types and circuit operation, D-MOSFET	3	Distinguish between MOSFET and D-MOSFET and their working	Illustration, Descriptive lecture	
	3	SCR – Working and Equivalent circuit, SCR as a switch and Application of SCR	3	Understand the working of SCR as a switch.	Illustration, Descriptive lecture of Circuit theory	
	4	Triac - Construction / Operation / Characteristics and Applications, Diac and its Applications	3	Differentiate DIAC and TRIAC their working and applications	Discussion on circuit working differences.	
II	**Digital Logic circuits and Flip Flops**					
	1	Digital IC characteristics, Diodes and	4	Identify the use of	PPT	Evaluation

		transistors in logic circuits,		and transistors in logic circuits	Illustration, Descriptive lecture	through: quiz,
	2	DTL type – AND, OR, NAND and NOR, RTL and TTL type NAND, ECL and I^2L circuits	4	Explain about the internal circuitry and working of basic logic circuits	Discussion on circuit working differences.	short questions
	3	Flip flops – NAND Latch, SR, D, JK flip flop	3	Assess the functioning of various flip flops	Descriptive lecture on circuit working differences.	Descriptive answers Assignment
	4	T and JK master – Slave flip flop	2	Understand the working of various flip flops	Discussion on circuit working differences	Formative assessment (I&II)
III	**Registers and Counters**					
	1	Shift register, Ring counter , Shift counter (Johnson's counter)	4	Understand the principle and working of registers and counters	Illustration, Descriptive lecture	Evaluation through: quiz,
	2	Asynchronous counter / Ripple counter, Mod counters, 4-bit binary down counters and 4 Bit up/down counters, BCD counter using decoding gates	5	Identify the different construction and circuit design of asynchronous counters	Discussion on circuit working differences. Practical demonstration	short questions Descriptive answers
	3	Synchronous counters –Design, Mod 3 counter, Random Sequence generator, Synchronous BCD counter	4	Able to design counters with random counting sequence	Lecture discussion on design techniques of Mod counters	Formative assessment (II)
IV	**Op-Amp Circuits**					
	1	Characteristics and parameters, Op-amp comparator, Schmitt Trigger, Inverting and non-inverting amplifier, Voltage follower , summing and difference amplifier, Differentiator and Integrator	4	Understand the basic operations, features and application of OP-amp	PPT Illustration, Descriptive lecture. Practical demonstration	Evaluation through: quiz, Problem solving
	2	Current to voltage converter, Solution of Differential equation and simultaneous equation using op-amp, Instrumentation Amplifier using Transducer Bridge	4	Assess the instrumental Applications of OP-amp	Group design of instrumentation amplifiers	short questions Descriptive answers
	3	Temperature indicator and controller, Light intensity meter , Measurement	3	Apply the OP-amp for different	Discussion on design	Assignment

		of flow and thermal conductivity, Analog weight scale		applications	techniques of Mod counters	Formative assessment (II&III)
	4	Differential input and output amplifier, Voltage to current converter, Very high impedence circuit , sample and hold system	3	Identify the use of OP-amp in various circuits .	Discussion on circuit working differences	
V	**Filter circuits and 555 Timer**					
	1	Active filters , First and second order Low pass Butterworth filter, Filter design, frequency scaling	3	Understand the principle of filter design	PPT Illustration, Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Formative assessment (III)
	2	First order and Second order High pass Butterworth filter	3	Differentiate between the working of first and second order filter	Descriptive lecture with PPT Illustration,	
	3	Higher order filters, Band pass filter, Wide and Narrow Band Rejection filter,Wide and Narrow Band Rejection filter, All pass Filter	4	Extend the design and application of various types of filters.	Descriptive lecture	
	4	555 Timer - internal structure, Schmitt Trigger, Astable multivibrators, Monostable multivibrators	4	Understand the working and applications of 555 timer	Practical demonstration Descriptive lecture with PPT Illustration,	

Course Instructor : Dr. V.Shally **Head of the Department:**Dr.S.Mary Delphine

Semester III
Core VIII: Microprocessor and Microcontroller
Subject Code: PP1732

No of hours per week	No of credits	Total no of hours	Marks
6	4	90	100

Objectives: **1.** To provide knowledge on the hardware, programming and applications of 8085 microprocessor and 8051 microcontroller.

2. To gain hands on experience in interfacing peripherals to the microprocessor.

Course Outcomes

CO	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Explain the operation of various components of the microprocessor 8085 and Pheripheral I/O, memory mapped I/O.	PSO-1	A
CO-2	Explain the various addressing modes and the instruction set of 8085 microprocessor	PSO-1	A

CO-3	Develop skill in writing programs for 8085 microprocessor	PSO-2	Ap
CO-4	Understand the various data transfer schemes, interrupts and interfacing circuits of 8085 microprocessor	PSO-1	U
CO-5	Experiment with the common applications of microprocessor (Display of decimal numbers, Generation of waves forms, Microprocessor based traffic control,Measurement of frequency, resistance, temperature, display of speed of a motor)	PSO-4	A
CO-6	Explain the architecture of 8051 microcontroller and some applications	PSO-1	U

Teaching Plan

Credit:4 **Total Hours:90 (Incl. Seminar & Test)**

Unit	Module	Topics	Lecture hours	Learning outcome	Pedagogy	Assessment/ Evaluation
I	**Evolution and architecture of microprocessor 8085**					
	1	Evolution of microprocessors – Intel 8085 microprocessor – Architecture – ALU – Timing and control unit	4	To be able to describe the architecture of 8085 microprocessor	PPT Illustration, Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Formative assessment(I)
	2	Registers (general purpose & special purpose registers) – Flags – Data and address bus – Pin configuration – 8085-based microcomputer	4	To explain the organization of 8085 microprocessor	PPT Illustration, Descriptive lecture, comparative study	
	3	8085 machine cycles and bus timings	4	To understand the working of each instruction and its execution	Descriptive lecture, comparative study	
	4	Memory interfacing – Peripheral I/O – Memory mapped I/O	3	To realize the interfacing of memory & various I/O devices with 8085 microprocessor	Descriptive lecture and group discussion	
II	**Introduction to assembly language programming**					
	1	Intel 8085 instructions – Opcode and operands – Instruction word size	4	To understand the instruction set of 8085 microprocessor	Descriptive lecture, comparative study	Evaluation through: quiz, short questions Descriptive answers Formative assessment(I& II)
	2	Instruction set of Intel 8085 – Instruction and data formats	4	To classify the instruction set of 8085 microprocessor	Descriptive lecture	
	3	Addressing modes – Stack – Subroutines	3	To identify the addressing mode of an instruction	PPT Illustration, Descriptive lecture, comparative study	
	4	Examples of assembly language	4	To distinguish the use	Descriptive	

		programs: addition of two 8-bit numbers – 8-bit subtraction – One's compliment – Two's compliment – Square of a number – Largest number in an array – Ascending or descending order – Smallest number in an array		of different instructions and apply it in assembly language programming.	lecture and comparative study	
III	**(a) Data transfer schemes – Interrupts – Interfacing** **(b) Microprocessor based data acquisition system**					
	1	Address space partitioning – Memory and I/O interfacing – Data transfer schemes – Programmed data transfer schemes, DMA data transfer scheme	4	To understand the various data transfer schemes of 8085 microprocessor	Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Formative assessment(II)
	2	– Interrupts of Intel 8085 – Hardware and software interrupts – Interrupt call locations – RST 7.5, 6.5 and 5.5 – Interfacing I/O devices – I/O ports: non programmable I/O port Intel 8212, Programmable Peripheral Interface (PPI) Intel 8255	4	To understand the operation of Programmable Interface devices	Descriptive lecture	
	3	Analog to digital converter – Sample and hold circuit – Analog multiplexer – ADC 0800 – Interfacing of A/D converter ADC 0800	4	To be able to describe the interfacing of A/D converter	PPT Illustration, Descriptive lecture	
	4	Interfacing of ADC 0800 and analog multiplexer AM 3705 – Interfacing of ADC 0800, analog multiplexer and sample and hold circuit	3	To realize the programming & interfacing of various devices with 8085 microprocessor	PPT Illustration, Descriptive lecture	
IV	**Microprocessor applications**					
	1	Delay subroutine – 7 Segment LED display	4	To demonstrate the assembly language programming for delays and subroutines	Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Assignment on applications. Formative
	2	Display of decimal numbers – Display of alphanumeric characters – Formation of codes for alphanumeric characters	3	To demonstrate the interfacing of display	Descriptive lecture	
	3	Generation of square wave or pulse – 8-bit multiplication – 8-bit division – Measurement of electrical quantities – Frequency	4	To develop programming skills in assembly language	Descriptive lecture	

		measurement – Resistance measurement				assessment(II & III)
	4	Measurement of physical quantities – Temperature measurement and control – Measurement and display of speed of a motor – Microprocessor based traffic control	4	To build up the assembly language programming skills and real time applications of microprocessor	Descriptive lecture	
V	**The 8051 Microcontroller**					
	1	Inside the 8051 – Introduction to 8051 assembly programming – Assembling and running an 8051 program – The program counter and ROM space in the 8051	5	To understand the basic concepts and architecture of 8051	PPT Illustration, Descriptive lecture	Evaluation through: quiz, short questions Descriptive answers Group discussion Formative assessment (III)
	2	Data types and directives – 8051 Flag bits and the PSW register – 8051 register banks and stack – Pin description of 8051 –	4	To explain the register organization of 8081	PPT Illustration, Descriptive lecture	
	3	– I/O programming – Bit Manipulation. Arithmetic Instructions: Addition of unsigned numbers, - Addition of Individual bytes	4	To develop knowledge about assembly language programs of 8051	Descriptive lecture	
	4	Subtraction of unsigned numbers– Unsigned multiplication and division.	2	To build up knowledge about assembly language programs of 8051	Descriptive lecture and comparative study	

Course Instructor :M. Mary Freeda Head of the Department: Dr.S.Mary Delphine

Semester III
Elective III (a): Physics of the Cosmos
Subject Code: PP1733

No of hours per week	No of credits	Total no of hours	Marks
6	5	90	100

Objectives: 1. The course enables the students to understand and realize the historical evolution of Universe and principles involved in Astrophysics

2. The topics included are Solar system, Comets, Galaxy, Cosmology and Astronomical Instruments which play a key role in the future employability and global progress of students.

Course Outcomes

CO	Upon completion of this course the students will be able to :	PSO addressed	CL
CO- 1	**Perceive** the historical evolution of solar system and universe	PSO-3	E

CO- 2	**Describe** the principles of physics in the formation of astronomical objects like planets-Satellites - Asteroids and Comets	PSO-1	U
CO- 3	**Examine** the requirements and limitations of instrumentation for modern astrophysical observations (Optical telescopes and Radio telescopes)	PSO-2	An
CO -4	**Explain** the basic issues involved in present day astrophysical investigations (Red shift and the expansion of the universe)	PSO-6	U
CO- 5	**Analyse** the formation of Binary stars, multiple stars, Neutron stars and Black holes	PSO-4	An
CO -6	**Interpret** the observations of Galaxies, dark matter, quasars and pulsars.	PSO-5	E
CO -7	Distinguish between of some important models of the universe and its observational tests.	PSO-5	An

Teaching Plan

Total contact hours: 90 (Including lectures, assignment and tests)

Unit	Module	Topics	Lecture Hours	Learning outcomes	Pedagogy	Assessment/ Evaluation
I	**Solar system**					
	1	Components of the solar system - The Sun - The Planet - Two types of planets- Satellites	**4**	Define the basic Components of the solar system	Lecture discussion	Evaluation Class test, oral question assignment Formative assessment I
	2	Asteroids and Comets - Composition differences between the Inner and Outer planets - Bode's law: The search for order - Density as a measure of a planet's composition –	**4**	Apply various Inner and Outer planets	Discussion and PPT Seminar	
	3	Age of solar system - Origin of solar system - Interstellar cloud - Formation of the solar Nebula	**4**	Study of solar system	Discussion and PPT	
	4	Condensation in solar Nebula - Accretion and Planetesimals - Formation of Planets - Formation of Moons - Final stages of Planet formation - Formation of Atmospheres - Cleaning up the solar system	**3**	Formation of Planets	Derivation and group discussion	
II	**Stars**					
	1	Introduction – Visual Binary – Spectroscopic Binary – Eclipsing Binary – Multiple stars – Origin of Binary stars	**4**	Study on Binary and multiple stars	Derivation discussion	Evaluation Class test, oral question

						Assignment, seminar Formative assessment I
	2	Stellar masses and mass Luminosity Relation – Mass transfer in close Binary systems.	**3**	Define and derive mass Luminosity Relation	Discussion and PPT	
	3	Discovery of pulsars – Rotating Neutron star model of pulsars – Period distribution and loss of rotational energy	**4**	Study on Neutron stars and Black holes	Derivation and group discussion PPT Seminar	
	4	Test of rotating neutron star model of pulsars Gold's model of pulsars, Black holes.	**4**	Neutron star and its models	Discussion and PPT	
III	**Galaxies**					
	1	Discovering Galaxies - early observations of Galaxies - Types of Galaxies - Differences in Stellar and Gas content of Galaxies	**4**	Study on galaxies	Derivation discussion,PPT	Evaluation Class test, oral question Assignment, seminar Formative assessment II
	2	The cause of Galaxy types - Galaxy collisions and Mergers - Measuring properties of Galaxies - Galaxy distances - using Cepheid Variables -	**2**	Define and derive Galaxy types	Derivation and group discussion	
	3	The Red shift and Hubble Law - Measuring the diameter of a Galaxy -Measuring the Mass of a Galaxy - Dark Matter- Quasars as probes of Intergalactic Space	**5**	Define and Derive Red shift and Hubble Law, Dark Matter and Quasars	Derivation and group discussion,PPT	
	4	Gravitational Lenses-Galaxy clusters - The local group-Rich and Poor Galaxy clusters - Super clusters	**4**	Define , derive and apply Gravitational Lenses and Galaxy clusters	Derivation and group discussion,PPT Seminar	
IV	**Cosmology**					
	1	Introduction – Red shift and the expansion of the universe – Matter Density in the universe and Declaration parameter	**4**	Prove Red shift and the expansion of the universe	Derivation, discussion,PPT	Evaluation Class test, oral question Assignment, seminar Formative assessment II/III
	2	Perfect cosmological principle – Fundamental equation of cosmology.	**4**	Define and derive Fundamenta	Derivation and group discussion,	

				l equation of cosmology	PPT	
	3	The current theories – Some important models of the universe	**3**	Define and Derive Some important models of the universe	Derivation and group discussion Seminar	
	4	Observational tests of cosmological models.	**4**	Define , derive and apply cosmological models.	Derivation and group discussion	
V	**Astronomical Instruments**					
	1	Light and its properties – Earth atmosphere and the electromagnetic radiation	**4**	Study on light and Earth atmosphere	Discussion, PPT	Evaluation Class test, oral question Assignment, Seminar Formative assessment III
	2	Optical telescopes	**3**	Define, discus and sketch Optical telescopes	discussion, PPT Seminar	
	3	Radio telescopes – Hubble space telescopes – Astronomical spectrographs – Photoelectric photometry	**4**	Define, discus and sketch Radio telescopes	discussion, PPT	
	4	Spectrophotometry – Detectors and Image processing.	**4**	Define, discus and sketch Detectors and Image processing.	discussion, PPT	

Course Instructor: **Dr.C**. Nirmala Louis

Head of the Department: Dr.S.Mary Delphine