SYLLABUS

MANONMANIAM SUNDARANAR UNIVERISTY, TIRUNELVELI-12

UG - COURSES – AFFILIATED COLLEGES

Course Structure for **B.Sc Physics** (Choice Based Credit System)

(with effect from the academic year 2017- 2018 onwards)

Semester-V							
Part	Subject Status	Subject Title	Subject Code	Credit			
III	Core	BASIC ELECTRONICS	SMPH51	4			
	Core	PROGRAMMING IN C++	SMPH52	4			
	Core	ATOMIC PHYSICS	SMPH53	4			
	Elective	SPECTROSCOPY	SEPH5B	4			
	Elective	COMMUNICATION ELECTRONICS	SEPH5C	4			
IV	Common	PERSONALITY DEVELOPMENT	SCSB5A	2			
III	Practical	MAJOR PRACTICAL - V	SMPHP5	4			
	Practical	MAJOR PRACTICAL - VI	SMPHP6	4			



Total Marks: 100 Internal Exam: 25 marks + External Exam: 75 marks

A. Scheme for internal Assessment:

Maximum marks for written test: **20 marks 3 internal tests**, each of **I hour** duration shall be conducted every semester. To the average of the **best two** written examinations must be added the marks scored in. The **assignment** for 5 marks.

The break up for internal assessment shall be: Written test- 20 marks; Assignment -5 marks Total - 25 marks

B. Scheme of External Examination

3 hrs. examination at the end of the semester

- A Part : 1 mark question two from each unit
- $B-Part:\ 5$ marks question one from each unit
- C Part: 8 marks question one from each unit

> Conversion of Marks into Grade Points and Letter Grades

S.No	Marks	Letter Grade	Grade point (GP)	Performance
1	90-100	0	10	Outstanding
2	80-89	A+	9	Excellent
3	70-79	А	8	Very Good
4	60-69	B+	7	Good
5	50-59	В	6	Above Average
6	40-49	С	5	Pass
7	0-39	RA	-	Reappear
8	0	AA	-	Absent

<u>Cumulative Grade Point Average (CGPA)</u>

$$\mathsf{CGPA} = \frac{\Sigma \left(\mathsf{GP} \times \mathsf{C}\right)}{\Sigma \mathsf{C}}$$

- **GP** = Grade point, **C** = Credit
- CGPA is calculated only for Part-III courses
- CGPA for a semester is awarded on cumulative basis

> Classification

- a) First Class with Distinction : CGPA $\ge 7.5^*$
- b) First Class

- : CGPA \geq 7.5* : CGPA \geq 6.0
- . COPA =
- c) Second Class : $CGPA \ge 5.0 \text{ and } < 6.0$ d) Third Class : $CGPA \le 5.0$



BASIC ELECTRONICS

Preamble: This course facilitates an understanding of circuit analysis semiconductor diode and transistor circuits and the basics of operational amplifier. Thepaper does not need any special pre requisite except the basic ideas on Electricity and Electronics at the school level and the learners are expected to gain knowledge to analyse and design electronic circuits

UNIT-I:

LINEAR CIRCUIT ANALYSIS

Constant voltage source, constant current source, conversion of voltage source into current source - Maximum power transfer theorem - Thevanin's theorem -Norton's theorem - hybrid parameters - determination of h parameter - equivalent circuit - the h parameters of a transistor.

UNIT-II: SEMICONDUCTOR DIODES AND DEVICES

PN Junction - V – I characteristics - Crystal diode as a rectifier - Zener diode - V – I characteristics - Tunnel diode - Half wave rectifier-Centre tap full wave rectifier - Full wave bridge rectifier - Comparison of Rectifiers - Filter Circuits - Types (capacitor filter, choke input filter, Π filter) -Zener diode as voltage stabilizer.

UNIT-III: TRANSISTOR AMPLIFIERS

Transistor action - Transistor connections - common emitter - common base - common collector - analysis of amplifiers using h- parameters - RC coupled amplifier - transformer coupled amplifier - power amplifier - classification of power amplifiers (Class A, Class B and Class C) - Push pull amplifier - FET charecteristics - JFET characteristics.

UNIT-IV: OSCILLATORS AND WAVE SHAPING CIRCUITS

Feedback principle and Barkhaussen criterion - Hartley, Colpitt's, and Phase shift oscillators using transistors – Astable - Monostable and Bistable multi vibrators using transistors - Schmitt trigger - clipping and clamping circuits - Differentiating circuit - Integrating circuit.

UNIT-V: OPERATIONAL AMPLIFIER

Op-Amp - pin diagram- characteristics of ideal Op - Amp - DC and A.C analysis - bandwidth - slew rate - frequency response - Op- Amp with negative feedback - applications - Inverting amplifier - Non inverting amplifier - Voltage follower- Adder - Subtractor - Integrator – Differentiator- Low pass, High pass and Band pass filters -Wien bridge oscillator.



Books for study

1. Principles of Electronics - V.K.Mehta & Rohit Mehta-S.Chand &Co.

Books for reference

1. Electronic fundamentals and applications - John D. Ryder – Prentice Hall

- 2. Electronic principles Malvino
- 3. Electronic devices and circuits David Bell- Prentice Hall

4. Basic Electronics - B.Basavaraj, H.N.Shivashankar-2 nd edition-University press

5. Physics of semiconductor devices - Dilip K.Roy - University press.



COMPUTER PROGRAMMING IN C++

Preamble: Objective of the course is to provide knowledge about the basics of Computer programming in C_{++} and to solve problems by writing programs. The paper does not need any special prerequisite and the learners are expected to come out with the ability to apply the computer language C_{++} to solve problems

UNIT-I: WHAT IS C++

Introduction - tokens - keywords - identifiers and constants - declaration of variables - basic data types - user defined data types-derived data types - symbolic constants - operators in C_{++} -expressions and their type-hierarchy of arithmetic operators- scope resolution operator – declaring, initializing and modifying variables-special assignment operators - all control structures-structure of a simple C ++ program

UNIT-II: ARRAYS AND FUNCTIONS IN C++

Introduction - one dimensional and two dimensional arrays-initialization of arrays-array of strings

Functions-introduction-function with no argument and no return valuesfunction with no argument but return value - function with argument and no return values- function with argument and return values- call by referencereturn by reference- function prototyping - inline functions - local, -global and static variables- -function overloading - virtual functions-main function-math library functions.

UNIT-III: CLASSES AND OBJECTS I

ntroduction - specifying a class - defining member functions-C++ program with class - nesting of member functions - private member functions - objects as function arguments - arrays within a class-array of objects-static class members-friend functions-constructors - parameterized constructors-multiple constructors - constructors with default arguments - copy constructor.

UNIT-IV: OPERATOR OVERLOADING, INHERITANCE AND POINTERS

Introduction -defining operator overloading - overloading unary operators binary operators. Inheritance - single inheritance - multiple inheritance - multiple inheritance - multiple inheritance - hierarchial inheritance-virtual base class-abstract class Pointers- definition-declaration- arithmetic operations.

UNIT-V: MANAGING CONSOLE I/O OPERATIONS

Introduction - C++ stream - C++ stream classes - unformatted I/O Operations - formatted console I/O operations - working with files - classes for file steam operations - opening and closing a file - file pointers and their manipulations.



Books for study

1. Object oriented Programming with C++ - E.Balagurusamy, Tata Mc Graw-Hill publishing company Ltd. New Delhi

Books for reference

- 1. Programming with C++ D.Ravichandran, Tata Mc Graw-Hill publishing company Ltd. New Delhi .
- 2. Object oriented Programming in C++-4 th Edn.Robert Lafore-Macmilan publishing company Ltd.
- 3. Fundamentals of Programming with C++ -Richardl.Halterman





ATOMIC PHYSICS

Preamble: The course provides an introductory account about the atomic structure and the impact of X-rays. This paper does not need any special prerequisite except the basic understanding of materials at the school level and the learners are expected to know the various atom models and the importance of X-rays in exploring the atomic structure

Unit I: BAND THEORY OF SOLIDS

The free electron theory of metals – expressions for electrical conductivity – thermal conductivity – Wiedman-Franz's law-Hall effectmagnetoresistance-determination of electronic charge – Millikan' s oil drop method – electron microscope – Band theory of solids – classification of solids on the basis of band theory.

Unit II: POSITIVE RAYS:

Discovery-properties- analysis – Thomson's parabola method – Aston's mass spectrograph – Bainbridge's mass spectrograph – Dempster's mass spectrograph – Dunnington's method of determining e/m.

Unit III : ATOMIC STRUCTURE-1

spectra-Thomson model-Alpha Early atomic particle scattering-Rutherford 'S nuclear model-drawbacks-Bohr atom model -Bohr's interpretation of the Hydrogen spectrum-correction for nuclear motionevidences favour of Bohr's theory-Ritz combination principlein correspondence principle-Sommerfield's relativistic atom model-drawbacks- the vector atom model - Quantum numbers associated with the vector atom model - the Pauli's exclusion principle - periodic classification of elements

Unit IV: ATOMIC STRUCTURE-II Coupling schemes-L-S Coupling-j-j Coupling-Hund rules- magnetic dipole moment due to orbital motion of the electron-due to spin of the electron -Stern and Gerlach experiment-spin-orbit coupling-optical spectra-spectral terms-spectral notation-selection rulesintensity rules-interval rule-fine structure of sodium D line-hyperfine structure-Normal Zeeman effect-theory and experiment- quantum mechanical explanation -Larmor's theorem- Anomalous Zeeman effect-Paschen –Bach effect-Stark effect.

Unit V: X-Rays: Production of X-rays – properties-absorption of X-rays – X-ray absorption edges- Bragg's law – Bragg's X-ray spectrometer –the powder crystal method –Laue's method – Rotating crystal method –X-ray spectra-continuous spectra- characteristic spectra-Moseley's law -importance–width of



spectral lines-Doppler broadening-collision broadening-X-ray Detectorsscintillation detector-semiconductor detectors

Books for study

1.Modern Physics - R. Murugesan (S.Chand &Co.)

Books for Reference

1.Modern Physics - R.Murugesan and Kiruthiga Sivaprasath, S. Chand & Co Ltd, New Delhi. 2.Modern Physics - B.S.Agarwal, Kedarnath Ramnath, Meerut, Delhi.

3.Atomic and Nuclear Physics - N.Subrahmanyan Brijal, S. Chand & Co Ltd, New Delhi 4.Modern Physics - B.V.N Rao, Wiley Eastern Ltd, New Delhi

5. Modern Physics-G.Aruldhas and P.Rajagopal-PHI L



SPECTROSCOPY

Preamble: This course facilitates an understanding of atomic and molecular spectra and the instrumentations .The paper needs a basic knowledge about atomic structure and the learners are expected to gain knowledge to identify materials with the help of various spectra

UNIT I: MICROWAVE SPECTROSCOPY

Rotation of molecules – Classification of molecules – Rotation spectra of diatomic molecules – Intensities of spectral lines – Effect of isotopic substitution – Non-rigid rotator – Spectrum of a non-rigid rotator –Polyatomic molecules – Symmetric top molecules – Asymmetric top molecules -Techniques and Instrumentation – Chemical analysis by microwave spectroscopy.

UNIT II: INFRARED SPECTROSCOPY

I.R. spectroscopy – Vibrating diatomic molecules – Simple Harmonic Oscillator - Anharmonic oscillator – Diatomic vibrating rotator – IR spectrum of carbon monoxide - Interaction of rotations and vibrations – Vibration of polyatomic molecules – Analysis by IR techniques.

UNIT III : RAMAN SPECTROSCOPY

Raman effect-discovery – Quantum theory of Raman effect – Classical theory of Raman Effect –Pure rotational Raman spectra- Linear molecules – Raman spectrum of symmetric top molecules - Vibrational Raman spectra – Rule of mutual exclusion – Overtone and combinational vibrations - Rotational fine structure – Polarization of light and the Raman Effect - Structure determination from IR and Raman spectroscopy.

UNIT IV: ELECTRONIC SPECTROSCOPY

Born - Oppenheimer approximation – vibrational coarse structure-Progressions – Frank-Condon principle – Dissociation energy and Dissociation products – Rotational fine structure -Electronic vibration transitions - Fortrat diagram -Predissociation – Diatomic molecules.

UNIT V : INSTRUMENTATION

Instrumentation and techniques in Infrared spectroscopy – Sources – Monochromators – Sample cells – Detectors – Single beam Infra red spectrometer – Double beam Infra red spectrometer

Book For Study

1.Fundamentals Of Molecular Spectroscopy - Colin N Banwell Elaine- M Mccash Fifth Edition

Book For Reference

1. Molecular structure and spectroscopy - G. Aruldhas, PHI Learning Pvt. Ltd, India.



2.Hand book of Analytical Instruments -R.S. Khandpur, Tata MC Grow Hill Ltd. 3.Spectroscopy -G.R. Chatwal and S.K. Anand, Himalaya publishing House, New Delhi.



COMMUNICATION ELECTRONICS

Preamble: This course enable the students to understand various modulation and demodulation techniques used for communication. The paper needs a basic knowledge in electronics and mathematics and the learners are expected to come out with the ability to choose proper modulation techniques .

UNIT I: AMPLITUDE MODULATION AND TRANSMISSION

Introduction – amplitude Modulation – AM envelop – AM frequency spectrum and bandwidth – Phasor representation of AM with carrier – coefficient of modulation or percentage modulation or modulation index – degrees of modulation – AM power distribution – AM Current relation and efficiency - modulation by complex information signal - doubleside band suppressed carrier AM - single side band suppressed carrier AM – Vestigal side band amplitude modulation – AM modulator circuits – emitter modulations or low power AM – collector modulator or medium and high power AM modulator - AM transmitters – Broadcast AM transmitters – Low level of AM transmitter – High level AM transmitter.

UNIT II: AMPLITUDE MODULATION - RECEPTION

Comparison of AM system – Quadrature amplitude modulation – principles of AM detection – AM receivers – receiver parameters – Tuned radio frequency (TRF) receiver or straight receiver – principles of superhetrodyne –double frequency conversion AM receiver.

UNIT III:ANGLE MODULATION – TRANSMISSION

Introduction – Frequency modulation – Phase modulation – Phase deviation and modulation index – Multitone modulation – Transmission band width of FM – conversion of PM to FM or frequency modulator – conversion of FM to PM / phase modulators – commercial broadcast FM – phasor representation of an FM and PM – average power of an AM/FM wave – generation of FM – direct method of FM generation – reactance tube modulator – indirect method of FM wave generation – FM transmitters – indirect method – Comparison of AM and FM.

UNIT IV:FM RECEPTION

FM detectors – Balanced slope detector – Foster seely discriminator – ratio detector – FM super heterodyne receiver – FM noise suppression – threshold extension by FMFB technique.



UNIT - V: DIGITAL MODULATION TECHNIQUES

Introduction – BFSK – Binary phase shift keying – Quadrature PSK – Differential PSK – Performance comparison of digital modulation schemes - M ary FSK – correlative coding – Duobinary encoding.

Book For Study

1.Principles Of Communication Engineering-Dr. K.S. Srinivasan, Second Edition : 2010.

Book For Reference

1.Electronic communication systems – George Kennedy & Bernard Davis, Tata Mcgraw Hills, 4th edition, 2008

2. Electronic communication Systems – Blake, Joseph

J. Adams ki, Sun Yifeng, Delamer publication, 2nd edition, 2012 (Rupa Publication, India). 3.Fundamentals of Electrical engineering – Wayone tomasi



PRACTICAL-V NON ELECTRONICS

- 1. Conversion of Galvanometer into Voltmeter and Ammeter
- 2. Ballistic Galvanometer Absolute Capacity of a Condenser

3. Ballistic Galvanometer – Absolute Determination & Comparison of Mutual Inductance.

- 4. Spectrometer Cauchy's Constants
- 5. Young's Modulus and Poisson's ratio of glass Elliptic Fringes
- 6. Potentiometer Calibration of Volt meter (High Range)
- 7. Potentiometer-Temperature Coefficient of Resistance
- 8. Spectrometre- Biprism
- 9. Thevanin's and Nortan's theorem Verification
- 10. Self inductance-Rayleigh's DC bridge method



PRACTICAL-VI ELECTRONICS

1. V-I Characteristics of Junction diode and Zener diode

2. Transistor characteristics

3. Colpitt's and Hartley Oscillator

4. Single stage amplifier-with and without feedback

5. Full wave rectifier with filters and regulated using zener diode (Study the variation of output voltage without filter, with filter and with zener diode)

6. Astable multivibrator using transistor

7.OPAMP-Adder&Subtractor

8. OPAMP-Differentiator & Integrator

9. OPAMP -Low Pass And High Pass Filter

10. FET charecteristics

